Suicide and self harm in young people

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Suicide and self harm in young people

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Editorial: Suicide and self harm in young people

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Editorial on the Research Topic
Suicide and self harm in young people

Introduction

Suicide is a leading cause of death among young people worldwide, and a history of prior self-harm is the strongest predictor of subsequent suicide (1, 2). Community-based studies have shown that ∼10% of young people have harmed themselves (3), with recent research suggesting an increase in the incidence of self-harm and suicide among this group, especially in children (4, 5). Internationally, young people are facing what has been described as a "rising tide of mental ill-health" (6). Increasing rates of mental disorders have been reported, including anxiety and depressive symptoms and, in some regions, suicide-related outcomes (7–11). Self-harm in young people remains, for the most part, hidden within the community, and so providing timely and targeted interventions remains a key challenge for clinicians and for those working in the broader area of youth mental health. This Research Topic aimed to add to our understanding of the factors underlying suicidal behavior in adolescence, global trends in the incidence of youth self-harm and suicide, and potential mechanisms and modifiable factors which may reduce risk of self-harm and suicide in young people. The 17 published articles broadly represent themes of risk factors and prevalence, service utilization and experiences of suicide and self-harm.

Prevalence of suicidal behavior and associated risk factors

Several studies published in this Research Topic have examined the prevalence of non-suicidal self-injury (NSSI) among young people, in a variety of populations. Xiao et al. carried out a meta-analysis of studies involving 264,638 adolescents to estimate the prevalence of NSSI in non-clinical adolescent populations. The authors reported

an aggregate prevalence of past-year history of 23.2%. A study carried out in Israel by Hamdan et al. reported higher rates of NSSI than the aggregate prevalence reported by Xiao et al., with 30.7% of the sample reporting that they had engaged in NSSI. In this study, elevated rates of NSSI were found in males, those from an immigrant group or Muslim minority, those with severe depressive symptoms and internet addiction. A study by Huang et al. which surveyed Chinese adolescents found that 33.9% of the participants had engaged in NSSI in the past year. Childhood trauma and psychological symptoms increased the risk of NSSI by two and five times, respectively, while high levels of psychological symptoms were found to have partial mediating effects between childhood trauma and NSSI.

In a study from Morocco (Tom and Mafoud), Global Schools Health Survey (GSHS) data in relation to suicidal ideation and planning were analyzed. GSHS is an international collaborative surveillance project designed to help countries measure and assess the behavioral risk factors and protective factors in key areas among young people. Suicidal ideation was reported by 14.4% and suicidal planning by 12.9%. Suicidal ideation was found to be associated with identifying as female, increasing age, bullying victimization, feeling lonely, cigarette smoking, marijuana use, and hunger frequency. Planning was associated with a lower educational level and living in a rural area.

In a school-based survey by Xu et al., conducted in three provinces in China, associations between psychological symptoms, suicide attempts (SA), and NSSI were examined in young people aged 10–20 years. Psychological symptoms and NSSI were independently associated with a higher likelihood of suicide. Adolescent boys with psychological, conduct or social adaptation symptoms without concurrent NSSI were almost three times more likely to report SA than those who reported NSSI, while in girls, only those with social adaptation symptoms had a higher risk of SA in the non-NSSI group than NSSI group.

Several studies examined novel methodologies or emerging risk factors for suicidal behavior in young people. The importance of biological markers were explored in work reported by both Abrial et al. and Barzialy et al. Abrial et al. present the protocol for a novel prospective study to assess the risk of re-attempting suicide and to investigate the multidimensional predictive factors associated with re-attempting suicide in youth after a first suicide attempt. Several socio-demographic, clinical and biological assessments will be undertaken in this promising work (Abrial et al.). Barzilay et al. evaluated the contribution of a polygenic risk score for suicide attempt (PRS-SA) in explaining variance in suicide attempt by early adolescence and conclude that PRS-SA may be useful for youth suicide risk classification.

Experience Sampling Methods (ESM)—which collect self-report information on experiences, emotions or behaviours from an individual as they occur in-the-moment—were explored in two studies. Findings of a study by Kirtley et al. indicate that short-term future thinking relates to suicidal ideation among a non-clinical sample of adolescents. Participants reporting higher past-week suicidal ideation reporting significantly less daily positive future thinking, suggesting a potential role in the development of suicidal thoughts and behaviors. Williams et al. report on the feasibility and acceptability of ESM among LGBTQ+ young people with self-harm thoughts and behaviors, finding that such methods are both acceptable to young people and feasible. The authors stress the need for a full-scale study to better understand temporal trends within this population.

In a timely systematic review, Scudder et al. sought to identify and describe empirically tested screening tools for suicidality in youth presenting to Emergency Departments (ED). In the included studies, the most researched tools were the Ask-Suicide Screening Questions (ASQ) ($n = 15$), Columbia-Suicide Severity Rating Scale (C-SSRS) ($n = 12$), Suicidal Ideation Questionnaire (SIQ) ($n = 11$), and the Risk of Suicide Questionnaire (RSQ) ($n = 7$). Where screening was applied to all patients, about one-fifth of pediatric ED patients screened positive; where suicide screening was applied to psychiatric patients only, over half screened positive. The authors suggest that such screening tools may help to support early detection and appropriate intervention for youth at risk of suicide.

Patterns of service utilization among young people

A number of studies examined help-seeking behavior and service utilization in young people prior to suicide or as a result of self-harm or suicidal ideation. Geulayov et al. examined the utilization of formal, informal and online supports accessed by adolescents before and during the first lockdown period of the COVID-19 pandemic in England. Approximately 13% of adolescents surveyed reported having ever self-harmed, and 7% reported to have self-harmed during the lockdown period. Help-seeking following self-harm was low, with more than one-third of young people not receiving any help. Most commonly, adolescents reported accessing support from friends, with few accessing formal or online supports. Common reasons for not accessing formal supports reflected stigma. The authors suggest that identifying ways to mitigate barriers to help-seeking as well as improving the perceived helpfulness of supports is warranted.

Two studies from the United Kingdom provide interesting overviews of the profile of young people experiencing suicidality—highlighting parental separation or loss, bullying, and autism spectrum disorder (or the presence of autistic traits) as important contributory factors. Both studies highlight the importance of accurate coding of such presentations by clinical services in order to accurately represent the number of presentations and subsequent referral pathways. Ashworth et al. presented a case series study of emergency department presentations by children and young people, which identified an increase in such presentations during the COVID-19 pandemic. Many were currently engaged with or referred to Child and Adolescent Mental Health Services (CAMHS),

a finding reflected in a study of Scottish referrals (Gilmour et al.) of CAMHS referrals, where 24% of all referrals were for suicidality. Their study further demonstrates the clear need for specialist self-harm teams within CAMHS in order to provide appropriate assessment and management of such presentations. They also highlight the need for early intervention in children under the age of 12 years, who are less likely to be referred for intervention.

Service utilization *via* CAMHS was further explored by Astrup et al., who examined service utilization in the year prior to suicide in a cohort of Norweigan young people. One-quarter of young people who died by suicide had contact with CAMHS in the year prior to death. Boys were less likely to have had contact with mental health services in the year prior to death and were four times more likely to have terminated contact at the time of death. The authors discuss the importance of strategies to improve service contact for boys in particular, as well as the need for more universal programs to address mental health of young people.

Young peoples' experiences of suicidal behavior

Finally, a number of studies in this Research Topic have utilized a range of qualitative methodologies to explore young peoples' experiences of suicide and self-harm. In Canada, Harding et al. conducted semi-structured interviews with caregivers of children and youth with fetal alcohol spectrum disorder with a view to exploring their perceptions of the young person's suicidal experiences. They used interpretative phenomenological analysis to form a composite vignette which depicted a single all-encompassing narrative organized around the social-ecological suicide prevention model. This comprised individual level factors such as sociodemographic characteristics, co-occurring health conditions, substance use, early life trauma and familial conflict. Secondly, relational factors such as feelings of belonging (or lack thereof), social disconnection, bullying, and the influence of peer groups were identified. Thirdly, there were a number of community level influences of suicidality centering on regions or settings such as neighborhoods, schools, workplaces, and interactions with healthcare systems. Finally, societal level factors were emphasized including issues such as stigma, geographic region (urban vs, rural settings), and the impacts of the COVID-19 pandemic on experiences. The authors state that their findings suggest the need for training and advocacy to ensure that mental health systems can appropriately respond to the needs of young people with fetal alcohol spectrum disorder experiencing suicidality.

In New Zealand, Van Wyk and Gibson conducted a thematic analysis on pre-existing transcripts of text communications between young people and a counseling helpline. Young people expressed that suicidal thoughts were a part of everyday life for them and they viewed suicide as an escape from their reality. However, young people also stated that they were ambivalent about dying. Young people also stated that they used suicidality to convey their anguish and connect with others. Young people spoke about the varying intensity of their suicidality, including when their thoughts were perceived to be out of their control. Around half of the young people stated they had made a plan for suicide. A number of young people recognized their need for help and support in regards to their suicidality. This study provides a novel insight into how young people themselves communicate their experiences of suicide in real-time.

In the United Kingdom, Norman et al. conducted semi-structured interviews with young women about their experiences of self-harm. Four themes were discovered *via* an interpretive phenomenological analysis, though just one of these is discussed in the brief report published in this Research Topic; "Is self-harm bad?". In this study, participants both acknowledged and resisted the social construct of self-harm as "bad". In particular, they resisted the idea of self-harm being "bad" due to beliefs that self-harm: was a symptom of underlying mental health difficulties or life stresses; "worked" for them as a coping mechanism; was a part of their identity and narrative. These findings provide additional insights into the way in which people who self-harm navigate the prevailing perceptions of the behavior. Such insights are a crucial step toward the goal of reducing recurrence of self-harm.

Conclusion

Through this Research Topic we sought to better understand the factors underlying suicidal behavior in adolescence, global trends in the incidence of youth self-harm and suicide, and innovative interventions to reduce self-harm and prevent suicide among young people. The body of research represented in this collection highlights novel methodologies and the importance of qualitative research when understanding how best to support young people. A key aim of this Research Topic was to have good representation of studies from low-middle income countries (LMICs), where a significant proportion of youth suicides occur, and from hard-to-reach groups (12). While many articles continue to be from high-income countries (HICs), we are seeing emerging research on ethnic minorities and groups who may be at increased risk of suicide. Future research priorities in this area include the involvement of those with lived experience in youth mental health research, the perspectives of caregivers and families, and the need for high-quality intervention studies.

Author contributions

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Childhood Trauma and Non-suicidal Self-Injury Among Chinese Adolescents: The Mediating Role of Psychological Sub-health

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The factors associated with non-suicidal self-injury (NSSI) of adolescents have been widely researched. However, the underlying mechanism of the relationship between childhood trauma and NSSI is limited. This study aimed to explore the risk factors for NSSI among Chinese adolescents. Our hypothesis was that psychological sub-health (PSH) played a mediating role between childhood trauma and NSSI. The Childhood Trauma Questionnaire, the Multidimensional Sub-health Questionnaire of Adolescent, and the self-report NSSI were used to measure childhood trauma, PSH, and NSSI. Structural equation model (SEM) was performed to verify our hypothesis. The results showed that 33.9% of the participants in our survey had engaged in NSSI in the past year. Adolescents who were left-behind children or in primary schools were more likely to engage in NSSI. Additionally, 56.2% of the participants had moderate to severe childhood trauma, and 26.1% of the participants had PSH. Furthermore, childhood trauma and PSH would increase the risk of NSSI by 2 times (B = 0.79, $p < 0.01$) and 5 times (B = 1.64, $p < 0.01$), respectively. SEM was established ($p = 0.512$) and the goodness-of-fit indices were examined (CMIN/DF = 0.892; GFI = 0.997; AGFI = 0.992; NFI = 0.991; RFI = 0.980; IFI = 1.00; TLI = 1.00; CFI = 1.00; RMSEA < 0.001). The SEM indicated that childhood trauma positively predicted NSSI both directly and indirectly through PSH. PSH has been confirmed to have partial mediating effects between childhood trauma and NSSI. The assessment of PSH may be an operable and effective method to screen and predict NSSI. Meanwhile, the intervention of childhood trauma and PSH may effectively prevent and reduce the occurrence of NSSI among adolescents.

Keywords: non-suicidal self-injury, adolescent, psychological sub-health, childhood trauma, left-behind children

INTRODUCTION

Non-suicidal self-injury (NSSI) is usually defined as deliberate and self-inflicted damage to the body without suicidal intent, which excludes socially accepted behaviors (e.g., piercing, tattooing, or religious rituals) (1). The essential difference between NSSI and suicide, suicidal ideation or suicide attempts is that NSSI is defined as occurring without suicidal intent. Yet another widely

used term for nonfatal self-mutilation is self-harm (regardless of suicidal intent), and the wish to die may be one of the motives or reasons for self-harm. NSSI is an urgent public health problem. The global prevalence of NSSI among adolescents is estimated to be 17.2% (2), while that in China is 22.37% (3). Self-injurious thoughts and behaviors are risk factors for further suicidal ideation, attempts, and death (4–6). More than 800 000 people die by suicide every year (7), while each suicide in a population is accompanied by more than 20 suicide attempts (8). In addition, NSSI was significantly and prospectively associated with increased levels of suicide ideation and suicide attempts and was identified as an important factor to assess the risk for later suicidality (9). Analysis of global patterns of mortality in young people indicated that NSSI has been verified as the strongest predictor of future suicide (10).

The COVID-19 pandemic poses greater challenges to mental health, however, research on NSSI among adolescents was limited (11). An emergency department in Ireland observed a reduction (35%) initially and followed a sharp increase (104%) in patients with self-harm from March to May 2020 (12). Besides, a retrospective international cohort study which examined the differences in hospital emergency psychiatric presentations for NSSI during the COVID-19 pandemic, had observed an increase in the number of adolescents seeking emergency services owing to self-harm (13).

There are many causes of NSSI, and childhood trauma as a prominent traditional risk factor has been extensively studied (14, 15). Childhood trauma mainly refers to emotional and physical abuse or neglect from family or society, approximately one-third of children are reported to have experienced severe childhood trauma (16). Actual or potential physical harm to a child caused by a caregiver or other person using rude and inappropriate behavior toward the child, or chronic and inappropriate emotional reactions to the child, such as malicious rejection, intimidation, or use of sarcastic, insulting, and discriminatory language toward the child. There was also the possibility of being molested as a child, or even being coerced into doing something sexual. Numerous studies have shown that childhood trauma can lead to extensive adverse and lasting effects, such as chronic fatigue syndrome (17), poor academic achievements (18), adulthood depression and anxiety symptoms (19), and early drug use (20). Childhood trauma undermines children's ability to develop positive adaptations, and in turn, the vulnerability of children's adaptive resources leads them to adopt flawed alternative regulatory and relational strategies such as NSSI (21). Trauma experts have noted that, while individuals report NSSI for a variety of reasons, the most salient is reacting to perceived uncomfortable and overwhelming emotions (21). NSSI was conceptualized as being associated not only with intrapersonal motivations (e.g., management of internal states), but also with interpersonal motivations (e.g., to evoke others' emotional responses, such as pity or anger) (22). Child maltreatment is an urgent public health problem that deserves more attention and scientific investment during health and socioeconomic crises like COVID-19 (23). The recession, especially parental job loss, exacerbated the risk of child abuse (24).

In recent years, the mechanisms between childhood trauma exposure and NSSI behaviors have aroused great interest among psychological workers. For screening and preventing NSSI among adolescents, there is an urgent need for an efficient and operable tool. Previous research ideas have focused on a specific point, with the main relevant concepts being borderline personality, alexithymia, and resilience (25–27). However, it is not realistic to screen for everything in practice. In view of the above reasons, this study will focus on a comprehensive concept of psychological sub-health state (PSH). PSH is a psychological state between health and disease, which is characterized by emotional and behavioral problems and the decline of social adaptability, but it is not in line with clinical or subclinical disease diagnosis (28). PSH is generally regarded as a series of suboptimal health states, mainly manifested by unexplained mental fatigue, panic, anxiety, low self-esteem, nervousness, recklessness, and even suicidal thoughts (29). Adolescents in a PSH state may feel inexplicably restless and stressed, feeling that others are not being friendly to them, or having difficulty controlling their anger and impulsiveness. PSH usually does not seriously impact their study and life, but this kind of state can bring adverse psychological and behavioral consequences. This study would explore the pathway from previous adverse experience (childhood trauma), current psychological state (PSH state) to adverse outcomes (NSSI).

The primary objective of the current study was to investigate the prevalence of childhood trauma, PSH, and NSSI of Chinese adolescents during the COVID-19 pandemic. Additionally, we aimed to analyze the relationships between previous or undergoing childhood trauma, current detrimental PSH states and NSSI behaviors. More specifically, this study explored the risk factors for NSSI with the aim of reducing the incidence of NSSI in adolescents. Furthermore, we hypothesized that childhood trauma would be directly and indirectly related to NSSI via PSH. The structural equation model (SEM) would be applied to examine the mediating role of PSH in the relationship between childhood trauma and NSSI.

MATERIALS AND METHODS

Participants

Participants were included in this survey if: (1) they were minors (< 18 years old), and (2) they volunteered to participate in this survey. Adolescents with severe mental or physical illness, or with impaired audiovisual function would be excluded from the study. All participants were recruited from schools in Anhui Province, China, between October 2020 and April 2021. Firstly, under the guidance of their school teachers, we explained the purpose and process of the study to the participants and made sure that they fully understood the study. Written informed consent were then obtained from the participants and their guardians (parents, or other caregivers). This survey was approved by the Ethics Committee of Chaohu Hospital, Anhui Medical University (2019-kyxm-012). All research procedures were strictly in line with the principles of the Helsinki Declaration.

TABLE 1 | Social demographic characteristics of adolescents.

Variables	Total participants	NSSI		Z/χ²	p
	(n = 778)	Yes (n = 264, 33.9%)	No (n = 514, 66.1%)		
Age	12.68 (1.34)	12.53 (1.35)	12.75 (1.32)	−2.54	0.01
Gender				2.15	0.14
Male	391 (50.3%)	123 (46.6%)	268 (52.1%)		
Female	387 (49.7)	141 (53.4%)	246 (47.9%)		
Grade				6.34	0.01
primary school	352 (45.2%)	136 (51.5%)	216 (42.0%)		
middle school	426 (54.8%)	128 (48.5%)	298 (58.0%)		
Accommodation type				3.65	0.06
Boarding student	107 (13.8%)	45 (17.0%)	62 (12.1%)		
Commuting student	671 (86.2%)	219 (83.0%)	452 (87.9%)		
Father's educational level				0.83	0.36
<9 years	463 (59.5%)	163 (61.7%)	300 (58.4%)		
≥9 years	315 (40.5%)	101 (38.3%)	214 (41.6%)		
Mother's educational level				0.38	0.54
<9 years	486 (62.5%)	161 (61.0%)	325 (63.2%)		
≥9 years	292 (37.5%)	103 (39.0%)	189 (36.8%)		
Left behind status				5.75	0.02
Yes	366 (47.0%)	140 (53.0%)	226 (44.0%)		
No	412 (53.0%)	124 (47.0%)	288 (56.0%)		
Siblings				0.37	0.55
Yes	324 (41.6%)	106 (40.2%)	218 (42.4%)		
No	454 (58.4%)	158 (59.8%)	296 (57.6%)		
Parents' marital status				1.86	0.40
Married	644 (82.8%)	212 (80.3%)	432 (84.0%)		
Parental divorce	122 (15.7%)	48 (18.2%)	74 (14.4%)		
Death of a parent	12 (1.5%)	4 (1.5%)	8 (1.6%)		
NSSI frequency					
< 5 times a year	N/A	73 (27.7%)	N/A	N/A	N/A
≥5 times a year	N/A	191(72.3%)	N/A		

Values are presented as number (%) or mean (standard deviation).

Measures

A self-designed questionnaire was used to collect sociodemographic characteristics. All participants received a screening questionnaire for NSSI (30, 31), asking 'Have you ever deliberately harmed yourself, but did not mean to kill yourself in the past year?'. Subsequently, a list of eight NSSI methods were presented as follows: (1) Have you ever hit yourself? (2) Have you ever pulled your hair yourself? (3) Have you ever banged your head or fisted against something? (4) Have you ever pinched yourself? (5) Have you ever scratched yourself? (6) Have you ever bitten yourself? (7) Have you ever exposed yourself to smoke, fire, flames, and overheated substances? and (8) Have you ever cut or pierced yourself? Participants who confirmed the reality that they had engaged in NSSI, the frequency of NSSI was investigated. The Cronbach's α coefficient for the NSSI was reported to be 0.776 (31).

The simplified version of the Childhood Trauma Questionnaire (CTQ-SF), a 28-item self-report questionnaire, was employed to assess a history of emotional and physical abuse and neglect that the participants had experienced or is experiencing. The original English version of the CTQ-SF was written by Professor Bernstein and his colleagues (32, 33) and was translated into Chinese by Zhao et al. (34). CTQ-SF was widely used in Chinese adolescents and proved to have good reliability and validity (35, 36). CTQ-SF consists of five subscales, including emotional abuse, emotional neglect, physical abuse, physical neglect, and sexual abuse.

The Multidimensional Sub-health Questionnaire of Adolescent (MSQA) was applied to assess participants' psychological health state. MSQA is a self-report symptom inventory developed for Chinese adolescents by Tao (37). MSQA consists of psychological health part and physical health part, and only the psychological health part was investigated in this study. psychological health part consists of 39 items, including 3 dimensions: emotional symptoms (17 items), behavioral symptoms (9 items) and social adaptation problems (13 items). Score points based on the duration of each symptom (1 point: none or last < 1 week; 2 points: last ≥ 1 weeks; 3 points: last ≥

2 weeks; 4 points: last $\geq$ 1 month; 5 points: last $\geq$ 2 months; 6 points: last $\geq$ 3 months). PSH state was determined if more than 7 items scored $\geq$4 points (38). MSQA has good reliability and validity (39), and Cronbach α coefficient is 0.96.

Statistical Analysis

Data analyses were conducted with SPSS 21.0, and AMOS 21.0 software packages. Chi-square tests were performed on classified variables. The single-sample Kolmogorov-Smirnov test was used to verify the data distribution type. The independent sample T-test or Mann-Whitney U test were used to compare variables of NSSI group with the non-NSSI group. Spearman or Pearson correlation analyses were applied to describe the correlations among continuous variables. In addition, Binary Logistic regression was used to explore the risk factors of participants' NSSI.

We performed a structural equation model (SEM) to verify the hypothesis of the mediating effect of PSH in the relationship between childhood trauma and NSSI. Confirmatory factor analysis was conducted in AMOS 21.0, and generalized least squares method was employed for parameter estimation. PSH and NSSI were latent variables. PSH was constructed with emotional symptoms, behavioral symptoms, and social adaptation problems, and NSSI was constructed with NSSI (Yes or No) and NSSI frequency. The following goodness-of-fit measures were used to evaluate how well the hypothesized model fit the sample data: Chi-square degrees of freedom ratio (CMIN/DF), comparative fit index (CFI), goodness-of-fit index (GFI), adjusted goodness-of-fit statistic (AGFI), incremental fit index (IFI), normed fit index (NFI), relative fit index (RFI), Tacker-Lewis index (TLI), and root mean square error of approximation (RMSEA). Generally, a well-fitting model is indicated when CFI, GFI, AGFI, IFI, NFI, RFI, and TLI values are above 0.9, CMIN/DF is below 2, and the RMSEA value is below 0.08. All statistical significance was set at $p < 0.05$, and all reported p-values were bilateral.

RESULTS

Social Demographic Characteristics of Participants

Based on the inclusion and exclusion criteria, we ultimately recruited 823 participants. After screening, 45 participants submitted incomplete questionnaires (33 for CTQ-SF questionnaires and 12 for MSQA questionnaires), thus, 778 questionnaires were eligible.

The demographic characteristics of NSSI group ($n = 264$, 33.9%) and non-NSSI group ($n = 514$, 66.1%) are shown in **Table 1**. And 72.3% participants of the NSSI group had frequently hurt themselves ($\geq$5 times a year). Of the 778 participants, there were 391 (50.3%) male and 387 (49.7%) female aged 10 to 17 years (mean age: 12.7 ± 1.3 years). If sorted by grades, there are 352 (45.2%) primary school students (grades 5, 6), and 426 (54.8%) middle school students (grades 7, 8, 9, 10, 11). Generally, participants of younger or lower grades were more likely to develop NSSI behavior ($p = 0.01$). Among the 107 (13.8%) boarding students, 42.1% of them had NSSI, and

TABLE 2 | The prevalence and intergroup comparison of childhood trauma and psychological sub-health state.

Variable	Total sample	NSSI		Z/χ^2	p
	($n = 778$)	Yes ($n = 264$)	No ($n = 514$)		
Childhood trauma	41.07 (11.98)	45.94 (12.81)	38.57 (10.71)	−8.59	<0.001
Yes	437 (56.2%)	191 (72.3%)	246 (47.9%)		
No	341 (43.8%)	73 (27.7%)	268 (52.1%)		
Emotional abuse	7.66 (3.49)	9.09 (4.00)	6.92 (2.94)	−9.18	<0.001
Physical abuse	6.40 (2.89)	7.13 (3.44)	6.03 (2.49)	−6.44	<0.001
Sexual abuse	5.80 (2.49)	6.24 (3.03)	5.58 (2.13)	−4.46	<0.001
Emotional neglect	11.72 (4.75)	13.07 (5.12)	11.03 (4.35)	−5.15	<0.001
Physical neglect	9.49 (3.25)	10.42 (3.40)	9.01 (3.06)	−5.47	<0.001
PSH state				107.44	<0.001
Yes	203 (26.1%)	129 (48.9%)	74 (14.4%)		
No	575 (73.9%)	135 (51.1%)	440 (85.6%)		
Emotional symptoms	33.01 (17.20)	43.87 (19.79)	27.43 (12.46)	−12.64	<0.001
Behavioral symptoms	17.81 (10.23)	23.88 (11.78)	12.7 (7.66)	−12.08	<0.001
Social adaptation problems	25.08 (12.36)	31.51 (14.07)	21.77 (9.88)	−10.56	<0.001

Values are presented as number (%) or mean (standard deviation).

the incidence of NSSI was not significantly higher than that of commuting students ($p = 0.06$). Additionally, nearly half of the participants (41.6%) had ever been or currently were left-behind children (i.e., children whose parents work in other cities and have been separated from their parents for more than half a year), and the incidence of NSSI was significantly higher than those who were accompanied by their parents ($p = 0.02$). Besides, most of the participants' parents were not well-educated (< 9 years) and didn't have siblings. Additionally, 82.8% of the participants' parents are in married status, 15.7% of the participants' parents have divorced, and unfortunately 1.5% of the participants' parents were deceased. Over all, the presence of siblings, parents' marital state and education didn't differ significantly between the NSSI group and the non-NSSI group, while participants adolescents who were left-behind children or in primary schools were more likely to engage in NSSI.

Statistical description and comparison of childhood trauma and PSH among NSSI group and non-NSSI group.

The Mann–Whitney U-tests were used to compare childhood trauma and PSH between NSSI group and non-NSSI group (**Table 2**). More than half of the participants (56.2%) had moderate to severe childhood trauma and 43.7% of them had ever deliberately hurt themselves within the last year, which significantly exceeded that of participants without childhood trauma (21.4%). Furthermore, participants with NSSI behaviors scored much higher on each subscale of CTQ-SF than those

TABLE 3 | Associations between childhood trauma and psychological sub-health state ($n = 778$).

Variable	1	2	3	4	5	6	7	8	9
Childhood trauma	1.00								
Emotional abuse	0.68**	1.00							
Physical abuse	0.56**	0.48**	1.00						
Sexual abuse	0.42**	0.31**	0.40**	1.00					
Emotional neglect	0.81**	0.41**	0.31**	0.19**	1.00				
Physical neglect	0.73**	0.32**	0.23**	0.23**	0.47**	1.00			
PSH state									
Emotional symptoms	0.42**	0.48**	0.25**	0.17**	0.26**	0.30**	1.00		
Behavioral symptoms	0.42**	0.49**	0.26**	0.20**	0.24**	0.31**	0.82**	1.00	
Social adaptation problems	0.41**	0.44**	0.27**	0.20**	0.25**	0.31**	0.80**	0.77**	1.00

*Spearman correlation was used for statistical analysis; **$p < 0.01$.*

TABLE 4 | Risk factors for NSSI ($n = 778$).

	B	SE	Wals	P	OR	95% CI	
						Lower	Upper
Left behind	0.19	0.18	1.18	0.28	1.21	0.86	1.71
Grade	0.64	0.18	13.43	<0.01	1.90	1.35	2.68
PSH state	1.64	0.19	78.00	<0.01	5.15	3.58	7.40
Childhood trauma	0.79	0.18	20.11	<0.01	2.20	1.56	3.10
Constant	−2.02	0.20	103.80	<0.01	0.13		

The statistical analysis used binary logistic regression with the "Enter" method; CI, confidence interval; OR, odds ratio; SE, standard error; $R^2 = 0.23$; Grade, 1: primary school, 0: middle school; PSH, psychological sub-health.

without NSSI behaviors ($p < 0.001$). In addition, participants with PSH state account for only 26.1% and the incidence of NSSI was as high as 63.3%, while the incidence of NSSI among participants without PSH state is only 23.5%. The NSSI group scored significantly higher in emotional symptoms, behavioral symptoms, and social adaptation problems than the non-NSSI group ($p < 0.001$).

Associations Between Childhood Trauma and Current PSH State

Table 3 presented the results of Spearman correlation analysis between the scores of CTQ-SF and MSQA. The total score of CTQ-SF was positively correlated with emotional symptoms ($r = 0.42$, $p < 0.01$), behavioral symptoms ($r = 0.42$, $p < 0.01$) and social adaptation problems ($r = 0.41$, $p < 0.01$). Also, high correlations were found between the PSH subscales (all $r > 0.40$, all $p < 0.01$).

Risk Factors for NSSI

Binary Logistic regressions with the "Enter" method were applied to explore the risk factors of NSSI. As shown in **Table 4**, childhood trauma (OR = 2.20, CI = 1.56–3.10), PSH (OR = 5.15, CI = 3.58–7.40) and grade (OR = 1.90, CI = 1.35–2.68) were risk factors for NSSI ($R^2 = 0.23$). According to the analysis results, the risk of NSSI was 1.9 times higher for primary school students than for middle school students, 2.2 times higher for participants with childhood trauma than for those without childhood trauma,

and 5.15 times higher for those in PSH state than for those in full mental health.

Analysis of the Structural Equation Model

The SEM was successfully built ($p = 0.512$). **Figure 1** presented the final results. Meanwhile, goodness-of-fit indices indicated satisfactory fit of the default model (CMIN/DF = 0.892; GFI = 0.997; AGFI = 0.992; NFI = 0.991; RFI = 0.980; IFI = 1.00; TLI = 1.00; CFI = 1.00; RMSEA < 0.001). **Table 5** showed the direct, indirect, and total effects of the final SEM, and all values were standardized. There were direct effects of childhood trauma ($\beta = 0.11$, $p < 0.001$) and PSH ($\beta = 0.47$, $p < 0.001$) on NSSI. The indirect effects of childhood trauma on NSSI were 0.204 ($p < 0.001$), and the total effects were 0.317 ($p < 0.001$). In general, it was estimated that the predictors of NSSI (childhood trauma and PSH) could explain 28 percent of its variance ($R^2 = 0.28$).

DISCUSSION

PSH has been confirmed to have partial mediating effects between childhood trauma and NSSI. To the best of our knowledge, this is the first study to investigate the effect of childhood trauma exposure on the occurrence of NSSI behaviors from the perspective of current PSH state.

Our survey results showed that 33.9% participants had engaged in NSSI in the past year. 56.2% of the participants had moderate to severe childhood trauma, and 26.1% of the participants had PSH. Additionally, adolescents who are left-behind children and in lower grades were more likely to engage in NSSI. Most importantly, the current findings highlighted that childhood trauma exposure and current PSH state significantly increase the risk of developing NSSI behaviors. Specifically, childhood trauma and the current adverse PSH in adolescents can increase the NSSI risks by 2 times and 5 times, respectively. Meanwhile, the SEM successfully verified our initial hypothesis that childhood trauma positively predicted NSSI both directly and indirectly through PSH.

This paper explored whether the prevalence of NSSI among Chinese adolescents increased during the COVID-19 pandemic. As we predicted, the prevalence of NSSI had increased sharply. The prevalence rate of NSSI in this study is consistent with that in the COVID-19 epidemic period in the domestic and overseas,
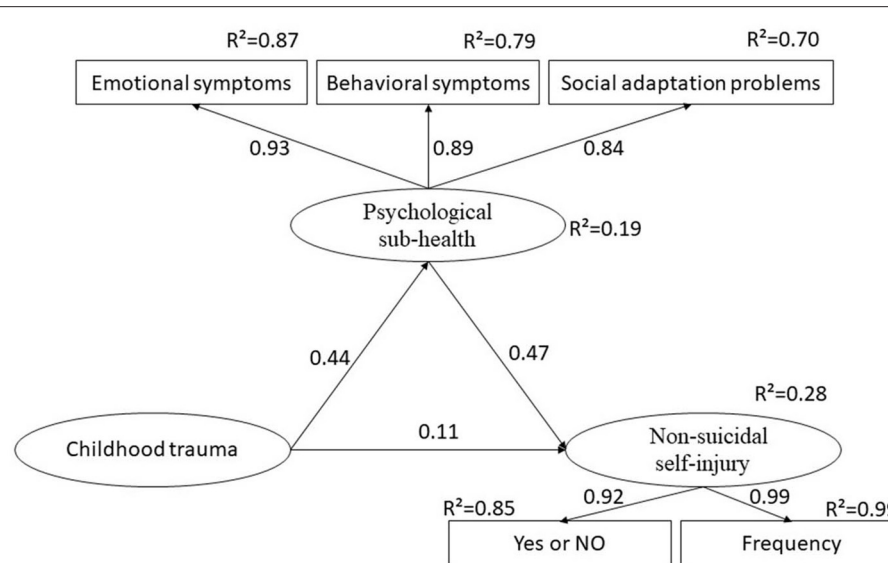
FIGURE 1 | Structural equation model for all the participants. The numbers beside the arrows indicate standardized path coefficients. R^2 represents squared multiple correlations. Probability level = 0.512; goodness-of-fit indices: CMIN/DF = 0.892; GFI = 0.997; AGFI = 0.992; NFI = 0.991; RFI = 0.980; IFI = 1.00; TLI = 1.00; CFI = 1.00; RMSEA < 0.001.

TABLE 5 | Direct, indirect, and total effects of the final structural model.

Endogenous variable	Exogenous variable	Direct effect	Indirect effect	Total effect	SMC
PSH state	Childhood trauma	0.44***		0.44***	0.19
NSSI	Childhood trauma	0.11***	0.20***	0.32***	0.28
	PSH state	0.47***		0.47***	

*Standardized coefficient estimates are presented; SMC, Squared multiple correlations; ***p < 0.001.*

and higher than that before the COVID-19 epidemic. Consistent with our findings, an online survey shows that the proportion of Canadian adolescents who intentionally hurt themselves seems to be higher than before the COVID-19 pandemic (40). However, a recent meta-analysis of the prevalence of self-harm (including NSSI and suicide attempts) in infectious disease epidemics, mainly including epidemics of Spanish Flu, severe acute respiratory syndrome, Ebola virus disease and COVID-19, hadn't found strong evidence on the association of infectious epidemics with self-harm (41). However, the authors above also noted that the prevalence of self-harm may be underestimated due to lockdown, under-reporting, and poor-quality studies. Therefore, the impact of epidemic on NSSI needs to be confirmed by further accumulation of more evidence.

Our study found that prevalence of NSSI was higher in primary school students than in middle school students. A recent meta-analysis showed that the prevalence of self-injurious behavior peaked at age 15 and then decreased in females, but there is a paucity of data from studies of males (42). Studies have shown that the onset of engaging self-harm (regardless of suicidal intent) behavior typically between the ages of 12 and 15 years, and cease within 5 years of the initial onset (43, 44). The fact that we investigated the incidence of NSSI in the past year rather than the overall incidence may explain the apparently high rate of

self-injury in lower grade participants. The neurodevelopmental vulnerability of early adolescents predisposes them to the development of emotional disorders and increased risk-taking behaviors (44). Additionally, our study found that left-behind children are more likely to injure themselves than those accompanied by their parents. Left-behind children are defined as minors whose parents have migrated to other cities to work or one of them has gone out to work and the other one has no ability to supervise them. Previous studies have demonstrated that children separated from their parents due to parental work, incarceration or abandonment show an increased likelihood of self-injury (45, 46). Therefore, child welfare institutions should pay more attention to left-behind children.

We investigated the childhood trauma of the participants, and the results showed that most participants had at least one type of childhood trauma, and childhood trauma exposure significantly increased the risk of NSSI. The strong link between NSSI and childhood trauma, especially sexual abuse, has been repeatedly confirmed and replicated by researchers (47). Despite the debatable direct causality of childhood trauma over NSSI, numerous studies have identified potential mediators of the relation between childhood trauma and NSSI. Of the proposed explanations of NSSI, affect dysregulation, dissociation, alexithymia, borderline personality had garnered broad empirical

support (47). In our study, PSH was introduced as a new concept to explore the relationship between childhood trauma and NSSI. A PSH state is a mixture of psychological imbalances (e.g., restlessness, fatigue), behavioral symptoms (e.g., tantrums), and social maladjustment (e.g., reluctance to attend school). PSH state in adolescents are often overlooked because they do not appear to be severe enough, yet they are on the verge of psychological breakdown. In this study, we had assessed the current PSH state of participants, the results showed that one in four participants was in PSH state, and the PSH state sharply increased the risks of NSSI. Moreover, the SEM verified that childhood trauma has a direct impact on NSSI and could also indirectly increase NSSI through PSH state.

Adolescents in a PSH state are prone to feeling unmotivated throughout the day and night, and sleepiness makes it difficult for them to concentrate on their studies, yet childhood trauma has been shown to increase the risk of sleep disorders (36). Also, some meta-analyses demonstrated that sleep problems such as short sleep duration, sleep disorders and poor sleep quality are associated with NSSI and suicidal thoughts (48, 49). Additionally, adolescents in PSH are susceptible to anger and even impulsive behavioral problems, and research suggests that traumatic childhood experiences can weaken impulse control and lead to impulsive behavior (50). Impulsivity is thought to be a contributing factor to NSSI and is associated with the severity of NSSI (51). Besides, adolescents who experience childhood trauma exposure are more sensitive to stress (52) and they show more avoidance, emotional suppression, and negative emotional expression in response to stressful events (53). Moreover, most adolescents in a psychological subhealth state are reluctant to ask for help when they encounter difficulties, and are even unwilling to go to public places or participate in group activities (54). Previous study had found a positive correlation between the severity of social anxiety symptoms and the amount of childhood trauma exposure (55). NSSI was significantly associated with shame and feelings of inferiority (low social rank), and difficulties with interpersonal functioning may be a potential pathway for increased suicidal attempt due to social anxiety (56, 57). In addition, NSSI, suicide attempts, and suicidal ideation have not only complex psychological mechanisms, but the underlying biological factors have also been continuously reported (58). Hypothalamic-pituitary-adrenal (HPA) was proved to be a key moderator of childhood trauma exposure and adolescent mental health, with abnormalities in the HPA axis linking childhood trauma to a range of adverse psychological outcomes (59, 60). Childhood trauma and the HPA axis have been suggested to play a major role in the etiology of NSSI, and adolescents engaging in NSSI, particularly in those with a history of childhood trauma, exhibited significantly higher cortisol awakening responses (61). Furthermore, childhood trauma appeared to be genetically associated with undesirable behaviors such as self-injury and addiction, and they may share common genetic etiology (62, 63).

Despite the advantage and implications of this study, the results were still limited by methodological factors. First, this study used a cross-sectional design, therefore, causal inference is not acceptable. To confirm causality, prospective studies with staged sequential assessments of PSH state and the onset of NSSI behaviors would be informative. Second, our study sample included only Chinese adolescents, thus, the findings may not generalize well to other countries or other cultural contexts.

Third, considering that all variables are subjectively evaluated, it is possible for participants to exaggerate or attenuate their impressions and evaluations of trauma exposure. Furthermore, the practical application of the current MSQA to predict NSSI is limited. Therefore, it is urgent to develop a more professional and operational evaluation tool.

CONCLUSION

Childhood trauma and the current adverse PSH in adolescents can increase the risk of NSSI. PSH has been confirmed to have partial mediating effects between childhood trauma and NSSI. Additionally, left-behind adolescents and younger adolescents deserve more attention from clinicians and educators. The present study provided potent evidence from a large sample for the mediating role of current PSH state between childhood trauma and NSSI. Since childhood trauma is difficult to prevent and heal, from the perspective of psychopathological mechanism, PSH state can be applied as an intermediate pathway to block the progression of childhood trauma to NSSI; while from the perspective of practical application, PSH state can be used as an alternative option which can be expediently assessed and intervened. Timely reversal of PSH state to healthy state can effectively prevent the consequences of undesirable behaviors. Overall, our findings provide clear directions for further research and clinical work on the etiologies, risk assessment, and treatment of NSSI.

DATA AVAILABILITY STATEMENT

As this study is still ongoing, the raw datasets for the current study will not be available until the end of this research project. Please contact the first author (Cui Huang, huang_cui66@163.com) for raw data requests.

AUTHOR CONTRIBUTIONS

The manuscript was designed and written by CH and QY. Data was collected by CH, QY, MG, XS, MYa, SS, PC, MYe, RP, and RZ, analyzed by CH and KZ, and verified by XZ. All authors read and agreed to the final manuscript.

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Children and Young People Presenting in a Pediatric Emergency Department in North-West England in Suicidal Crisis: An Exploratory Case Series Study

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Suicide is a leading cause of death among children and young people (CYP) worldwide, and rates have been increasing in recent years. However, while evidence exists regarding factors associated with suicide and self-harm, there is limited information publicly available on the CYP who present in suicidal crisis. This is a case series study of CYP (aged 8–16) experiencing suicidal crisis who presented in an Emergency Department at a pediatric hospital in North-West England between March 2019 and March 2021 (*n* = 240). Clinical records were extracted and audited to explore demographic data, methods of recording patient attendance, the clinical pathways available and the patterns of pathway usage, and differences in CYP presentations before and after the COVID-19 pandemic. Attendees were mostly White females, with a mean age of 13.5 years, and 24% had a diagnosed special educational need. "Social/social problems" was the most commonly used code for recording attendance (38%), and pathways varied depending on code used. A range of parental and familial factors were also identified. There were more CYP presenting with self-harm in addition to suicide ideation after the pandemic began (43 vs 27% pre-pandemic). This study provides the first clear insight into CYP who seek help at a North-West Emergency Department for suicidal crisis, and work is now needed to develop effective prevention strategies tailored toward the groups most at-risk.

Keywords: child and adolescent, suicide, crisis, self-harm, emergency departments, mental health

INTRODUCTION

Suicide is still the leading cause of death among children and young people (CYP) in the United Kingdom (1–3), with suicide rates amongst adolescents having increased by 7.9% per year in the last decade (4). Rates have increased even further in more recent years; 2018 data on suicide deaths from the Office for National Statistics (ONS) indicate a 22% one-year increase in suicide rates in under 25-year-olds, the largest rise amongst all age groups (5). In adolescents and young adults, rates of death by suicide are 2–4 times higher in men than in women, while suicide attempts are 3–9 times more common in women than men (6, 7). Within the context

of suicide research, these gender differences in suicidal behavior rates are known as the "Gender Paradox" (8). In adolescents and young adults, this paradox changes according to age (9); women's suicide attempt rates increase with age, peaking in mid-adolescence, whereas men's suicide rates continue to increase into early adulthood (10, 11). The United Kingdom suicide rate in adolescent girls is now the highest since records began in 1981 (12, 13). Furthermore, there is some emerging evidence of a possible trend of increasing child suicide deaths in England during the COVID-19 pandemic and associated lockdowns, although this is provisional and numbers are too small for any meaningful analysis (14).

Several risk factors may increase the likelihood of suicide in CYP; indeed suicide is thought to be caused by the interplay of genetic, biological, psychological, and social factors (15). Research has identified various risk factors associated with youth suicide (15, 16) including previous or recent stresses such as witnessing domestic violence, bullying, self-harm, bereavement (including by suicide), academic pressures (13), and special educational needs (SEN), in particular Autism Spectrum Condition (ASC). Population-based mortality studies have demonstrated extraordinarily high rates of death by suicide in autistic youth and adults (17). Gender differences have been identified in this population as well, with higher rates of suicide attempts for autistic girls compared with boys (17).

Research suggests that outcomes for autistic girls are worsened by poor understanding of the differences in autism presentation between genders, including greater levels of camouflaging or masking behavior to conceal autistic characteristics, and better social communication and interaction among autistic girls (18). This gender bias is further exasperated by ill-informed diagnostic criteria and the development and validation of assessment tools that fail to tap into the "female phenotype," due to most materials being validated with males. Subsequently, vital opportunities to diagnose autistic girls are missed, leading to under- and late diagnosis, particularly for those without intellectual disability. Thus, girls are diagnosed with autism at later ages than boys, with many women getting their first diagnosis well into adulthood (19–21). The delayed diagnosis and subsequent support offered to autistic girls may explain the high rate of suicide attempts in this population (17).

Aside from socio-demographic characteristics, another well-established, yet scarcely investigated, psychological risk factor for death by suicide is suicide ideation or crisis (16). Suicidal crisis is a spectrum, ranging from thoughts of death and passive ideation with no intent or plan, to specific suicidal ideation with intent or plan (16). It has been shown that the more pervasive the suicidal crisis, the more likely the individual is to attempt suicide (16, 22). Evidence suggests that around 80% of individuals who have died by suicide did seek help for crisis at least once in the year before their death, and most of them had Emergency Department (ED) contact (23).

Risk factors or correlates associated with suicidal crisis are given substantially less attention in the extant evidence base than factors associated with suicide attempts or completed suicides. Although a meta-analysis by Ribeiro et al. (24) did identify risk factors in five subcategories for suicide ideation

(prior suicide ideation, hopelessness, depression diagnosis, abuse history, and anxiety diagnosis), they found that prediction was only slightly better than chance for all outcomes, and no broad (sub)category accurately predicted far above chance levels; this has not changed in the past 50 years. There is also minimal evidence in a United Kingdom setting, particularly with hospital-based samples or with CYP specifically. Furthermore, the studies that have been conducted with CYP often look at individualistic trait risk factors, such as perceived burdensomeness, hopelessness, and stress (25), even though these factors studied in isolation are usually not useful in predicting suicide risk (26). Research has generally failed to explore pervasive socio-demographic risk factors for suicidal crisis or ideation in broader ecological domains.

However, evidence suggests that risk factors for or correlates of adolescent suicide *attempts* do operate within multiple socio-ecological domains in a young person's environment (26, 27). In keeping with Bronfenbrenner's Ecological Systems Theory [EST; (28)], evidence exists for risk factors relating to abuse, parental substance misuse, bullying, and chronic familial dysfunction or violence [see (29) for an overview]. According to EST, risk factors in these socio-ecological domains interact with and impact one another in a complex system (30), influencing an individual either directly or indirectly. Thus, family and community factors are also integral (31). Ayyash-Abdo (26) attempted to apply EST to adolescent suicides, identifying key risk factors in each system. In the microsystems (i.e., proximal risk factors), factors in the familial (e.g., family history of suicides, parental psychopathology, loss), peers (e.g., loneliness, low levels of peer support) and school (e.g., academic performance, perceived school connectiveness) domains were also identified, in addition to the individual factors such as depression, hopelessness, and drug and alcohol use. Furthermore, in the macrosystems (i.e., distal risk factors), factors such as the media, and ethnic, cultural, and societal differences all influenced adolescents' suicide risk. However, while there is evidence to suggest that there is some overlap between risk factors for suicide and suicidal crisis (32), there is also some evidence indicating distinctions between them (29). Thus, further work is needed in this area.

Despite evidence that suicidal crisis is a risk factor contributing to suicide among CYP, the number of presentations for suicidal crisis without attempts at EDs is not consistently registered, nor is there consistent coding used across NHS Trusts for recording patients who present at ED in suicidal crisis (33). Therefore, while national data is already available for individuals who attend ED for self-harm (34), there is a lack of national data available for those individuals who attend ED in suicidal crisis. Given the relationship between suicidal crisis and later suicide attempts, a consistent code for suicidal crisis, and an understanding of the factors that are associated with suicidal crisis, are of crucial importance in the prevention of future deaths. This information would provide services with a better understanding of the number of CYP in suicidal crisis, which in turn could lead to a more effective management of such individuals, as well as reduced youth suicide rates (33, 35).

In addition, there is also a lack of consistent evidence regarding the pathways available across NHS Trusts for

individuals who present to ED in suicidal crisis (36). Clinical pathways available for CYP who attend in suicidal crisis tend to be complex and they have not previously been examined systematically, despite evidence which suggests that prompt referrals to clinical pathways and application of appropriate interventions can empower hospital systems in the management and prevention of suicide (1, 37). Thus, a rigorous evaluation of the pathways available for CYP who attend EDs in suicidal crisis is needed, to inform better modeling of service provision for these patients (37).

THE CURRENT STUDY

The North-West of England has a suicide rate that falls around the national average, with 10.7 deaths per 100,000 (national average = 10.4) although this varies considerably across different areas of the region (12). Suicide rates among CYP are not reported by area, and so self-harm is the closest proxy indicator, given that 52% of CYP who die by suicide have previously self-harmed (38). Hospital admissions rates for self-harm for 10–24 year olds are significantly worse in the North-West region compared to the England average (520.5 vs 430.5 per 100,000), and rates are particularly concerning for 15–19 year olds (39).

One dedicated pediatric hospital in the region has its own children's ED and Child and Adolescent Mental Health Services (CAMHS), including community CAMHS, in- and out-patient clinics, and a dedicated CAMHS crisis team. The crisis service includes a multi-disciplinary team who provide support to CYP presenting in crisis regarding self-harm, suicidal ideation, and acute mental health difficulties. However, until now, no formal analysis of the hospital's data has been conducted into the number of CYP presenting at ED in suicidal crisis, the demographic characteristics of those presenting, the subsequent pathways that they follow, or how ED presentations are recorded in the hospital's system. Furthermore, while anecdotal evidence indicates a sharp increase in demand on the crisis team's services since the COVID-19 pandemic began in March 2020, significant differences in ED attendance before and after the pandemic have not been explored.

To address this, we aimed to compile data pertaining to the number of CYP presenting at the hospital's ED in suicidal crisis, how this was coded, and the resultant care pathways they followed. An audit was then conducted of the hospital's ED data for all CYP who had presented in suicidal crisis in the years 2019–2021. The study aimed to address the following research questions:

1. Are certain socio-demographic characteristics across ecological domains significantly associated with ED attendance for suicidal crisis among CYP?
2. What are the most common methods for recording presentations of suicidal crisis in this ED?
3. What are the clinical pathways available to CYP who attend the ED in suicidal crisis, and what are the patterns of pathway usage?

4. Are there differences in the characteristics of CYP who attend the ED in suicidal crisis before and after the start of the COVID-19 pandemic in March 2020?

MATERIALS AND METHODS

Design and Setting

This retrospective case series study included CYP experiencing suicidal crisis who had attended an ED at a local pediatric hospital between March 2019 and March 2021 ($n = 240$). Access to the anonymised data was approved by the hospital's research department.

Participants and Data Extraction

Clinical records at the hospital were reviewed between March 2019 and March 2021. Inclusion criteria included any patients aged 16 or younger (the hospital advises anyone age over 16 to attend an adult ED) who presented to ED in suicide crisis (with and without self-harm) during the study period. Data on CYP that visited the hospital in suicide crisis were provided to the researcher by the hospital data team. An electronic inspection of the clinical notes was performed through the Meditech system (Medical Information Technology Inc., Westwood, MA, United States). All patient notes under potentially relevant codes (e.g., low mood, suicide thoughts, social problems, overdose) were audited, and those indicating suicidal crisis or ideation were extracted, collated, and anonymised. Each patient's clinical record was inspected and included in the study only if suicide crisis or ideation was clearly reported in the clinical notes.

Variables examined included sex, ethnicity, SEN, presence of suspected ASC traits, mental health conditions, suicide ideation with or without self-harm, history of self-harm, clinician determined risk (in terms of Pierce score), and parental socio-demographics. It was also investigated whether the children were previously known to CAMHS or were under CAMHS at the time of the ED presentation. These data were either collected from the family using a standard *pro forma* completed by the clinician when triaging the patient, or they were already available on the hospital system if the patient had previous been under Community Pediatrics and/or was currently known to CAMHS. Further details regarding the demographics of the patients are presented in the results section below.

Data Analysis

Our sample size was predetermined based on the number of CYP attending ED. This was an exploratory analysis, whereby descriptive statistics were conducted to identify the socio-demographics of the sample and the factors characteristic of CYP presenting in suicidal crisis. Chi-squared analyses, regressions, and independent samples t-tests were also conducted to establish statistically significant associations and differences in the dataset. We chose not to conduct Bonferroni corrections for multiple comparisons based on recommendations from Armstrong (40) and Rothman (41) that corrections for multiple comparisons in exploratory studies are not required, due to

the increased likelihood of Type 2 errors. Analyses were conducted in IBM SPSS 26.

While the researchers had access to all records, the dataset only captured entries made in clinical records; unrecorded clinical activity or missing information from ED documents was therefore unavailable. For the purposes of this study, only the presence of each factor within each person's clinical records was used for the analysis. It is possible this strategy may have led to underestimation of some factors: for example, sexual orientation.

RESULTS

Socio-Demographic Characteristics of Patients: Individual Factors
Demographic Characteristics
Between March 2019 and 2021, 240 CYP attended the hospital's ED for suicidal crisis (see **Table 1**). The majority of attendees were female (67%; $n = 160$) and White British (93%; $n = 222$), and the mean age was 13.5 years (SD = 1.42; range = 8–16).

Approximately one-quarter of CYP had a diagnosed SEN (24%; $n = 58$). 10% ($n = 6$) of the patients with an SEN had a diagnosis of learning disabilities, 41% ($n = 24$) had ASC with/without other learning disabilities, 26% ($n = 15$) had attention deficit hyperactivity disorder (ADHD) with/without other learning disabilities, and 22% ($n = 13$) had both ASC and ADHD.

However, an additional 51 CYP (21%) from the whole sample (i.e., those with and without a diagnosed SEN, but excluding those with an existing ASC diagnosis) were recorded as having suspected ASC traits (as suspected by the clinician assessing the patient or based on the patient currently being on the ASC pathway awaiting diagnosis), meaning that in total 37% ($n = 88$) of the whole sample had either ASC or ASC traits. Further exploration of this data indicated that 61% ($n = 54$) of those with ASC or ASC traits were female.

Mental Health History
The majority of CYP had a history of mental health difficulties (60%; $n = 142$). Of those with existing difficulties, the most common diagnoses were anxiety with/without comorbidities (44%; $n = 62$) or low mood with/without comorbidities (32%; $n = 45$), although the majority had no formal diagnosis recorded (69%; $n = 98$). Most patients were previously known to CAMHS (64%; $n = 154$), and 23% ($n = 54$) were currently under CAMHS when they attended the ED (see **Table 1**).

The majority of CYP did not have a previous ED attendance for suicidal crisis (76%; $n = 183$). However, 69% ($n = 162$) had a history of self-harm. Clinician-determined risk (based on the Pierce Suicide Intent Scale, a standardized measure of risk of death by suicide) was deemed high for 21% of the sample ($n = 51$), moderate for 18% ($n = 44$) and low for 15% ($n = 37$). Risk data, however, should be interpreted with caution due to the large proportion (34%; $n = 82$) of "unknown" recordings, and the limited data available on the reliability of the measure for use with CYP. Risk levels were significantly associated with sub-diagnosis

TABLE 1 | Individual socio-demographic characteristics of patients presenting in suicidal crisis.

Demographic	N	Percentage of whole sample
Sex		
Female	160	66.6
Male	80	33.3
Ethnicity		
White British	222	92.5
Other	16	6.7
Unknown	2	0.8
SEN		
Yes	58	24.2
ADHD	12	5.0
ADHD and learning disabilities	3	1.3
ASC	21	8.8
ASC and ADHD	12	5.0
ASC, ADHD and learning disabilities	1	0.4
ASC and learning disabilities	3	1.3
Learning disabilities	6	2.5
No	182	75.8
ASC Traits		
Yes	51	21.3
No	189	78.8
Previous mental health difficulties		
Yes	142	59.2
Anxiety	43	17.9
Anxiety and comorbidities	10	4.2
Anxiety and low mood	9	3.8
Low mood	40	16.7
Low mood and comorbidities	5	2.1
Other	35	14.6
No	97	40.4
Unknown	1	0.4
Previously known to CAMHS		
Yes	154	64.2
No	86	64.2
Currently under CAMHS		
Yes	54	22.5
No	186	77.5
History of self-harm		
Yes	162	67.5
No	78	32.5
Clinician-determined risk		
Low	37	15.4
Moderate	44	18.3
High	51	21.3
n/a	26	10.8
Unknown	82	34.2

[$X(4) = 51.65, p < 0.001\ \varphi = 0.46$], whereby higher risk levels were given to patients who had also self-harmed.

Socio-Demographic Characteristics of Patients: Familial Factors
The majority of CYP presenting with suicidal crisis reported separation or loss of a parent (68%; $n = 162$), and most were living with a single parent or a single parent and siblings (44%;

$n = 106$). Parental mental health issues (44%; $n = 105$), parental drug misuse (17%; $n = 41$), and parental criminality (16%; $n = 38$) were also recorded among a sizeable minority of CYP, although a large proportion of data were missing for these variables. Approximately one-quarter of CYP had experienced neglect (24%; $n = 57$) or domestic violence (24%; $n = 57$), and one-third experienced some form of physical, emotional and/or sexual abuse (32%; $n = 77$). 23% were known to a social worker (see **Table 2**).

Further examination of parental factors revealed a number of significant associations with CYP's mental health diagnosis (if they had received one), as displayed in **Table 3**. A statistically significant association was found between parental mental health (reported by parents) and CYP's previous mental health diagnoses [$X(4) = 15.30, p = 0.004$]; as such a young person was significantly more likely to have been diagnosed with mental health difficulties if their parent also had mental health difficulties. A significant association was also found between parental drug misuse [$X(4) = 13.92, p = 0.008$], parental criminality [$X(4) = 13.62, p = 0.009$] and CYP mental health diagnosis. Results suggested those CYP whose parents had misused drugs or reported criminality were more likely to have diagnosed mental health difficulties. Furthermore, those CYP with diagnosed mental health difficulties were also statistically significantly more likely to have experienced neglect [$X(4) = 16.87, p = 0.002$], have witnessed domestic violence [$X(4) = 12.68, p = 0.013$], abuse [$X(4) = 14.84, p = 0.005$], and have experienced parental separation or loss [$X(4) = 12.23, p = 0.016$].

Methods of Recording ED Presentations by Clinicians
Diagnosis at ED
In total, 65% of patients received a diagnosis of "suicide ideation" ($n = 157$) when presenting at the ED. The remainder received a diagnosis of "suicide ideation with deliberate self-harm" (35%; $n = 83$). Of those who presented with ideation and deliberate self-harm, the most common means were overdose (55%; $n = 46$) cutting (28%; $n = 23$), and suffocation (10%; $n = 8$).

Coding
"Social problems" was the most commonly used code to record attendances at the ED for suicidal crisis (see **Table 4**), with 22% of all attendances recorded under that code ($n = 53$). This was followed by the codes "other" (21%; $n = 51$), "social" (15%; $n = 53$), and "overdose" (13%; $n = 32$).

A regression analysis was conducted with "code" as the dependent variable, and socio-demographic characteristics as the independent variables. SEN diagnosis status ($\beta = 0.163$, $p = 0.021$), social worker status ($\beta = -0.148$, $p = 0.034$), and sub-diagnosis ($\beta = 0.24$, $p = 0.040$) were significant predictors of coding type. Further analysis of means indicated that individuals diagnosed with an SEN were more likely to be given the code of "other" compared to those without an SEN

TABLE 2 | Familial socio-demographic characteristics of patients presenting in suicidal crisis.

Demographic	N	Percentage of whole sample
Separation or loss of a parent		
Yes	164	68.3
No	70	29.2
Unknown	6	2.5
Living Circumstances		
Both parents (with/without siblings)	67	27.9
Parent and step-parent (with/without siblings)	24	10.1
Single parent (with/without siblings)	106	44.2
Other	32	13.3
Care home	1	0.4
Unknown	10	4.2
Parental mental health difficulties		
Yes	105	43.8
No	93	17.5
Unknown	42	17.5
Parental drug misuse		
Yes	41	17.1
No	150	62.5
Unknown	49	20.4
Parental criminality		
Yes	38	15.8
No	154	64.2
Unknown	48	20.0
Neglect		
Yes	57	23.8
No	136	56.7
Unknown	47	19.6
Domestic violence		
Yes	57	23.8
No	135	56.3
Unknown	48	20.0
Abuse		
Yes	77	32.1
No	117	48.8
Unknown	46	19.2
Social worker		
Yes	55	22.9
No	164	68.3
Unknown	21	8.8

TABLE 3 | Chi-square analysis of the association between CYP diagnosed mental health difficulties and parental risk factors.

Variable	X	df	p	Cramer's V
Parental Mental Health	15.30	4	0.004**	0.179
Parental Drug Misuse	13.92	2	0.008**	0.170
Parental Criminality	13.62	4	0.009**	0.168
Neglect	16.87	4	0.002**	0.187
Domestic Violence	12.68	4	0.013*	0.163
Abuse	14.84	4	0.005**	0.176
Parental Separation or Loss of a Parent	12.23	4	0.016*	0.160

$*p < 0.05; **p < 0.01$.

TABLE 4 | Diagnosis and coding frequencies for patients with suicidal crisis.

Recording	N	Percentage of whole sample
Diagnosis		
Suicide ideation	157	65.4
Suicide ideation with deliberate self-harm	83	34.6
Cutting	23	9.6
Overdose	46	19.2
Suffocation	8	3.3
Other	6	2.5
Code		
Low mood	3	1.3
Mental health	19	7.9
Other	51	21.3
Overdose	32	13.3
Self-harm	21	8.8
Social	37	15.4
Social problem	53	22.1
Suicidal thoughts	24	10.0

TABLE 5 | Referral pathways for patients in ED with suicidal crisis.

Initial Referral	N	Proportion of whole sample
Admitted inpatient ward	107	44.6
ED assessment by Crisis Care Team	28	11.7
Discharged	29	12.1
Left before seen	2	0.8
Outpatient	73	30.4
n/a	1	0.4

Referral Pathway	N	Proportion of whole sample
Admitted to another service	2	0.8
Already on CAMHS waiting list	7	2.9
Already under another service/no further treatment appropriate	5	2.1
Discharged/signposted to another service	15	6.3
Follow-up	46	19.2
Follow-up by local CAMHS	49	20.4
Referred to another service/specialty	35	14.6
Referred to local CAMHS	78	32.5
n/a	3	1.3

$[X(1) = 6.05, p = 0.014, \varphi = 0.16]$. Having a social worker was associated with less use of the "overdose" category $[X(2) = 9.52, p = 0.009, \varphi = 0.20]$. Having a sub-diagnosis of "suicide ideation with deliberate self-harm" (compared to "suicide ideation") was associated with increased use of the "overdose" category $[X(1) = 51.26, p < 0.001, \varphi = 0.46]$, "deliberate self-harm category" $[X(1) = 21.87, p < 0.001, \varphi = 0.30]$, and less use of the "suicidal thoughts" category $[X(1) = 8.12, p = 0.004, \varphi = 0.35]$ and "social" and "social problems" categories $[X(1) = 28.74, p < 0.001, \varphi = 0.35]$.

Patterns of Clinical Pathway Usage
Initial Referral
After presenting at the ED, the majority of young people were admitted to an inpatient ward (45%; $n = 107$) or were seen as an outpatient (30%; $n = 73$). From December 2020 the Crisis Care Team increased liaison with the ED, meaning that CYP were assessed by a member of the Crisis Care team (once deemed fit), to evaluate current risk and mental state. Based on the outcome of the assessment, CYP were referred to the most appropriate service or discharged back to the community. A full list of referrals are presented in **Table 5**.

Referral Pathway
Following the young person's attendance to the ED, eight referral pathways were utilized. The most frequently used was "referral to local CAMHS" (33%; $n = 78$), followed by "followed up by local CAMHS" (20%; $n = 49$) and "follow-up" (19%; $n = 46$). A full list of referral pathways is presented in **Table 5**.

A chi-squared test was used to further analyze the referral pathways for young people attending the ED in suicidal crisis. A significant association was identified between the type of code recorded and the referral pathway the young person followed $[X(56) = 88.46, p = 0.004, \varphi = 0.23]$, meaning the code assigned to the ED presentation significantly influenced where the patient

was referred onto. For example, individuals coded as "social problems" were more likely to be referred to local CAMHS than to have no further treatment. However, no significant association was identified between gender $[X(8) = 14.85, p = 0.060, \varphi = 0.249]$ or age $[X(64) = 63.19, p = 0.505, \varphi = 0.18]$ and the referral pathway.

Outcomes for CYP With ASC Traits
Given the unexpectedly large proportion of individuals with ASC or ASC traits in the sample, exploratory chi-square tests were conducted to further examine the outcomes for this group of CYP. There was a significant association between ASC traits and referral pathway $[X(8) = 16.59, p = 0.035, \varphi = 0.26]$, suggesting that those with ASC traits were more likely to be followed-up by local CAMHS, whereas those with no ASC traits were more likely to be referred to local CAMHS.

A significant association was also identified between an individual having ASC traits and them being already under CAMHS $[X(1) = 9.32, p = 0.002, \varphi = 0.20]$; as such those presenting to the ED with ASC traits were more likely to already be known to CAMHS than those presenting with no ASC traits. All other tests were not significant (see **Figure 1**).

Pre and Post COVID-19 Pandemic
Based on descriptive statistics, a number of differences were identified between March 2019–2020 and March 2020–2021. As the first COVID-19 lockdown occurred in March 2020 in the United Kingdom, this allows for a comparison pre and post the COVID-19 pandemic beginning. The mean age of the sample was broadly similar between the 2 years (13.48 vs 13.56). The number
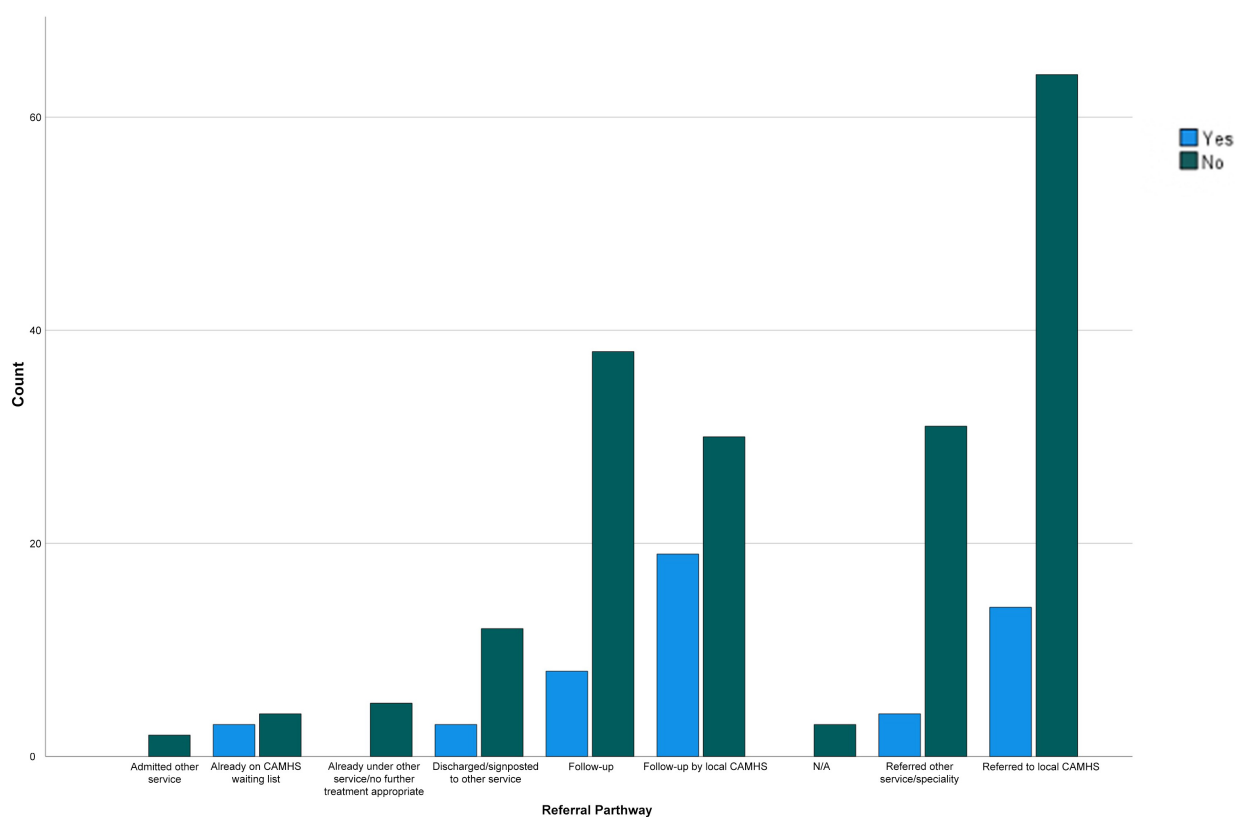
FIGURE 1 | Referral pathway following ED attendance for suicidal crisis and ASC traits.

of females attending slightly increased from 64% in 2019–2020 to 69% in 2020/2021, whereas the number of males slightly reduced (36 to 31%). More CYP were previously known to CAMHS in the year following the pandemic beginning (69 vs 60%), and more were currently under CAMHS (29 vs 17%).

A series of independent t-tests were conducted to establish if there were any significant differences in attendees' characteristics before and after the pandemic beginning. There were significant differences in the number of patients who had a social worker [$t(227) = -2.0, p = 0.048$], and were currently under CAMHS [$t(219) = -0.2.27, p = 0.024$], whereby more CYP were known to a social worker (28.1 vs 18.3%) and were under CAMHS (28.9 vs 16.7%) in the year after the pandemic began. There was also a significant difference in sub-diagnosis [$t(228) = -2.61, p = 0.010$], with significantly more CYP presenting with suicide ideation with deliberate self-harm after the pandemic (43%) than before (27%).

In terms of referral pathways, there were significant differences between the 2 years regarding the number of CYP who were followed-up by CAMHS [$t(218) = -2.15, p = 0.033$], and who were referred to other services [$t(219) = 2.89, p = 0.004$]. Specifically, a higher number of CYP were followed-up by CAMHS after the pandemic (26%) compared to the year before (15%), whereas a higher number of CYP were referred to other services or specialties in the year before the pandemic (21%) than afterward (8%). No other differences were statistically significant.

Chi-square analyses also indicated a significant association between year of attendance and code used [$X(7) = 38.59, p < 0.001, \varphi = 0.40$], with the code "social problems" being used more in the year before the pandemic (31%) than afterward (12%). This is illustrated in **Figure 2**.

DISCUSSION

This case series study of a pediatric hospital's ED in North-West England aimed to explore the socio-demographic characteristics of CYP attending for suicidal crisis, methods of recording presentations, the clinical pathways used, and differences in CYP presenting in the ED since the COVID-19 pandemic. Analyses indicated that 240 CYP attended the ED between March 2019 and March 2021. Attendees were mostly White females, with a mean age of 13.5 years. One-quarter had a diagnosed SEN, and almost one-third had either diagnosed or suspected ASC. Most had a history of mental health difficulties, most commonly anxiety, as well as deliberate self-harm, and were previously known to CAMHS. The majority also reported separation or loss of a parent; parental mental health issues, drug misuse, and criminality were also common. Additionally, abuse was frequently reported, including neglect or physical, emotional, and/or sexual abuse, as well as experiences of domestic violence. Almost one-quarter were known to a social worker. Following

FIGURE 2 | Code assigned to ED attendance for suicidal crisis by year: 2019–2020 and 2020–2021.
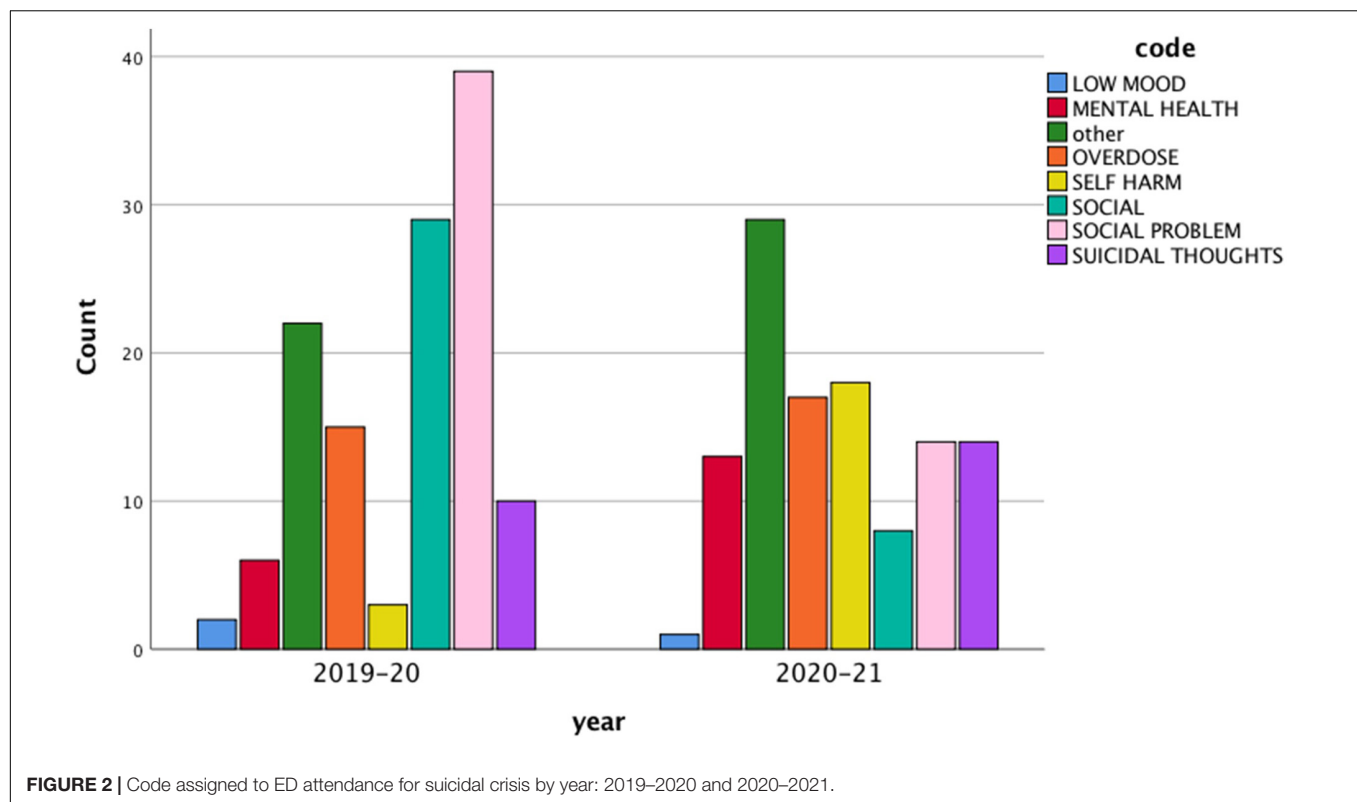
assessment by a clinician, most received a diagnosis of "suicide ideation," and "social problems" was the most commonly used code to record attendance. Following this, patients were typically admitted to an inpatient ward or seen as an outpatient, and then referred to CAMHS. Regarding the potential impact of the COVID-19 pandemic, slightly more females and slightly less males presented at the ED after March 2020. In the year following the pandemic, there were significantly more CYP who were known to a social worker and currently under CAMHS, whereas other services or specialties were used significantly less as a referral pathway. There were also more CYP presenting with self-harm in addition to suicide ideation after the pandemic began.

Socio-Demographic Characteristics

Our findings are consistent with existing evidence regarding the individual factors associated with suicidality in CYP, including previous self-harm and a history of mental health difficulties (42, 43). Furthermore, the mean age of attendees (13.5 year old) is in line with the notion that early adolescence is a critical period for the onset of mental health conditions, with current statistics suggesting that 50% of lifetime difficulties are first experienced by 14 years of age (44). However, while the higher rate of girls relative to boys presenting in the ED in this study is counter-intuitive based on existing evidence highlighting that men, particularly young men, are more likely to die by suicide than women (45), this may be explained by the gender paradox in suicidal behavior. For example, it is thought that while young men have low rates of suicidal behavior relative to women, they have higher rates of suicide mortality (46); in other words, men

are more likely to use violent means and have more serious intentions to die when attempting suicide (47). Thus, they may be less likely to present in the ED looking for help, and their attempts may be more likely to result in death before they can receive support. Women are also more likely to seek help for mental health conditions generally (48, 49) and are more likely to experience internalizing difficulties (e.g., depression/anxiety) commonly associated with suicidality (50, 51), which may also help to explain the gender discrepancy identified here.

An unanticipated and particularly noteworthy finding in this sample is the relatively large proportion [37 vs 1.76% in the wider population; (52)] of CYP who were diagnosed with ASC or suspected to have ASC traits, and specifically those who were autistic girls [61 vs 33% of autistic individuals in the wider population are girls/women; (53)]. There is some evidence to suggest that autistic adults are at greater risk of suicidal ideation and behaviors, including deaths, relative to the rest of the population [0.31 vs 0.04% premature death by suicide; (17, 54–57)]. Indeed, a Swedish mortality study showed a sevenfold increased risk of premature death by suicide in people with ASC compared to the general population (58). However, one study by Hannon and Taylor (59) examining suicidal behavior among autistic young people found that rates were similar in comparison to the general population, with overlapping risk factors. While they initially suggested that ASC traits might be risk factors (e.g., social and communication difficulties may lead to interpersonal problems and social isolation), another study with adolescents and young adults found that it was those with less "severe" autistic traits that were at heightened risk, potentially due to their better

emotional insight and more contact with others putting them at increased risk of distress and peer victimization (59, 60).

This hypothesis may lend support for the high presentation rates of autistic girls in the current study, as they are more likely to adopt masking behaviors and engage in social activities than autistic boys (61), which may put them at heightened risk of suicidality. However, one study by Hedley et al. (62) found that while social support and loneliness predicted suicide ideation in autistic individuals, the pattern of relationships in their path analyses was nearly identical for males and females. Thus, this casts doubt on the social interaction hypothesis. Conversely, diagnosis stage may provide an alternative explanation. Girls are more likely to be diagnosed with autism at a later age than boys (19, 63), so there is potential that the delayed diagnosis and subsequent lack of attribution for their experiences may be causing girls heightened levels of distress (60, 64), although more research is first needed before this hypothesis can be confirmed. However, based on the findings identified here, autistic CYP, particularly girls, are a vulnerable group at an increased risk for suicidal crisis, and there is a clear need for greater support and urgency for further research into risk detection and prevention of suicide in autistic people. Increased acceptance of autistic CYP in schools and social groups, and greater awareness and flexibility for autistic CYP, will benefit everyone in society and may also lead to a decrease in feelings of rejection and suicidal thinking for autistic individuals (57). Schools, primary care, and CAMHS services need to be aware of this risk, and should be delivering targeted and effective interventions and services for autistic CYP, in order to prevent them from reaching the point of crisis.

In terms of familial characteristics, high rates of CYP in this sample reported parental or familial difficulties, many of which have previously been identified in the international literature as common risk factors for suicidal ideation or behaviors. For instance, these findings are in keeping with reports from Taliaferro and Muehlenkamp (29) that factors associated with abuse, parental substance misuse, and familial dysfunction or violence are related to adolescent suicide attempts. Furthermore, Perkins and Hartless (27) found a clear association between abuse and frequent suicidal thoughts and attempts for all adolescents, regardless of gender or ethnicity, although factors such as parental substance abuse and family structure were not significant once other risk factors were accounted for. However, another study of adolescents hospitalized for suicidal ideation and/or behavior did find that poorer perceptions of family functioning by adolescents were positively associated with suicide ideation and history of suicide attempts (65). Similarly, a study by Thompson et al. (66) in the United States, found that the presence of familial adverse childhood experiences (ACEs), including abuse, parental incarceration, and family history of suicidality in childhood increased the odds of later suicide attempts or ideation, with the accumulation of multiple ACEs further increasing the odds. Thus, while our findings are in keeping with previous international literature, this is one of the first times that familial factors associated with suicidal crisis in a clinical sample of CYP have been examined in a United Kingdom setting. The characteristics identified here can be used to help inform early identification and intervention with CYP who may

be at heightened risk of experiencing suicidal crisis, although further studies with larger samples are still needed.

Coding Practices

Eight different codes were used by clinicians when recording patients who presented in the ED with suicidal crisis, the most common of which was "social problems." Perhaps unsurprisingly, codes of "overdose" and "deliberate self-harm" were used more frequently for CYP who had presented with suicidal ideation and self-harm. However, few other significant predictors of code use were identified. The heterogeneity in coding practices found here is a cause for concern that has been flagged in several other reports recently, as current data may be misrepresentative of the true volume of suicidal crisis presentations [e.g., (33, 67)]. Given that EDs are often the first point of contact for people experiencing distress relating to suicidality (68), it is important that we have a system that can provide an accurate indication of the number and characteristics of individuals who are presenting in crisis, in order to be able to offer tailored and effective levels of support.

A "suicidal thoughts" code is available for use (R45.81) in the current coding system (International Classification of Diseases 10th Edition; ICD-10); however, in the present sample, it was only used 10% of the time, despite all patients in the study having attended ED with "suicide ideation" as their primary diagnosis. It appears that this is not a unique issue, with other international studies reporting similar findings. For instance, research conducted by Sveticic et al. (67) in Australia also found great variation in code use for suicide ideation, with 38 different codes used, and the R45.81 code being used less than half the time. Another study by Anderson et al. (69) in America reported the same issue, with only 3% of patients with an indication of suicidal ideation in the notes field having a corresponding ICD-9 code. While the exact reason for the coding issue in the current study is unknown, it may be due to the ICD-10 guidelines stating that this code should only be used if the clinician is certain there is no underlying mental disorder, meaning that other codes are chosen. Further research is needed in this area, to determine clinicians' reasoning for code choices, and there is a clear need for improved coding practices relating to suicidal crisis (33).

Limitations

This study has several strengths and provides significant contributions to the extant evidence base, by helping to paint a picture of the CYP who are seeking help from EDs for suicidal crisis in North-West England. This information can help to inform early identification strategies to determine those who may be at-risk, meaning effective intervention and support strategies can be offered, and subsequent distress prevented. However, these findings should be interpreted within the context of some methodological limitations. Firstly, the relatively small sample size limits the statistical power, and effect sizes are also generally small, meaning that any significant findings should be interpreted with caution, and analytic techniques are limited in their complexity. The sample is also limited to CYP who are seeking help, and thus likely only reflects a small minority

of CYP who are experiencing suicidal crisis. Furthermore, as a case series study, there was no control group, meaning that true risk factors cannot be identified. Comparative data would highlight the socio-demographic characteristics that puts some CYP at heightened risk of suicidal crisis, relative to the rest of the population. In addition, data were only collected from a single hospital in one region of England over a 2-year period. Thus, care must be taken when attempting to generalize these findings to other geographical regions. It is also important to note that the variables available for analysis were limited to those self-reported by attendees, their parents, and/or clinicians. Finally, due to its retrospective nature, some patient data have been inevitably missing.

Notwithstanding these limitations, this was a highly exploratory study, aiming to gain insight into and understanding of patient profiles and pathway management. Thus, this provides a basis for further work in this area, utilizing larger samples, comparison groups, and multiple NHS Trusts across various regions of the United Kingdom.

Conclusion

Our results provide the first clear indication in the United Kingdom of the common socio-demographic characteristics of CYP in North-West England who present in EDs seeking help for suicidal crisis, and the resultant care pathways that they follow. The findings highlight the high proportion of attendees who were White and female, and who were diagnosed with or suspected to have autism, as well as inconsistencies in the coding practices used when recording patient attendances. Thus, our findings have implications for early identification and intervention with children who may be at a heightened risk for suicidal crisis, and for the development of guidance surrounding the coding practices that need to be used. In turn, this will help to ensure an accurate understanding of the rates of suicidal crisis among CYP in the United Kingdom, and will support the development of effective services for CYP. However, we acknowledge the highly explorative nature of this study, and call for similar research to be conducted on a larger scale in order to confirm our findings.

AUTHOR CONTRIBUTIONS

EA led the project, analyzed the data, and wrote the manuscript. SP collected and analyzed the data. MM analyzed the data and supported the writing of the manuscript. PS supported with the interpretation of the findings and the writing of the manuscript. All authors read and provided feedback on manuscript drafts.

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Suicide After Contact With Child and Adolescent Mental Health Services—A National Registry Study

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Background: Research has shown a strong association between suicide and mental disorders, and people in contact with services for mental health and substance use are known to be at high risk of suicide. Still, few studies have previously described suicide among young people in contact with Child and Adolescent Mental Health Services.

Aim: The aim of this study is to examine the prevalence of contact and suicide rates by gender and age groups, and to describe patient demographics and service utilization in secondary mental health services.

Methods: All young people in contact with Child and Adolescent Mental Health Services in the year prior to death in the period 2008–2018 were identified by linking the Norwegian Cause of Death Registry and the Norwegian Patient Registry. We estimated the prevalence of contact and suicide rates among those with and without contact, by gender and age groups. Characteristics of treatment contact were compared between boys and girls. Variables with significant differences were entered into a multivariate logistic regression model using gender as an outcome.

Results: More girls (39.7%) than boys (11.8%) had contact with Child and Adolescent Mental Health Services in the year prior to death. Among girls, suicide rates per 100,000 patients increased linearly in the age groups 10–13, 14–16, and 17–19 years: 5, 22, and 38 per 100,000 patients, respectively. Among boys, the suicide rate increased sharply from 7 per 100,000 patients in the age group 14–16 years to 40 per 100,000 patients in the 17–19-year-old group. In the age-adjusted multivariate model, boys were 4.07 (1.22–14.44, $p = 0.024$) times more likely to have terminated contact at the time of death.

Conclusion: This study shows gender differences in both suicide rates and service utilization among young people in contact with Child and Adolescent Mental Health Services before suicide, and future studies should focus on identifying the causes of these gender differences in service contact.

Keywords: suicide, mental health services, adolescent, children, mental disorders, registry study, inpatient, outpatient

INTRODUCTION

Suicide is one of the leading causes of death in young people (1, 2). The suicide rate among 10–19-year-olds is estimated to be ~4 per 100,000—with large variations according to sex, age and country of residence (3). Suicide among children younger than 15 years is rare, and the prevalence rises during teenage years and into adulthood, especially among boys (3–5). As in the adult population, suicide rates are higher among boys than girls in most countries (3, 6). In several high-income countries (UK, US, Canada, and Australia), an increase in suicide rates among adolescents has been observed over the past decade (7–9). According to the latest WHO estimates, suicide is the fourth most common cause of death in young people worldwide (10), and suicide among adolescents is a major public health concern that should receive attention in research and be addressed by means of national suicide preventive strategies.

Self-harm refers to intentional self-poisoning or self-injury, irrespective of motive or the extent of suicidal intent (11), and is one of the strongest risk factors for suicide (12, 13). With an estimated overall prevalence of 16.9 %, self-harm is considerably more common among adolescents than suicide (14), and has increased considerably among adolescents during the past decades (14, 15). Given that suicide in children and adolescents is a very rare event, many studies have used self-harm, suicidal behaviors or suicidal ideation as proxy variables to examine suicide, but since risk factors and populations are far from overlapping, it is important to examine suicide in these groups directly.

Suicide is strongly associated with mental disorders (16), and this association has also been found in studies in adolescents, especially among older adolescents (13, 17, 18). However, as with suicide among adults, the issue of suicide among adolescents is complex, and the causes are only partly understood. Genetic and biological factors, social and environmental factors, family-related factors, adverse life events and psychological aspects are important risk factors (1, 11, 19). Among adolescents, psychosocial factors such as family related problems, bereavement, academic pressure, bullying, relationship problems, excessive drinking and illicit drug use, physical health conditions, and suicide-related internet use are found to be important risk factors (5, 13, 18). A lower prevalence of psychosocial risk factors, self-harm, and mental disorders has been found among boys compared to girls prior to suicide (5). Some studies have showed that the youngest children, below 16 years of age, present less apparent warning signs and were less exposed to known risk factors before suicide than older adolescents (17, 20).

Children and adolescents who die by suicide are more often in contact with mental health services compared to controls (21). Some studies have found that the prevalence of contact with services for children and adolescents before suicide is lower than what is found among adults (22, 23). Rodway et al. (13) found

that 32 % of all adolescents who died by suicide in England had lifetime contact with child and adolescent mental health services before suicide, with more girls having contact with services before suicide than boys.

Most studies on service contact before suicide in children and adolescents have either used wide age groups or included broader definitions of service use (5, 21, 23–26), and national registry studies on suicide in Child and Adolescent Mental Health Services (CAMHS) are currently lacking (22). The use of complete national samples over a broad time period is important, and the availability of national health registries provides a unique opportunity, especially when studying rare events such as suicide in children and adolescents. Consequently, the aim of the current national registry study is to describe characteristics and service utilization among young people who have been in contact with CAMHS in the year before suicide. First, we aim to examine the prevalence of contact, and suicide rates by gender and different age groups. Second, our aim is to describe patient demographics and service utilization in secondary mental health services during the year prior to death. Our hypothesis is that we will find gender differences in these variables for boys and girls who had contact with CAMHS during the year prior to death.

MATERIALS AND METHODS

Sample and Design

This study used a registry-based cross-sectional observational design. The sample consisted of a linkage between the Norwegian Cause of Death Registry (NCDR) (27) and the Norwegian Patient Registry (NPR) (28). First, a list of all deaths by suicide and deaths by undetermined intent (X60-84; Y10-34; Y87.0; Y87.2) between Jan 1, 2008, and Dec 31, 2018, was obtained from the NCDR. These were then linked to data from mental health services and substance use disorder services in the NPR using a unique 11-digit personal identifier. All young people who had been in contact with CAMHS within the year before their date of death were included in the final sample ($n = 73$). The sample included two cases aged 20 years, and nobody was older than 20 years. The NPR conducted the data linkage.

The aggregated total number of young people in contact with CAMHS in the year prior to death was retrieved from the NPR, and the aggregated total number of suicides in Norway in young people aged between 10 and 19 years was retrieved from the NCDR. Aggregated data was grouped by gender and age groups.

Data Sources

The NCDR (27) contains, among other things, information about dates of death and causes of death in Norway. The registry has a high coverage, with medical information for >98 % of all deaths (29).

Secondary health services, including private institutions and specialists contracted to the regional health authorities, routinely report all patient activity (including administrative data, patient demographics, and medical information such as treatment and diagnoses) to the NPR (28). Personally identifiable information has been included in the registry since 2008, and data from substance use disorder services has been included since 2009.

Abbreviations: CAMHS, child and adolescent mental health services; NCDR, norwegian cause of death registry; NPR, norwegian patient registry; NSSI, non-suicidal self-injury.

In Norway, the healthcare system, including secondary mental health services, is publicly funded and is accessible at a low deductible fee through referral. Child and Adolescent Mental Health Services (CAMHS) is a separate secondary mental health service in Norway, serving children and adolescents up to 18 years of age. It is possible to receive treatment in CAMHS until the age of 23, if treatment started before the age of 18. CAMHS mainly offers outpatient treatment, but also includes inpatient services. Service utilization during the last year was retrieved from child and adolescent mental health services, adult mental health services, substance use disorder services, and private mental health practitioners.

MEASUREMENTS
Demographic Information and Diagnosis
Information about gender, age, date of death, and ICD-10 codes for method of suicide were retrieved from the NCDR. Age was used as both a continuous and a categorical variable. Mental health diagnoses according to ICD-10 (30) registered after contact with secondary mental health services and substance use disorder services in the year prior to death were retrieved from the NPR. Diagnoses were collapsed into the categories of substance use disorders (F10-F19), psychotic disorders (F20-F29), affective disorders (F30-F39), anxiety disorders (F40-F48), behavioral syndromes associated with physiological disturbances and physical factors (F50-F59), personality disorders (F60-F69), development disorders (F70-F79, F80-F89), and behavioral and emotional disorders with onset usually occurring in childhood and adolescence (F90-F98). Unspecified diagnoses (Z-diagnoses, R-diagnoses and F99 diagnosis) and no diagnoses were collapsed into one category. No diagnoses of organic mental disorder (F00-F09) were present in the material.

Service Utilization
Information regarding service utilization was retrieved from the NPR and analyzed based on two time periods. First, we assessed data at the last contact. Level of care was recorded at two levels: outpatient contact and inpatient contact at last contact. Contact status at last contact was recoded into two levels: ongoing contact—contact as outpatient with open referral and contact within 90 days or current inpatient contact (discharged from inpatient services as deceased); and terminated contact—last contact as outpatient with closed referral or no contact within 90 days or discharged from inpatient services as alive. Service utilization in the year prior to death includes the number of those who, in addition to contact with CAMHS, had contact with adult mental health services (including private mental health specialists) and/or substance use disorder services. The number of those admitted to inpatient care (including admissions in CAMHS, adult mental health services, and substance use disorder services) and the number of those with outpatient contact in these services were also included. The total number of outpatient contacts during the year prior to death were counted for each person.

Analyses
Data was analyzed with R version 4.1.2 (31). To assess the prevalence of contact with CAMHS in the year prior to death, we compared data for the children and adolescents in the age groups 10–13, 14–16, and 17–19 years in the current study with data of all children and adolescents who died by suicide in the same age groups during the study years from the NCDR. Two cases aged above 19 years were excluded from the analysis regarding prevalence of contact and suicide rates (**Table 1**), but were included in the other analyses regarding characteristics and service utilization (**Tables 2**, **3**). Suicide rates in children and adolescents with contact were calculated by standardizing the number of suicides with the number of children and adolescents who had contact with CAMHS during the year prior to death. Suicide rates in children and adolescents without contact were calculated by standardizing the number of suicides with the number of children and adolescents without contact in CAMHS. Confidence intervals for the rates were estimated using the Poisson distribution, and age was collapsed into three categories—10–13, 14–16, and 17–19 years—and analyzed separately for boys and girls.

For the categorical variables, differences between genders were tested using Fisher's exact test, since several variables contained small numbers. We used an odds ratio as a measure of the strength of association for boys compared to girls. As age and number of days since last contact were skewed, we tested the difference between groups with a non-parametric Mann-Whitney test, and reported the median for days since last contact. Variables with significant differences ($p < 0.05$) between boys and girls were then entered into a bivariate and multivariate logistic regression model, adjusted for age groups, using gender as an outcome. None of the boys were diagnosed with a personality disorder, and this variable was therefore not included in the model. Since contact status and days from last contact are interdependent, we only included contact status in the multivariate model. Since there were large differences regarding age groups, we adjusted for age groups in the bivariate and multivariate regression models to account for these differences.

Ethics and Approvals
Given that informed consent could not be retrieved, access to the data was provided by means of an exemption from patient confidentiality granted by the Norwegian Directorate of Health. The Regional Committees for Medical and Health Research Ethics, South-East Norway, approved the project (reference number: 32494). As some numbers will unavoidably be small when reporting on a low-frequency phenomenon, we decided not to stratify the sample with regard to variables other than gender and age groups and gender and suicide methods/service utilization/diagnosis, in order to avoid potential identification.

RESULTS
Prevalence of Contact and Suicide Rates
In total, 316 children and adolescents aged 10–19 years died by suicide in Norway between 2008 and 2018. Of those, we identified 73 young people (24 boys and 49 girls) who died by suicide

TABLE 1 | Number of suicides and suicide rates in children and adolescents with and without contact in Child and Adolescent Mental Health Services (CAMHS) in the year prior to death.

Age	Contact with child and adolescent mental health services in the year prior to death			No contact with child and adolescent mental health services in the year prior to death		
	n[a]	%	Rate[b] (95% CI)	n	%	Rate[c] (95% CI)
Girls						
10–13	3	37.5	5.04 (−0.66 to 10.74)	5	62.5	0.39 (0.05 to 0.74)
14–16	19	52.8	22.36 (12.31 to 32.41)	17	47.2	1.82 (0.95 to 2.68)
17–19	26	33.8	38.08 (23.44 to 52.72)	51	66.2	5.24 (3.80 to 6.68)
N	48	39.7	22.60 (16.2 to 28.90)	73	60.3	2.29 (1.77 to 2.82)
Boys						
10–13	2	25.0	1.83 (−0.71 to 4.37)	6	75.0	0.46 (0.09 to 0.84)
14–16	5	13.5	6.70 (0.83 to 12.57)	32	86.5	3.19 (2.08 to 4.29)
17–19	16	10.7	39.82 (20.31 to 59.33)	134	89.3	12.52 (10.40 to 14.65)
N	23	11.8	10.30 (6.07 to 14.50)	172	88.2	5.11 (4.25 to 5.87)

[a] The total sample includes two cases aged 20 years and they are excluded from the analyses in **Table 1**.
[b] Rate per 100, 000 patients in CAMHS.
[c] Rate per 100, 000 population without contact in CAMHS.

within a year of contact with Child and Adolescent Mental Health Services (CAMHS) during the same period. Overall, 23 % of those who died by suicide were in contact with CAMHS during the year prior to death. There were large gender and age differences, as shown in **Table 1**. Among the boys, the overall prevalence in contact was 11.8%, compared to 39.7% of the girls. The highest prevalence of contact was among girls in the age group 14–16 years, and the lowest prevalence of contact was among boys in the age group 17–19 years. Of the total sample, 21 were older than 17 years. When excluding these, the prevalence of contact under the age of 18 was 35%. For both genders, as shown in **Table 1**, suicide rates in CAMHS were highest in the age group 17–19 years. However, suicide rates differed according to age and gender: in girls, the suicide rate gradually increased with age, but in boys, the suicide rate increased more sharply in the oldest age group, and across all age groups the suicide rate in CAMHS was higher among girls than among boys.

Description of the Sample

Characteristics of the young people who died by suicide within the year of contact with CAMHS are shown in **Table 2**. The boys/girls ratio was 0.49. The average age was 16.5 years (range 12–20). Only two were 20 years of age. Hanging or strangulation was by far the most frequently used method of suicide in both genders, followed by jumping from a height or jumping/lying in front of a moving object. In total, these two methods accounted for 80% of all suicide deaths among young people who had been in contact with CAMHS during the year prior to death. Two adolescents died by poisoning, and there were no deaths by use of firearms or sharp objects in this study. Two were registered as death by undetermined intent. Affective disorders formed the largest diagnostic group, followed by anxiety disorders. There were 18 (24.7%) who had not received a diagnosis or had only received an unspecified diagnosis during the year prior to death. Significant gender differences ($p = 0.026$) were only found for personality disorders.

Service Utilization

Most had their last contact with CAMHS (**Table 2**), but some had their last contact with adult services. The majority were outpatients (current or terminated) at last contact. Eight had their last contact as inpatients, seven of these were current inpatients at the time of death, and fewer than three were inpatients in CAMHS. Significant gender differences were found for contact status at last contact ($p = 0.005$). The majority of girls were registered with an ongoing contact at the time of death, whilst a terminated contact was much more common among boys. The median time from last contact to suicide was 72 days for boys and 6 days for girls ($p = 0.008$).

Although all cases had at least one contact with outpatient services during the year prior to death, girls had a significantly higher number of outpatient contacts ($p = 0.004$). The median number of outpatient contacts was 13.5 for boys and 21.0 for girls. Fewer boys than girls had at least one inpatient contact ($p = 0.024$) during the year prior to death. Contact in adult mental health services was common (28.8%), and 18 (24.7%) had contact in substance misuse services during the year prior to death.

In the age-adjusted bivariate logistic regression model comparing boys with girls, differences in the numbers of those with terminated contact and those with inpatient contact during the year prior to death remained significant (**Table 3**). Boys were more likely to have terminated contact at the time of death [OR = 4.99 (95% CI 1.66–15.99)], and they were less likely to have inpatient contact during the year prior to death [OR = 0.22 (95% CI 0.06–0.69)]. When adjusted for all other variables, boys were still more likely to have terminated contact [OR = 4.07 (1.22–14.44)].

DISCUSSION

In Norway, 23 % of those aged 10–19 years who died by suicide in the period 2008–2018 had contact with CAMHS in the year prior to death, with the prevalence of contact being considerably

TABLE 2 | Description of all young people in contact with Child and Adolescent Mental Health Services (CAMHS) in the year prior to death by gender.

	Boys	Girls	Total		
	(n = 24)	(n = 49)	(n = 73)	OR[a] (95% CI)	P
Age, mean (sd)	16.7 (1.9)	16.3 (1.7)	16.5 (1.8)	–	0.248
Age groups					0.301
10–13	2 (8.3)	3 (6.1)	5 (6.8)	1.06 (0.13–7.03)	
14–16	5 (20.8)	19 (38.8)	24 (32.9)	0.42 (0.12–1.27)	
17–20	17 (70.8)	27 (55.1)	44 (60.3)	1 (ref)	
Method of suicide, n (%)					
Hanging or strangulation	14 (58.3)	32 (65.3)	46 (63.0)	0.75 (0.25–2.31)	0.612
Jumping from a height or jumping/lying in front of a moving object	5 (20.8)	8 (16.3)	13 (17.8)	1.34 (0.30–5.42)	0.747
Other	5 (20.8)	9 (18.4)	14 (19.2)	1.17 (0.27–4.54)	1.00
Mental disorders during the year prior to death, n (%)					
Substance use disorders (F10-F19)	1 (4.2)	6 (12.2)	7 (9.6)	0.32 (0.01–2.85)	0.414
Psychotic disorders (F20-F29)	1 (4.2)	3 (6.1)	4 (5.5)	0.67 (0.01–8.89)	1.00
Affective disorders (F30-F39)	10 (41.7)	26 (53.1)	36 (49.3)	0.64 (0.21–1.89)	0.457
Anxiety disorders (F40-F48)	4 (16.7)	18 (36.7)	22 (30.1)	0.35 (0.07–1.28)	0.106
Behavioral syndromes associated with physiological disturbances and physical factors (F50-F59)	2 (8.3)	6 (12.2)	8 (11.0)	0.66 (0.06–4.07)	1.00
Personality disorders (F60-F69)	0	9 (18.4)	9 (12.3)	–	0.026
Development disorders (F70-F79, F80-F89)	0	2 (4.1)	2 (2.7)	–	1.00
Behavioral and emotional disorders with onset usually occurring in childhood and adolescence (F90-F98)	6 (25.0)	11 (22.4)	17 (23.3)	1.15 (0.30–4.07)	1.00
No diagnosis/only unspecified diagnosis	9 (37.5)	9 (18.4)	18 (24.7)	2.63 (0.76–9.17)	0.089
Service utilization at last contact, n (%)					
Child and adolescent mental health services	21 (87.5)	39 (79.6)	60 (82.2)	1.78 (0.40–11.17)	0.525
Adult mental health services[b]	3 (12.5)	7 (14.3)	10 (13.7)	0.86 (0.13–4.26)	1.00
Substance use disorder services	0	3 (6.1)	3 (4.1)	–	0.546
Level of care at last contact, n (%)					
Outpatient contact	23 (95.8)	42 (85.7)	65 (89.0)	1 (ref)	
Inpatient contact	1 (4.2)	7 (14.3)	8 (11.0)	0.26 (0.01–2.27)	0.258
Contact status at last contact, n (%)					
Ongoing contact	12 (50.0)	41 (83.7)	53 (72.6)	1 (ref)	
Terminated contact	12 (50.0)	8 (16.3)	20 (27.4)	4.99 (1.49–17.88)	0.005
Days from last contact to suicide, median (IQR)	72.0 (5-186)	6.0 (1-30)	9.0 (2-82)	–	0.008
Service utilization during the year prior to death, n (%)					
Adult mental health services[b]	4 (16.7)	17 (23.3)	21 (28.8)	0.38 (0.08–1.41)	0.169
Substance use disorder services	3 (12.5)	15 (20.5)	18 (24.7)	0.33 (0.05–1.36)	0.148
Inpatient contact	5 (20.8)	24 (49.0)	73 (100.0)	0.28 (0.07–0.94)	0.024
Outpatient contact	24 (100.0)	49 (100.0)	73 (100.0)	–	–
Number of outpatient contacts, median (IQR)	13.5 (4.5–15)	21.0 (11-35)	15 (10-31)	–	0.004

[a]Reference group is girls.
[b]Adult mental health services and private mental health specialist.

TABLE 3 | Differences in characteristics and service utilization between girls (reference) and boys.

Factors	Age-adjusted bivariate model		Age-adjusted multivariate model	
	OR (95% CI)	p	OR (95% CI)	p
Terminated contact				
No	1 (ref)		1 (ref)	
Yes	4.99 (1.66–15.99)	0.005	4.07 (1.22–14.44)	0.024
Number of outpatient contacts during the year prior to death	0.98 (0.96–1.00)	0.197	1.00 (0.98–1.02)	0.756
Inpatient contact during the year prior to death				
No	1 (ref)		1 (ref)	
Yes	0.22 (0.06–0.69)	0.013	0.26 (0.06–1.01)	0.062

higher among girls. Suicide rates were lowest in the youngest age groups for both genders, and these increased with age, but with a different pattern for boys and girls. In the final multivariate model, boys were four times more likely to have a terminated contact at the time of death.

The contact prevalence in CAMHS is lower than the contact prevalence in adult mental health services and substance use disorder services in Norway, where the proportion of people in contact was well above 40% in all age groups combined (32, 33). Because of the transition into adult mental health services at the age of 18, contact prevalence with CAMHS after the age of 17 is lower, thus affecting the total proportion in contact with CAMHS in the year prior to death. Although the proportion in contact would be 35% if the cases aged 18 or older were excluded from the sample, this is still lower than the proportion in contact with adult mental health services in Norway.

More girls than boys died by suicide after contact with CAMHS. This may be a result of more girls than boys being in contact with CAMHS in the age groups 14–16 and 17–19 years. The suicide rate across all age groups was highest among girls in contact with CAMHS. This is opposite to the trend for the general population (4), the adolescent population (3), and those in adult mental health services (34). Possible explanations for this could be a combination of the lower occurrence of mental disorders among boys in the adolescent population in general (35) and there being less psychosocial risk factors. This could also be a result of a lower prevalence of disclosure of both mental disorders and risk factors among boys, and a lower prevalence of warning signs before suicide, expressed by self-harm, for example (26). It could also be a result of impulsive behavior, and other factors such as help-seeking behavior and the organization of services (potentially more tailored to girls) could also be involved. Moreover, parents in Norway are responsible for providing consent when receiving an offer of treatment for a child under the age of 16. As a result of this, there is a possibility that adolescents at the age of 16 or older may decline an offer of treatment. It is important for the services to reach boys in this age group, as the overall rates are highest in this group.

The suicide rates varied by gender and age groups. Among both those with and those without contact, the suicide rates increased with increasing age. The increase in suicide rates with increasing age may relate to a higher occurrence of mental disorders among older compared to younger adolescents in

general (35), and also as shown in studies among adolescents who die by suicide (13, 17, 18). Due to the lower prevalence of mental disorders among children and adolescents who die by suicide (13, 16, 20), together with a high complexity of other psychosocial factors (5, 13, 18) and an overall low proportion in contact with CAMHS in the year prior to death, universal or public health interventions might prove to be the most important approach in order to reduce the number of suicides among adolescents in Norway. Around 70% of all boys and more than 40% of all girls that died by suicide were in the group aged 17–19 without contact in CAMHS, which may illustrate the importance of universal prevention programs for this age group, such as suicide behavior education for young adults (36).

Affective disorders were the most common mental disorder in this study. This is consistent with the literature, where an affective disorder is a known risk factor for suicide in children and adolescents (18), and also a common disorder in the adolescent population (37). More surprising was that few adolescents were diagnosed with a substance use disorder, although a quarter of the sample had been in contact with substance use disorder services during the year prior to death. Thus, under-diagnosis of substance use disorders seems likely, and better assessment and treatment of substance use disorders should be a priority for the services. Furthermore, a high proportion did not receive any diagnosis or had only received an unspecified diagnosis during the year prior to death. Although non-significant, boys were almost three times more likely to receive an unspecified diagnosis compared to girls. Adequate assessment and diagnostics are important prerequisites for the quality of effective treatment, and the high proportion with no diagnosis or an unspecified diagnosis is a cause for concern and makes this an area with potential for improvement. Reservations concerning the diagnosis of children and adolescents could be one explanation for the high proportion without a specific diagnosis. In addition, adolescents may have an unclear pattern of symptoms and comorbidity, and other psychosocial factors may represent a major part of the clinical picture, making it difficult to determine a diagnosis. It is possible that both unassessed personality traits (38) and affective temperament types (39) could also be important.

The finding that everyone in the sample had contact with outpatient services during the year prior to death was anticipated, as outpatient treatment constitutes 95% of the services in CAMHS in Norway (40). The main service utilization factor

examined here was that boys who died by suicide were more likely to have terminated contact compared to girls. This finding may explain other significant findings, such as the number of days since last contact and the number of outpatient contacts. Less severe psychopathology or at least fewer warning signs among boys, and perhaps a lower prevalence of help-seeking behavior, and a lower level of engagement in treatment may lead to a premature termination of contact, with potential under-treatment of their problems as a consequence. CAMHS need to be aware of this and individualize the services based on the patient's needs and preferences.

There were no gender differences regarding the method of suicide. Hanging or strangulation was the most frequently used method of suicide, followed by jumping from a height or jumping/lying in front of a moving object. Glenn et al. (3) found the same pattern when examining cross-national suicide rates by suicide method in the same age group. Limited access to certain methods, and suicide contagion (41, 42), in combination with impulsivity, may also have an impact on the choice of method.

In the present study, few children and adolescents died by poisoning or cutting—methods frequently used in non-fatal self-harm (12, 43). This finding is in accordance with earlier studies on adolescents and young people (12, 43), but nevertheless represents important information for clinicians, who regularly assess and treat adolescents with NSSI (non-suicidal self-injury). This also shows the importance of studying suicide in this group directly, and not only through proxy variables.

STRENGTHS AND LIMITATIONS

A strength of this study is the use of registry data, which makes it possible to include a complete national sample of all young people who died by suicide within the year after contact with CAMHS. Since the registry data has already been collected for administrative purposes and not by a researcher, it also reduces the risk of ascertainment and recall bias. A major limitation was the low statistical power, which prevents us from examining patient demographics and service utilization considering both gender and age groups simultaneously. Furthermore, some of the results need to be interpreted with caution due to the small numbers and wide confidence intervals. Another major limitation of the current study is the uncontrolled observational design. Consequently, we were unable to estimate the risk associated with the described factors. Furthermore, the registers lack information about previous suicidal behavior, and sociodemographic or social factors. Given our design, we were unable to study the transition into adult mental health services.

CONCLUSION

This national registry-based study found that more girls than boys died by suicide during or up to 1 year after contact with CAMHS, and boys were 4 times more likely to have a terminated contact at the time of death. Therefore, it is important for CAMHS to review their services and assess whether they are sufficiently adapted for boys. It is also important to ensure the

presence of suicide prevention programs and initiatives that are aimed at engaging boys. Given the large heterogeneity of suicide rates within CAMHS patients, both future studies and efforts at clinical prevention should take into consideration both gender and age groups when it comes to suicide prevention. Nevertheless, the highest suicide risk is among the oldest adolescents, which should be the main target group for suicide prevention in CAMHS. Although both the proportion of those in contact with the services and the suicide rates were much lower than in adult populations, the rates are still much higher among those adolescents who are in contact with CAMHS than those who are not.

Whilst the generalizability of these findings needs to be examined in other countries and health systems, the results could indicate that treatment engagement and retention in CAMHS might be particularly important for boys. For both genders, missing diagnoses of substance use disorders and the frequent use of unspecified diagnoses indicate a potential for quality improvement, which could possibly result in better patient safety. Suicide among young people in contact with CAMHS is an important cause of years of life lost, and future studies should further examine gender differences in treatment utilization and other paths that could guide suicide prevention in children and adolescents.

AUTHOR'S NOTE

DATA AVAILABILITY STATEMENT

ETHICS STATEMENT

AUTHOR CONTRIBUTIONS

FW, MM, HA, and AK formulated the research questions, designed the study, and contributed and agreed to the

final manuscript. MM curated data. HA analyzed the data and wrote the first draft. FW supervised the project.

All authors contributed to the article and approved the submitted version.

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Non-suicidal Self-Injury Among Adolescents From Diverse Ethnocultural Groups in Israel: The Association With Sleep Problems and Internet Addiction

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Objectives: Although Non-suicidal Self-Injury (NSSI) has received more attention in recent years, most of these studies focused on samples from North American and European countries; consequently, little is known about its patterns and frequency in other cultures as well as its relation to sleep problems and internet addiction. As one of the few studies that aim to fill this gap, the current study examined the prevalence, characteristics, and types of NSSI behaviors among adolescents from diverse ethnocultural groups.

Methods: A sample of 642 adolescents, aged 12–18 years, were randomly recruited from different middle and high schools in Israel, employing a snowball sampling technique. The sample included the following: 50% Jews and 34.7% Muslims born in Israel, 9.7% immigrants from the former Soviet Union (FSU), and 4.4% immigrants from Ethiopia. The participants completed self-report questionnaires that assessed their NSSI, sleep problems, internet addictions, and depressive symptoms.

Results: Almost one-third of the sample had engaged in NSSI, while 6% frequently injured themselves. More than half of the FSU immigrants and one-third of the Muslim participants indicated that they engaged in NSSI. These two population groups also exhibited severe depressive symptoms, sleep problems, and internet addictions. The most parsimonious correlations with NSSI included being male, an immigrant/Muslim minority who exhibited severe depressive symptoms and internet addictions.

Conclusions: These results emphasize the need for routine NSSI assessments to prevent long-term sequelae, including any forms of suicidal thoughts and behaviors and adult borderline personality disorder (BPD). Primary preventive programs that include adaptive coping skills may eliminate the social contagion effect of NSSI.

Keywords: Non-suicidal Self-Injury (NSSI), sleep problems, ethnicity, internet addiction, depression

INTRODUCTION

Non-suicidal Self-Injury (NSSI) refers to the deliberate and direct wounding of one's body tissue without suicidal intent (1, 2). This phenomenon affects individuals worldwide, and its occurrence has increased rapidly in the last two decades (3, 4). Most individuals who engage in NSSI tend to utilize more than one method to injure themselves repeatedly (5–8). People engage in NSSI for different purposes, including the desire to alter their internal state; eliminate negative emotions (e.g., anger, stress), negative cognitions (e.g., suicidal ideation, traumatic memories), negative affect states (e.g., dissociation); self-punishment; and to establish a sense of internal control (5, 6, 9, 10).

Although NSSI is generally considered as a behavior associated with psychiatric populations especially borderline personality disorder (1, 11)–several studies have documented it in non-psychiatric samples, including adolescents and young adults (3, 12–14). Furthermore, population-based surveys reported that between 12 and 37.2% of adolescents in secondary school populations and 12 and 20% of teenagers and young adults have engaged in NSSI (15–17). Additionally, the gender differences in NSSI engagement were found to be mixed. While some studies indicate that females frequently engage in NSSI (5, 8), others did not find similar results (1, 7, 11, 18).

Although NSSI has received increased attention in recent years, few studies are concerned with its frequency and functions in different ethnic and cultural groups. The actual prevalence rates of NSSI in community-based populations remain unknown, and the relevant figures tend to vary considerably across studies since operational definitions, and modes of measurement are inconsistent (19–22). Moreover, most studies concerning NSSI are focused on samples from North American and European countries; consequently, little is known about it in other cultures. Only a few studies have focused on non-western cultures and highlighted mental health issues. For example, in Turkey, nearly 20% of high school and 15% of college students reportedly engaged in NSSI (23–25). Similarly, other studies reported that between 22 and 38% of Muslim adolescents and college students engaged in NSSI at some point in their lifetime and that males were more prone to these behaviors (26, 27). In order to fill the gap, this study aimed to examine the prevalence of NSSI among the adolescents in Israel's different ethnic and cultural groups and determine whether these cultural and ethnic backgrounds are related to NSSI.

Several variables act as risk factors for NSSI, including major depression disorder (MDD), anxiety, impulsivity, social isolation, and low self-esteem (5, 11, 28–30). Despite the fact that changes in sleep patterns are one of the most common outcomes of puberty development in comparison to childhood (31) less is known about the relationship between sleep problems and NSSI and whether it is a risk for NSSI. Previous studies suggest these sleep changes can develop sleep problems in many adolescents, which become more frequent with the advancing of puberty (32, 33). Sleep problems are a significant health issue for the youth (33–35), and related to different risk factors that could increase NSSI activities (including depression, anxiety, suicidal ideation, impulsivity, and aggression). Nevertheless, only a few community studies have examined the association between sleep patterns and NSSI. In a population-based study, Hysing et al. (36) found that insomnia, short sleep durations, and an abnormal sleep onset latency were correlated with self injury even after adjusting for demographics, perfectionism, depression, and ADHD symptoms (36). Lundh et al. (37) found poor sleep functions as a risk factor for the development of NSSI among young girls, even when controlling for psychopathology (37). However, their study was not originally designed to investigate the association between sleep and NSSI, and sleep disturbances were measured using only one global question.

Adolescents are especially attracted to technological methods of communication, which offer interaction with others and, at the same time, provide anonymity and a sense of social acceptability (38). The dramatic growth of internet usage among adolescents has increased the prevalence of several related pathologies. For example, internet addictions have become common health issue among adolescents; in the Netherlands and Italy, 3.7 and 5.4% of adolescents exhibit this addiction, respectively (39, 40). Although NSSI and internet addictions are common among adolescents, few studies have described the relationship between these two risk behaviors (41). Nevertheless, significant efforts have been made to understand the relationship between NSSI activity and the contents of materials accessed on the internet (42, 43), including sharing NSSI experiences (44) and communication between people who self-injure in virtual communities (17). Therefore, examining the correlation between the pathological use of the internet and NSSI among adolescents from different ethnicities may provide further knowledge concerning the cross-cultural risk of NSSI.

Taken together, the aims of this study were (1) to explore the prevalence, characteristics, and type of NSSI behavior among adolescents from diverse ethnocultural groups in Israel, and (2) to examine whether sleep problems and internet addictions related to NSSI behaviors when controlling for depressive symptoms.

Our hypotheses were: (1) NSSI will be more frequent among immigrants and adolescents from ethnic minorities than among other population groups. (2) NSSI will be related to sleep difficulties, internet addictions, and depressive symptoms.

METHODS

Participants and Procedure

This study utilized a cross-sectional design. Furthermore, a sample of 642 adolescents, aged 12–18 years (M = 14.95, SD = 1.53), were recruited from different middle and high schools in Israel by employing a snowball sampling technique (45, 46). The researchers sent a handout to the parents of students, including information regarding the study's aims. Parents were able to update the school administration or the researchers if they did not wish their children to participate in the study. The students whose parents disagreed were excluded. The researchers informed students who chose to participate in the study about the aim of the study, which will take place on a specific day instead of the class scheduled. The adolescents–who chose to participate in the study–were provided with links to local mental health

resources. The study was approved by the Ethics Committee of the Ministry of Education of Israel and the IRB of the Academic College of Tel-Aviv-Yaffo.

Measures

Deliberate Self-Harm Inventory-Youth Version

(DSHI-Y) (47). The DSHI-Y is a modified version of the Deliberate Self-harm Inventory (DSHI) (48) that aims to assess the lifetime history of various aspects concerning self injury without suicidal intention. The DSHI is based on the conceptual definition of deliberate self-harm as the deliberate and direct wounding or alteration of body tissue (without conscious suicidal intent) that results in severe injuries which cause tissue damage (48). The DSHI-Y is a 6-item questionnaire that assesses the presence and frequency of the following self-mutilating behaviors: cutting, self-burning, severe scratching, self-biting, banging (of the head and other body parts), and self-punching. Participants rated each item on a 5-point Likert scale, where 1=No, "*I have never done this;*" 2 = "*Yes*, one *time;*" 3 = "*Yes, 2–5 times;*" 4 = "*Yes, 6–10 times;*" and 5 = "*Yes, more than 10 times.*" The questionnaire exhibited excellent internal consistency ($\alpha = 0.91$). Furthermore, consistent with previous studies, two dichotomous variables were created (37, 47). First, a history of NSSI was established where a score of "0" was assigned for participants who indicated that they had not engaged in any NSSI behaviors and a score of "1" to participants who did have a history of these behaviors. In order to distinguish between frequent and occasional NSSI participants, a second variable was assigned a score of "0" for participants who reportedly engaged in five or fewer NSSI incidents (Infrequent NSSI), and a score of "1" to indicate self-harming participants who reportedly engaged in more than five incidents (frequent NSSI). In the current study, the DSHI-Y's internal consistency was $\alpha = 0.78$.

The Child and Adolescent Sleep Checklist

Oka and Horiuchi (49) is a 24-item checklist designed to identify sleeping habits and screen for sleeping problems in adolescents. Participants were asked to respond to items using the following five choices: 0 indicated "never," 1 "occasionally," 2 "sometimes," 3 "always," and 4 "unknown." The global score range was 0–72, where a global score > 18 would indicate the presence of sleeping problems. The reliability of the test ranged between 0.8 and 0.98 (49). In the current study, the CASC's internal consistency was $\alpha = 0.81$.

The Internet Addiction Test

Young (50) is a 20-item questionnaire in which respondents rate items on a five-point Likert scale pertaining to the degree to which their internet usage affects their daily routine, social life, productivity, sleeping pattern, and emotions. Scores range from 20 to 100; Young (50) suggests that a score of 20–39 points typifies an average online user who has complete control over his/her usage; a score of 40–69 signifies frequent problems caused by internet usage, and a score of 70–100 means that their internet usage is causing significant problems. The IAT factor analysis in a previous study revealed a good to moderate internal consistency ($\alpha = 0.54$–0.82) (51); nevertheless, it has

shown a steady internal consistency before (Cronbach's $\alpha = 0.93$) (52). Consistent with Young's (50) suggestion, dichotomous variables were created in the current study using a 40 or higher cutoff score. A score of "0" and "1" was assigned to participants who reported non-problematic or moderate to severe internet usage, respectively. In this study, the IAT's internal consistency was $\alpha = 0.92$.

Patient Health Questionnaire-9 Modified for Adolescents

Johnson et al. (53) is a 9-item self-report questionnaire to assess the severity of adolescents' depression. Each item is rated on a 4-point scale (0 = Not at all; 1 = Several days; 2 = More than half the days; and 3 = Nearly every day). The total score ranges from 0 to 27; higher scores indicate greater severity of depression. A global score > 10 indicates the presence of moderate to severe depression symptoms. The PHQ-A has shown a 92% accuracy in diagnosing major depression disorder in a past study (53). In the current study, its internal consistency was $\alpha = 0.85$.

We also assessed participants' demographic characteristics included their age, gender, class, family status, parents' place of birth and educational level, religious affiliation, and degree of religiosity.

Statistical Analysis

All analyses were conducted using the Statistical Package for the Social Sciences (SPSS) version 20. The comparisons between the NSSI and Non-NSSI groups utilized chi-square tests for dichotomous data (e.g., gender, ethnicity, and other cutoff point measures) and *t*-tests or *ANOVA* for continuous data (sleep problems, the severity of depression, internet addiction). Regression diagnostic tests were used to assess the multicollinearity between predictors. A multiple logistic regression analysis was performed to test the predictive utility of significant correlations for NSSI behaviors. Goodness-of-fit statistics were used to compare and select the most parsimonious models. A Bonferroni correction was administered since the comparison included multiple tests. Furthermore, 90.1% of the participants had no missing data for any variable, 7.2% had missing data for one or two variables, and 3.8 % had missing data for three to four variables. The alpha value was set to 0.05.

RESULTS

The sample included different ethnic groups: 50% of the participants were Jews (50%; $N = 321$), 34.7% were Muslims ($N = 223$) born in Israel, 9.7% ($n = 62$) were immigrants from the former Soviet Union (FSU), and 4.4% were immigrants from Ethiopia ($N = 28$). The demographic characteristics of the participants are displayed in **Table 1**.

The analyses revealed that 30.7% ($N = 197$) of the participants reported a history of NSSI behavior, while 5.8% ($N = 37$) reported that they frequently engaged in such behavior (i.e., more than five incidences). Furthermore, 26.2% ($N = 168$) of the total sample exhibited severe symptoms of depression, 41.3% (265) reported sleep difficulties, and almost a quarter of them

TABLE 1 | Demographic characteristics of the sample (n = 642).

Age M ± SD	14.95 ± 1.53	
	N	**%**
Gender (girls)	344	53.6%
Ethnicity		
Jews born in Israel	321	50%
Muslims born in Israel	223	34.7%
FSU immigrants*	62	9.7%
Ethiopian immigrants	28	4.4%
Parents' education level		
Elementary/ High School Education	267	41.6%
Tertiary academic education	302	47.0%
Level of religiosity (High)	159	24.7%

*FSU, former Soviet Union.

TABLE 2 | Clinical characteristics of the participants (n = 642).

Clinical characteristics		
Depression	168	26.2%
Sleep difficulties	265	41.3%
Internet addiction	156	24.3%
Lifetime NSSI	197	30.7%
Frequent engagement in NSSI	37	5.8%

NSSI, non-suicidal Self-Injury.

(24.3%) exhibited internet addictions (**Table 2**). As presented in **Figure 1**, the most common method of self-mutilation used by the adolescents was cutting (44.7%), followed by severe scratching (43.7% reported severely scratching themselves at least once) and banging (39.6%).

Demographic and Clinical Characteristics of Adolescents Engaging in NSSI

The data indicate that adolescents with a history of NSSI behavior were more likely to be male [49.2% (97) vs. 36.9% (162); $\chi^2_{(1)}$ = 8.66, p =0.003], FSU immigrants [57.4% (35) vs. 21.9% (70) [or Muslim minority [37.2% (83) vs. 21.9% (70); $\chi^2_{(3)}$ =35.97, p < 0.001] when compared to those without such a history. Furthermore, adolescents who engaged with NSSI reported higher levels of depressive symptoms in compare to those who did not engaged in NSSI [42.6% (84) vs. 19.1% (83); $\chi^2_{(1)}$ =38.71; p < 0.001], sleep difficulties [59.2% (116) vs. 34.5% (149); $\chi^2_{(1)}$ =33.71; p < 0.001], and internet addiction behaviors [37.7% (72) vs. 27% (113); $\chi^2_{(1)}$ =7.15; p < 0.01] (**Table 3**). Within the NSSI group, participants who were frequent engagers (>5 times) tended to exhibit higher levels of depressive symptoms [70.3% (26) vs. 36.9% (58); $\chi^2_{(1)}$ =13.55, p < 0.001], sleep difficulties [78.4% (29) vs. 55.8% (87); $\chi^2_{(1)}$ =6.37, P = 0.01] and more

severe internet addictions [45.9% (17) vs. 7.9% (2); $\chi^2_{(1)}$ =14.45, p < 0.001].

A multiple logistic regression analysis was performed to test the predictive utility of the significant correlates concerning engaging in NSSI. As it can be seen on **Table 4**, when controlling for the above-noted demographic and depressive symptoms, the most parsimonious model set included the following variables: being male (OR = 2.39, P < 0.001), immigrants (OR = 2.15, p < 0.001), Muslims born in Israel who also exhibit severe depressive symptoms (OR = 2.34, p < 0.001), and people with internet addictions (OR = 1.01, p = 0.005).

DISCUSSION

This study is one of the few studies focusing on a non-clinical adolescent sample from a diverse ethnic adolescent community and aims to identify its associated risk factors. The results revealed that almost one-third of the participants engaged in NSSI, while 6% frequently injured themselves. More than half of the FSU immigrants and over one-third of the Muslim participants reportedly engaged in NSSI. Furthermore, adolescents from ethnocultural minority backgrounds (FSU immigrants and Muslims born in Israel) exhibited severe depressive symptoms and internet addictions.

The prevalence of NSSI among the sample participants exhibited relatively higher rates when compared to both Western and non-Western samples. For instance, the lifetime frequency of NSSI among adolescents in western countries ranges between 13.9 and 35.6% (1, 3, 7, 54). The same trend was found in non-Western countries as well, where the estimated lifetime frequencies varied from 9.3% in Japan (55) to 32.7% in Hong Kong (56).

Furthermore, the results indicate that immigrants and Muslim minority adolescents had a higher risk of engaging in NSSI than Israeli Jewish adolescents. These results are significant since they indicate inconsistent NSSI prevalence results between ethnic and racial groups. Interestingly, while some studies did not find any differences (57, 58), others found higher rates of NSSI among white participants when compared to ethnic minority individuals (17, 59–61). Only one other study reported higher frequencies of NSSI among minority groups (62). The first and second generations of FSU immigrants and immigrants from Ethiopia were more at risk of suicidal behaviors (63), alcoholism, and substance abuse than their native counterparts (64). Different models may explain why these groups are vulnerable to psychological distress and risk behaviors. One possible explanation is related to "minority stress," which refers to stress experiences during adverse social interactions resulting from being a stigmatized social group and the target of discrimination and prejudice (65). This may affect their vulnerability toward adverse psychological, social, and academic outcomes; this includes suicidal behavior, depression, anxiety, and delinquency among immigrants and ethnic minority groups (66–71).

In our study, the Muslim adolescents–who live as an ethnic minority in Israel–were more vulnerable to psychopathology

FIGURE 1 | Type of NSSI and frequencies of use. *NSSI, Non-suicidal Self-Injury.
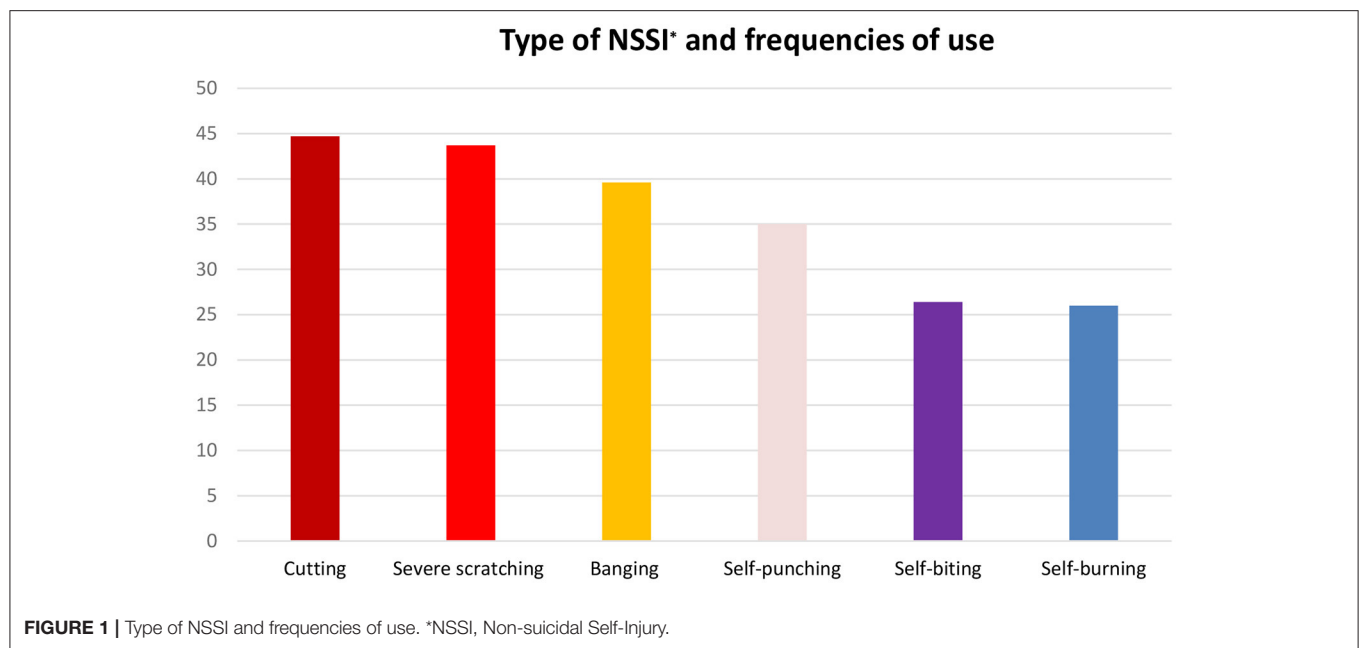
TABLE 3 | Demographic and clinical characteristics of participants' NSSI* history and engagement frequency ($n = 642$).

	History of NSSI engagement				Frequency of NSSI engagement (within NSSI group)			
	Without NSSI $N = 439$	NSSI $N = 197$	Test $_{(df)}$	Significance	Low frequency $N = 149$	High frequency $N = 37$	Test $_{(df)}$	Significance
Demographic characteristics								
Age (M ± SD)	15.0 ± 1.53	14.91 ± 1.51	$t = 0.69$	$p > 0.1$	14.96 ± 1.54	15.14 ± 1.26	$t = -1.01$	$p > 0.1$
Gender (Male) % (N)	36.9% (162)	49.2% (97)	$\chi^2_{(1)} = 8.66$	$P = 0.003$	51% (76)	57.1% (20)	$\chi^2_{(1)} = 0.43$	$p > 0.1$
Jews born in Israel % (N)	78/1% (249)	21.9% (70)[a]	$X^2_{(3)} = 35.97$	$p < 0.001$	96.2% (306)	3.8% (12)	FET	$p = 0.08$
FSU immigrants** % (N)	42.6% (26)	57.4% (35)[b]			89.8% (53)	10.2% (6)		
Ethiopian immigrants% (N)	67.95% (19)	32.1% (9)[ab]			96.4% (27)	3.6% (1)		
Muslims born in Israel % (N)	62.8% (140)	37.2% (83)[b]			91.9% (205)	8.1% (18)		
Religiosity level (High) % (N)	20.3% (89)	25.9% (51)	$\chi^2_{(1)} = 3.64$	$p > 0.1$	27% (41)	27% (10)	$\chi^2_{(1)} = 0.79$	$p > 0.1$
Clinical characteristics % (N)								
Depression	19.1% (83)	42.6% (84)	$\chi^2_{(1)} = 38.71$	$p < 0.001$	36.9% (58)	70.3% (26)	$\chi^2_{(1)} = 13.55$	$p < 0.001$
Sleep problems	34.5% (149)	59.2% (116)	$\chi^2_{(1)} = 33.71$	$p < 0.001$	55.8% (87)	78.4% (29)	$\chi^2_{(1)} = 6.37$	$P = 0.01$
Internet addiction	27% (113)	37.7% (72)	$\chi^2_{(1)} = 7.15$	$p < 0.01$	7.9% (12)	45.9% (17)	$\chi^2_{(1)} = 14.45$	$p < 0.001$

*NSSI, Non-suicidal Self-Injury. **FSU, former Soviet Union; FET, fisher's exact test.

and risk behaviors, including depression, and somatization, than the Jewish students, as reported in different studies (67). Furthermore, Muslim adolescents were found significantly more at risk for suicidal behaviors than their counterparts (72). One explanation for these patterns is related to the fact that they may be exposed to more stressors and the lack of mental health resources. Another explanation could be related to the infrequent help-seeking behaviors of immigrants and ethnic minority adolescents. Several studies assert that ethnicity and gender are significant determinants of help-seeking (73–76). Accordingly, the fact that the current study participants who engaged in NSSI were more likely to be male and ethnic and cultural minorities minimized their probability of seeking help. Different hypotheses have been suggested regarding the barriers

TABLE 4 | Logistic regression model predicting NSSI (n = 642).

	Odds ratio	S.E.	Wald z	P-value	95% CI
FSU immigrants*	2.15	0.19	14.78	<0.001	1.45–3.18
Muslims born in Israel*	1.78	0.24	12.54	0.002	0.92–2.86
Gender (Male)	2.39	0.20	18.53	<0.001	1.61–3.56
Depression	2.34	0.23	14.11	<0.001	1.50–3.64
Internet addiction	1.01	0.06	7.59	0.005	1.0–1.03

*Reference group, Jewish adolescents born in Israel. Hosmer and Lemeshow test for goodness-of-fit: $\chi^2_{(8)} = 9.64$, $p = 0.26$.

against help-seeking among adolescents and young men. These include denial of emotions (77, 78), avoidance (79), and perceived stigma (80). Therefore, a future study that focuses on help-seeking patterns and attitudes toward mental health difficulties of male adolescents from different ethnic and cultural backgrounds may clarify the roles of gender, culture and norms in preventing and treating psychopathology.

The results of this study highlight that adolescents who injure themselves suffer from sleep difficulties and internet addictions. It can be suggested that the high correlation between the participants' internet addictions and sleep problems negatively affects their ability to regulate emotions (81) and increases their depressive symptoms. There is evidence, albeit not definitive, that interfering with sleep is a causal pathway between excessive social media use and NSSI (82). Therefore, it is imperative to determine how different aspects of social media use (duration and timing) are related to sleep problems, psychopathology, and suicidal risk. Sleep hygiene programs implemented in high schools were found to help raise sleep efficacy, reduce emotional distress and risk behaviors, and sustain more stable academic performance than those who did not participate in the programs (83).

Furthermore, vulnerable youths who injure themselves tend to struggle with naming their emotions, coping with difficulties and are more likely to seek cyber support and information than professional help (84). However, the virtual communities they are attracted to could increase their risk of normalizing or even encouraging risk behaviors, including NSSI (85). Despite these dangers, the relationship between social media and NSSI remains unclear.

The current study has several significant limitations. First, in using a cross-sectional survey, causality among the study variables should not be inferred. More specifically, the temporal effect of internet usage on depression and NSSI could not be determined. Second, all study measures were self-reported and susceptible to subjectivity biases and under reporting due to social desirability. Third, the study's sample comprised adolescents' volunteers, perhaps not accurately representing the adolescents' population in Israel. This is especially true regarding the immigrants from Ethiopia with a low percentage in our sample. Future studies are needed to examine the research questions in longitudinal studies with at least some objective measures.

This study's results emphasize the need to routinely assess NSSI, especially among immigrants and ethnocultural minority groups and in non-clinical samples. An earlier age of onset of NSSI and a longer duration of NSSI during adolescence predict adult borderline personality disorder (BPD) (86). Furthermore, different studies have presented that engaging NSSI behaviors among adolescents are a dominant and unique risk factor for all forms of suicidal thoughts and behaviors (87, 88). Therefore, primary preventive programs that include information concerning adaptive coping skills may eliminate its social contagion effect (89). Furthermore, cultural adaptation should be geared toward improving the validity of these programs. Lastly, the study highlights the importance of sleep hygiene and preventive programs that reduce the adverse consequences of sleep interference.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Academic College of Tel Aviv-Yaffo. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Associations of Non-suicidal Self-Injury and Psychological Symptoms With Suicide Attempt in Adolescents: Are There Any Gender Differences?

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Background: Psychological symptoms and non-suicidal self-injury (NSSI) are independently associated with suicide attempts (SA). Yet, no study has tested the interaction effects between NSSI and psychological symptoms on SA in community adolescent populations, or examined whether the interaction varies by gender. We sought to examine the interaction effects of NSSI and psychological symptoms on SA in adolescents and explore gender differences.

Methods: A school-based health survey in 3 provinces in China was conducted between 2013–2014. 14,820 students aged 10–20 years completed standard questionnaires, to record the details of various psychological symptoms, SA and NSSI.

Results: Psychological symptoms and NSSI were independently associated with a higher likelihood of SA in both boys and girls ($p < 0.001$). Adolescents with psychological, conduct or social adaptation symptoms without concurrent NSSI, were twice as likely to report SA (corresponding RORs were 1.80, 1.80 and 2.16, respectively; $p < 0.01$) than those who reported NSSI. Male adolescents with psychological, emotional, conduct or social adaptation symptoms had a higher risk of SA in the non-NSSI group than the NSSI group (corresponding RORs were 2.85, 2.26, 2.30 and 3.01 respectively; $p < 0.01$). While in girls, only adolescents with social adaptation symptoms had a higher risk of SA in the non-NSSI group than NSSI group (corresponding RORs was 1.71, $p < 0.05$). In the non-NSSI group, boys reporting psychological symptoms exhibited a higher likelihood of a SA than their female counterparts.

Conclusion: Psychological symptoms and NSSI are independently associated with an increased risk of SA in adolescents. However, to some extent, NSSI may reduce the risk of SA among individuals with psychological symptoms, especially in boys.

Keywords: non-suicidal self-injury, psychological symptoms, suicide attempt, adolescents, gender

INTRODUCTION

Suicide is a major public health problem in adolescents as it constitutes the second leading cause of mortality in youth worldwide (1). It is estimated that for each death by suicide, an additional 25 suicide attempts (SA) are made, with the ratio even greater among teenage populations (2). Results from the 2017 national YRBSS (Youth Risk Behavior Surveillance System) in America have indicated that as much as 7.4% of students (10–24 years) had attempted suicide one or more times during the 12 months prior to the survey (3). Although the burden attributable to suicide has decreased in recent years, suicide continues to be the second principal cause of DALY (disability-adjusted life years) related to injury in the 15–24 years population within China (4). In addition, youth suicide attempt may increase risk for poor health and social functioning in adulthood, such as metabolic syndrome, elevated inflammation and long-term unemployment problems in adulthood (5). Therefore, the study of suicidal attempt and its related factors may contribute to the early detection and intervention strategies.

To date, an array of risk and protective factors have been examined in relation to youth suicide (6–10). Of which, the psychological symptoms and a history of non-suicidal self-injury (NSSI) being regularly cited as notable correlates in both cross sectional and prospective studies (11–15). For instance, one large cross sectional study of Chinese students, Tang and colleagues reported that the presence of NSSI was a commonly associated feature of SA irrespective of whether or not it was accompanied by suicidal ideation (12). Similarly, in a 8 year longitudinal study examining clinically depressed adolescents, Tuisku et al. concluded that NSSI remained a strong predictor of suicidal behavior over the course of the study (13). Likewise, the relationship between psychological symptoms and SA have been evidenced in both clinical and general population samples. A study of 17 622 students from 8 Chinese cities revealed that the prevalence of suicide ideation, plan and attempt were found to increase in line with a greater number of psychological symptoms (14, 15). Moreover, evidence from longitudinal studies suggest that the relationship between various psychiatric disorders and SA may actually strengthen over time (16).

A host of studies have also demonstrated a correlation between psychological symptoms and NSSI in adolescents (17, 18), with psychological symptoms frequently found to predict incident NSSI at follow-up (19). Such findings have led many researchers to conclude that NSSI may represent a form of maladaptive coping style which helps to modulate life stress and regulate affective and social experiences (20–22). This is supported by the DSM-5 definition of NSSI which suggests that a primary function of NSSI is to relieve a negative feeling or cognitive state and induce a positive emotional equilibrium

(23). Nevertheless, there continues to be ambiguity around the function of self-harm in relation to psychological symptoms among different populations. Evidence from studies of patients with borderline personality disorders indicates that rather than resulting in emotional relief, NSSI appears to be associated with a further increase in negative emotion (24). It has also been suggested that when NSSI no longer effectively regulates increasingly stressful conditions individuals may start to engage in more extreme forms of self-injury (25). This fits with evidence from clinically depressed samples which demonstrates that the risk of suicidal behavior is elevated amongst adults with a history of NSSI and current Major Depressive Disorder (MDD) (26). Yet, it remains to be determined as to whether the affective regulation function of NSSI may show interim benefits, helping to attenuate the relationship between psychological symptoms and SA among general population adolescents.

Early evidence is conflicting in relation to the nature and underlying function of self-harm across genders with some studies suggesting that females more likely to use self-harm as a means of externalizing internal distress (27) while others have failed to support the existence of distinct gender differences (28). More recent evidence from You and colleagues indicates that while affect regulation remains one of the primary functions of NSSI for both genders, male adolescent self-injurers were more likely to endorse the social influence function than their female counterparts (20). Despite this, no study has explored gender differences in the interaction between NSSI and psychological symptoms on SA in general population adolescents.

The main hypothesis tested in this study is that individuals with psychological symptoms or NSSI would be associated with a higher risk of engaging in SA, and the interaction effects between psychological symptoms and NSSI increase the occurrence of SA, as well as there may be gender differences. Therefore, the aim of this paper is to investigate the independent effects of psychological symptoms and NSSI on SA in a sample of general population adolescents, secondly examine the interaction effects between psychological symptoms and NSSI on SA, and thirdly ascertain whether the interaction effects differs by gender.

METHODS

Study Sample and Procedures

The study population was derived from a health survey involving adolescents from junior and senior middle schools located in 3 areas (Bengbu in Anhui province, Zhengzhou in Henan province, Guiyang in Guizhou province) in China. The survey was conducted from November 2013 to January 2014. We have weighed the economic development and population composition of each region. These three provinces are broadly representative of the average level in China, and are also where our adolescent health research network is located, which facilitates data collection. Eight schools (four rural and four urban) were selected from each city, all of which were general junior and senior schools. As four schools consisted of junior and senior parts, the total number of the schools was 20 for the survey. A total of 15,278 students from grades 7–12 were selected to participate in the study and asked to complete an anonymous

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FIGURE 1 | The flow diagram presenting the selection of study participants.
*Combined Secondary School refers to a school with both a junior school and a senior school.
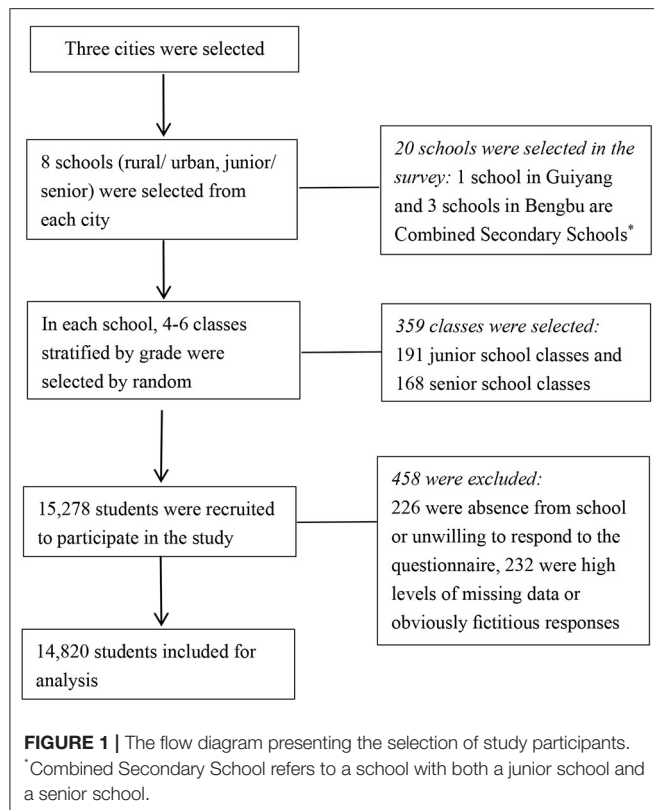
questionnaire. Of all participants, 458 (3.0%) were excluded from the study because of (1) absence from school on the day of the survey or unwillingness to respond to the questionnaire ($n =$ 226), and (2) high levels of missing data or obviously fictitious or inconsistent responses ($n = 232$). Thus, a total sample of 14,820 participants were analyzed. And it has been reported in previous studies (29). The flow diagram was shown in **Figure 1**.

Before the questionnaire survey, informed consent was sought from parents/ guardians of each student. At the scene of investigation, the health survey team members explained the anonymous and confidential nature of the data to the students, and provided an opportunity for them to ask questions. If they were not willing to participate, they were allowed to withdraw from the study. The design and data collection procedures were approved by the Ethics Committee of Anhui Medical University (2012534). The research was performed in accordance with the Declaration of Helsinki.

MEASURES

Measurements of Sociodemographic and Adverse Childhood Experiences
Sociodemographic Profile
Demographic data for each participant was recorded, including age, gender, urban/rural residency, parents' education level (less than junior middle school, junior middle school, senior middle school, college or higher), self-perceived economic status of the family (poor, moderate, or good).

Adverse Childhood Experiences
The model adjusted for the presence of adverse childhood experiences (ACEs) due to the correlation with psychological symptoms, NSSI and SA. ACEs were defined as having experienced childhood maltreatment and/or household dysfunction. Childhood maltreatment was assessed using the Child Trauma Questionnaire (CTQ) (30), a widely used 28-item measure that examines five forms of childhood trauma (physical abuse, sexual abuse, emotional abuse, physical neglect and emotional neglect). Respondents were defined as "exposed to a category" if they responded "very often," "often," or "sometimes," to any item in that category. Household dysfunction questions were derived from the Adverse childhood experiences international questionnaire (31). Respondents were defined as exposed to household dysfunction if they responded "Yes" to any item. In the present study, Cronbach's alpha coefficient for the ACEs scale was 0.726. Due to the high inter-relatedness of various types of ACEs (all $p< 0.01$), an ordinal 'number of ACEs types' score was created by summing the dichotomous ACEs items (range 0 to 6), and analyses were conducted with 4 categories of summed score (0, 1–2, 3–4, 5–6) (32).

Measurements of Psychological Symptoms, NSSI and SA
Psychological Symptoms
Psychological symptoms in the past 12 months were examined by the psychological domain of the "Multidimensional Sub-health Questionnaire of Adolescents" (MSQA) (33, 34). Briefly, psychological symptoms were evaluated by 39 questions, consisting of 3 sub-scales: emotional symptoms (18 questions), conduct symptoms (8 questions) and social adaptation symptoms (13 questions). Emotional symptoms, included indicators of depression and anxiety, e.g., "Not enjoy anything at all." Conduct symptoms, included paranoid and aggressive behaviors, e.g., "Feel like everyone's against you." Social adaptation symptoms, included interpersonal difficulties such as poor school adjustment and forgoing social resources, e.g., "Feel uncomfortable in school life." The internal consistency reliability coefficient of the emotional, conduct, social adaptation and psychological symptoms scale in the present study was 0.901, 0.818, 0.856, and 0.920 respectively. Each item contained 6 response options (none or lasting <1 week, lasting≥1 week, lasting≥2 weeks, lasting ≥1 month, lasting ≥2 months, or lasting≥3 months). Only the symptom duration lasting 1 month or more was assigned "yes (=1)." For each item, no symptoms or symptom durations of <1 month were assigned no "(=0)". Sub-scale scores and total scores were then calculated. In accordance with the national norm established for MSQA in China (34), the 90th percentile of national norm was selected as the cut-off points, which was 3, 1, 4, and 8 for emotional, conduct, social adaptation and psychological symptoms, respectively. Psychological and 3 subgroup symptoms were treated as dichotomous variables.

Non-suicidal Self-Injury
All participants received a screening question for non-suicidal self-injury(NSSI), which asked "In the past 12 months, have

you ever harmed yourself in a way that was deliberate, but not intended to take your life? *Yes* or *No*?" A list of eight NSSI methods was then presented. The details of the questions were as follows: (1) hit yourself (2) pulled your own hair (3) banged your head or fist against something (4) pinched or scratched yourself (5) bitten yourself (6) cut or pierced yourself (7) burned yourself (8) Have you ever done some other things with the intention of hurting yourself (30). For those who confirmed that they had engaged in certain method of NSSI, the frequency was investigated, and the total frequency of NSSI was calculated. NSSI was treated as a dichotomous variable (frequency of NSSI [≥ 3], *Yes* or *No*) (35). The internal consistency reliability of NSSI was 0.749 in the current study.

TABLE 1 | Characteristics of participants by NSSI, *n*(%): 20 schools survey in China.

Variables	Total	NSSI(Yes)	NSSI(No)	*p*-value
Age (mean, SD)	15.44 (1.8)	15.51(1.9)	15.41(1.8)	0.006
Regional areas				
Zhengzhou	5087(34.3)	1141(29.5)	3946(36.0)	<0.001
Guiyang	4617(31.2)	1385(35.7)	3232(29.6)	
Bengbu	5116(34.5)	1346(34.8)	3770(34.4)	
Urban/rural				
urban	6125(41.3)	1547(40.0)	4578(41.8)	0.043
rural	8695(58.7)	2325(60.0)	6370(58.2)	
Father's education level				
college or more	2230(15.0)	552(14.3)	1678(15.3)	0.002
senior middle school	3129(21.1)	808(20.9)	2321(21.2)	
junior middle school	6039(40.7)	1534(39.6)	4505(41.1)	
less than junior middle school	3422(23.1)	978(25.2)	2444(22.4)	
Mother's education level				
college or more	1706(11.5)	411(10.6)	1295(11.8)	<0.001
senior middle school	2826(19.1)	705(18.2)	2121(19.4)	
junior middle school	5369(36.2)	1350(34.9)	4019(36.7)	
less than junior middle school	4919(33.2)	1406(36.3)	3513(32.1)	
Economic status of family				
good	1841(12.4)	438(11.3)	1403(12.8)	<0.001
moderate	10306(69.6)	2542(65.7)	7764(70.9)	
poor	2673(18.0)	892(23.0)	1781(16.3)	
ACEs score				
0	1573(10.6)	169(4.4)	1404(12.8)	<0.001
1 2	6388(43.1)	1310(33.8)	5078(46.4)	
3 4	5303(35.8)	1679(43.4)	3624(33.1)	
5 6	1556(10.5)	714(18.4)	842(7.7)	
Psychological symptoms				
No	11248(75.9)	2139(55.2)	9109(83.2)	<0.001
Yes	3572(24.1)	1733(44.8)	1839(16.8)	
Emotional symptoms				
No	10514(70.9)	1886(48.7)	8628(78.8)	<0.001
Yes	4306(29.1)	1986(51.3)	2320(21.2)	
Conduct symptoms				
No	10488(70.8)	1891(48.8)	8597(78.5)	<0.001
Yes	4332(29.2)	1981(51.2)	2351(21.5)	
Social adaptation symptoms				
No	11588(78.2)	2330(60.2)	9258(84.6)	<0.001
Yes	3232(21.8)	1542(39.8)	1690(15.4)	
Suicide attempt (SA)				
No	14171(95.6)	3476(89.8)	10695(97.7)	<0.001
Yes	649(4.4)	396(10.2)	253(2.3)	

Suicide Attempt

Suicide attempt (SA) was defined by responses to the question "Have you ever tried to kill yourself in the past 12 months?" (Yes/No).

Statistical Analysis

Comparisons of sociodemographic risk factors, ACEs, psychological symptoms and SA between the NSSI and non-NSSI group were assessed using chi-squared test for categorical variables and one-way analysis of variance for continuous. Binomial logistic regression models were used to examine the associations between psychological symptoms and SA in the NSSI and non-NSSI groups. In the models, adjustment was made for age, gender, regional area, school, urban/rurality, mother's education level, economic status of the family and ACEs. In case collinearity problem, mother's educational level was adjusted for in the model, rather than father's educational level.

Gender differences in the associations between psychological symptoms and SA in the NSSI vs. non-NSSI were examined by

calculating a ratio of two odds ratios (RORs) (36). All analyses were conducted with SPSS software, version 23.0 (SPSS Inc., Chicago, IL). A p-value of <0.05 was considered statistically significant in the analyses.

RESULTS

In 14,820participants, the mean age was 15.4 years (SD = 1.8), with a range of 10 to 20 years. 50.2% of the sample were females and 58.7% were recorded as living in a rural area. A total of 649(4.4%) adolescents reported that they had engaged in SA in the past 12 months. The rate of psychological symptoms and NSSI was 24.1% (3572) and 26.1% (3872), respectively.

Compared to the non-NSSI group, individuals with NSSI were more likely to report psychological symptoms, emotional symptoms, conduct symptoms, social adaptation symptoms and SA ($p < 0.001$). The details of differences between the NSSI and non-NSSI group can be seen in **Table 1**.

FIGURE 2 | Associations of psychological symptoms with NSSI in **(A)** total sample **(B)** males and **(C)** females, OR(95%CI).
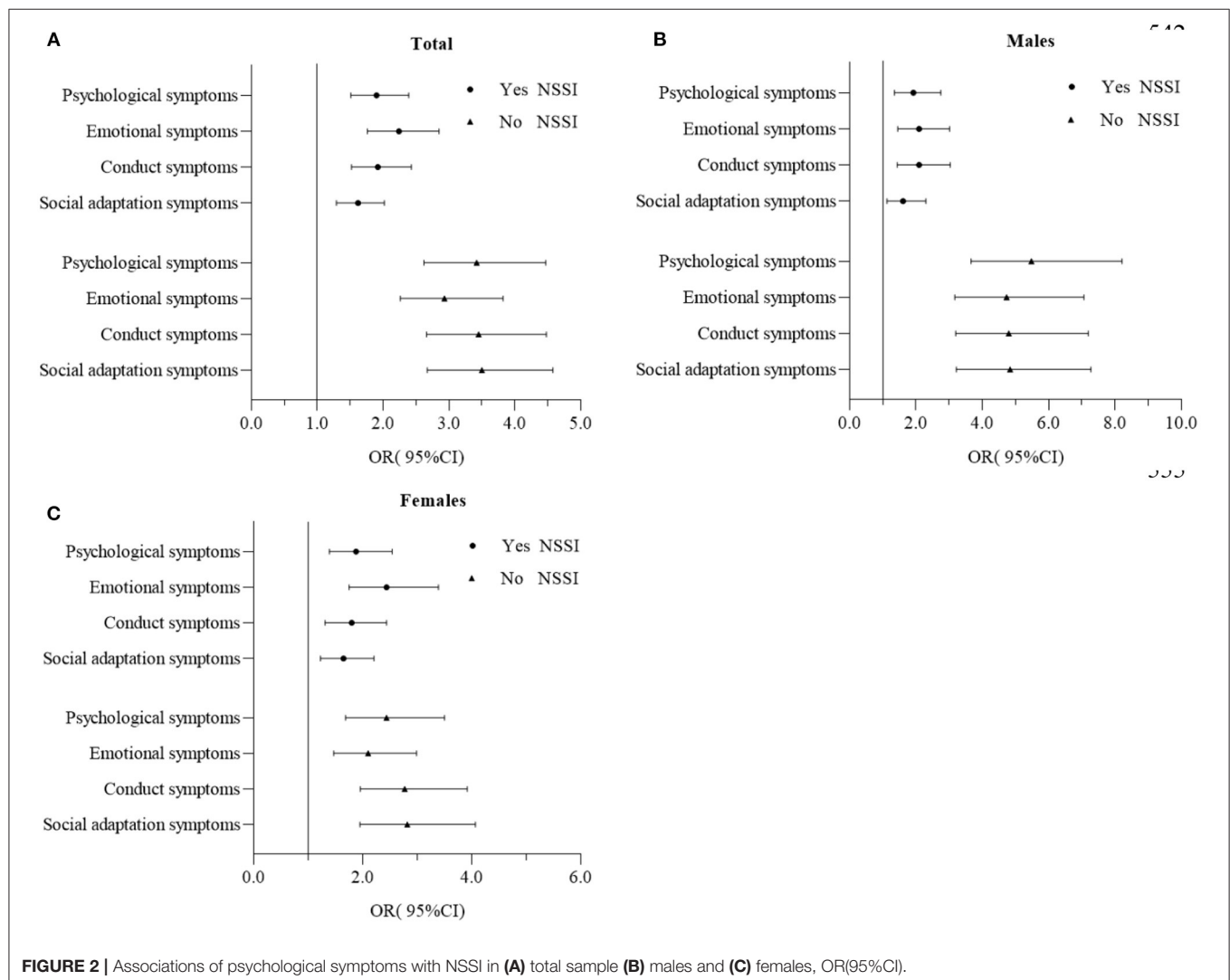
Psychological symptoms, including thee emotional, conduct and social adaptation subscales and NSSI were highly correlated in both males and females ($p < 0.001$). Psychological symptoms and NSSI had independent effects on SA after controlling for age, regional areas, school, urban/rurality, mother's education level, economic status of family and ACEs in males and females (shown as **Supplementary Tables 1**, **2**).

In the multivariate adjusted logistic regression models, as shown in **Figure 2**, **Table 2**, psychological symptoms were positively associated with SA in both NSSI groups (with or without NSSI), however in adolescents with psychological, conduct and social adaptation symptoms, the non-NSSI group were twice as likely to report SA (corresponding RORs were 1.80, 1.80 and 2.16, respectively; $p < 0.01$) than those with NSSI. There was an interaction effect between psychological symptoms, conduct symptoms, social adaptation symptoms and NSSI on SA in the total sample (corresponding OR(95%CI) were 0.56(0.40–0.79), 0.59(0.42–0.82) and 0.47(0.33–0.65), respectively; $p<0.01$), but no interaction effect was found for emotional symptoms and NSSI on SA (OR=0.77, 95%CI: 0.54–1.09; $p = 0.135$).

Adjusted OR for SA by psychological symptoms and NSSI, in males and females are shown in **Figure 2**, **Tables 3**, **4**. In males, adolescents with psychological, emotional, conduct and social adaptation symptoms had a higher likelihood of SA in the non-NSSI group than NSSI group (corresponding RORs were 2.85, 2.26, 2.30 and 3.01 respectively; $p < 0.01$). While in females, adolescents with social adaptation symptoms had a higher likelihood of SA in the non-NSSI group than NSSI group (corresponding RORs was 1.71, $p < 0.05$). There was an interaction effect of psychological symptoms, emotional symptoms, conduct symptoms, social adaptation symptoms and NSSI on SA in males (corresponding OR(95%CI) were 0.37(0.22–0.62), 0.45(0.27–0.76), 0.46(0.27–0.78) and 0.35(0.21–0.58), respectively; $p < 0.01$). While the only interaction effect was observed for social adaptation symptoms and NSSI on SA in females (OR = 0.56, 95%CI: (0.35–0.87); $p = 0.011$). In the non-NSSI group, males with symptoms of psychological, emotional and conduct problems were more likely to report SA than females (corresponding RORs were 2.25, 2.25 and 1.73 respectively; $p < 0.05$), while in the NSSI group, no gender differences were found.

DISCUSSION

The finding that psychological symptoms and NSSI represent independent risk factors for suicidal behaviors are akin to numerous prior studies (9–15). However, the current study advances the existing knowledge by demonstrating that in some instances, NSSI may actually weaken the strength of the relationship between psychological symptoms and SA in the short term. Unlike studies which have postulated that a

TABLE 2 | Number, % and adjusted OR of SA by psychological symptoms and NSSI.

Group		n(%)	OR(95%CI)[a]	p–Value	Ratio of two ORs in NSSI (No) vs. NSSI (Yes)	
					ROR(95%CI)	p-Value *
Psychological symptoms	*NSSI*					
No	No	140(1.5)	1.0			
Yes	No	113(6.1)	3.42(2.62–4.47)	<0.001		
No	Yes	147(6.9)	1.0			
Yes	Yes	249(14.4)	1.90(1.51–2.39)	<0.001	1.80(1.27-2.56)	0.001
Emotional symptoms	*NSSI*					
No	No	132(1.5)	1.0			
Yes	No	121(5.2)	2.93(2.26–3.82)	<0.001		
No	Yes	113(6.0)	1.0			
Yes	Yes	283(14.2)	2.24(1.76–2.85)	<0.001	1.31(0.92–1.87)	0.140
Conduct symptoms	*NSSI*					
No	No	120(1.4)	1.0			
Yes	No	133(5.7)	3.45(2.66–4.48)	<0.001		
No	Yes	121(6.4)	1.0			
Yes	Yes	275(13.9)	1.92(1.52–2.43)	<0.001	1.80(1.27–2.55)	0.001
Social adaptation symptoms	*NSSI*					
No	No	146(1.6)	1.0			
Yes	No	107(6.3)	3.50(2.67–4.58)	<0.001		
No	Yes	184(7.9)	1.0			
Yes	Yes	212(13.7)	1.62(1.29–2.02)	<0.001	2.16(1.52–3.07)	<0.001

SA, suicidal attempt; NSS, non-suicidal self-injury.

[a]Adjusted for gender, age, regional areas, school, urban/rurality, mother's education level, economic status of family and ACEs.

*2-side P-value.

TABLE 3 | Number, % and adjusted OR of SA by psychological symptoms and NSSI in males.

Group		n(%)	OR(95%CI)[a]	p–Value	Ratio of two ORs in NSSI (No) vs. NSSI (Yes)	
					ROR(95%CI)	p–Value *
Psychological symptoms	NSSI					
No	No	52(1.2)	1.0			
Yes	No	56(7.0)	5.48(3.66–8.21)	<0.001		
No	Yes	62(5.1)	1.0			
Yes	Yes	89(10.6)	1.92(1.35–2.75)	<0.001	2.85(1.67–4.89)	<0.001
Emotional symptoms	NSSI					
No	No	49(1.1)	1.0			
Yes	No	59(5.8)	4.73(3.17–7.06)	<0.001		
No	Yes	53(4.7)	1.0			
Yes	Yes	98(10.4)	2.09(1.45–3.01)	<0.001	2.26(1.32–3.89)	0.003
Conduct symptoms	NSSI					
No	No	45(1.1)	1.0			
Yes	No	63(5.8)	4.80(3.20–7.19)	<0.001		
No	Yes	47(4.4)	1.0			
Yes	Yes	104(10.5)	2.09(1.44–3.03)	<0.001	2.30(1.33–3.98)	0.003
Social adaptation symptoms	NSSI					
No	No	56(1.2)	1.0			
Yes	No	52(6.5)	4.84(3.22–7.27)	<0.001		
No	Yes	74(5.7)	1.0			
Yes	Yes	77(10.1)	1.61(1.13–2.30)	0.009	3.01(1.75–5.16)	<0.001

SA, suicidal attempt; NSSI, non–suicidal self–injury.
[a] Adjusted for age, regional areas, school, urban/rurality, mother's education level, economic status of family and ACEs.
* 2–side P-value.

the risk of suicide is heightened among individuals with a history of NSSI in conjunction with current clinical depression (26), the reverse effect was observed in the current study of general population adolescents whereby, in the absence of recent NSSI, adolescents with current psychological symptoms were twice as likely to report SA. By implication, this reinforces the assumption that NSSI may temporarily serve to regulate psychological distress. For instance, Hamza et al. found that the interaction between NSSI and individual's level of intrapersonal distress on suicidal behavior, and the association between NSSI and SA was stronger among individuals experiencing high levels of psychological distress (37). One possible interpretation for this finding is that in instances where NSSI fails to effectively regulate distress, individuals may turn to more extreme forms of self-injury which share similar experiential qualities, such as suicidal behaviors (25). This is in keeping with research which suggests that NSSI commonly serves an emotional regulation function among individuals experiencing internal distress resulting from depressive symptoms (22). Our results are consistent with the belief that NSSI may function as a maladaptive coping mechanism used to regulate affective or interpersonal difficulty (20, 23). This is also consistent with findings from Linda et al. who suggest that in the context of life stress, even passive problem coping weakened the relationship between life stress and suicidal ideation for individuals with a history of suicide attempts (38).

The results of the present suggest that the relationship between NSSI, psychological symptoms and risk of SA may manifest differently in males and females. Among those who did not self-harm but reported psychological symptoms, the risk of SA was higher for males than their female counterparts. Moreover, among those who reported self-harm, the risk of SA was reduced only among females with social adaption symptoms, whereas for males, the risk was reduced for those with multiple forms of psychological symptoms. These findings may in part, be explained by studies which have shown that females tend to make greater use of active coping skills and are more likely to seek social support than males (39, 40). It may be reasonable therefore to assume that, since males are less likely to implement active coping strategies and draw upon social support in times of psychological distress, NSSI may represent an alternative, albeit maladaptive, coping mechanism which can reduce the risk of SA in the interim.

Furthermore, the results provide substantive support for the divergent function of self-harm in males and females. In previous Chinese cohort studies, adolescent male self-injurers were found to be more likely than their female counterparts to endorse functions which included increasing control and getting others' attention (20). As the authors indicate, this suggests that the externalizing motivations may be a significant driver of self-harm amongst males while females are more likely to endorse internationalizing motivators. In cases where males exhibited psychological symptoms, NSSI may help them to better externalize their emotions and consequently, reduce the likelihood of engaging in SA. Therefore, the adaptive or maladaptive

TABLE 4 | Number, % and adjusted OR of SA by psychological symptoms and NSSI in females.

Group		n(%)	OR(95%CI)[a]	p–Value	Ratio of two ORs in NSSI (No) vs. NSSI (Yes)	
					ROR(95%CI)	p–Value *
Psychological symptoms	NSSI					
No	No	88(1.9)	1.0			
Yes	No	57(5.5)	2.44(1.69–3.50)	<0.001		
No	Yes	85(9.3)	1.0			
Yes	Yes	160(17.9)	1.88(1.39–2.54)	<0.001	1.30(0.81–2.08)	0.280
Emotional symptoms	NSSI					
No	No	83(1.9)	1.0			
Yes	No	62(4.7)	2.10(1.47–2.99)	<0.001		
No	Yes	60(7.8)	1.0			
Yes	Yes	185(17.7)	2.44(1.75–3.39)	<0.001	0.86(0.53–1.40)	0.544
Conduct symptoms	NSSI					
No	No	75(1.7)	1.0			
Yes	No	70(5.5)	2.77(1.96–3.92)	<0.001		
No	Yes	74(9.0)	1.0			
Yes	Yes	171(17.3)	1.80(1.31–2.44)	<0.001	1.54(0.97–2.45)	0.070
Social adaptation symptoms	NSSI					
No	No	90(1.9)	1.0			
Yes	No	55(6.1)	2.82(1.95–4.07)	<0.001		
No	Yes	110(10.6)	1.0			
Yes	Yes	135(17.4)	1.65(1.23–2.21)	0.001	1.71(1.07–2.74)	0.026

SA, suicidal attempt; NSSI, non–suicidal self–injury.
[a] Adjusted for age, regional areas, school, urban/rurality, mother's education level, economic status of family and ACEs.
* 2–side P–value.

nature of NSSI may depend on the psychological symptoms and gender.

Strengths and Limitation of the Study

The strengths of the current study include the following: First, we were able to examine the association between psychological symptoms, NSSI and SA among a large-scale school-based adolescent sample, covering urban and rural areas in China. Second, to our knowledge, the current study was the first study to identify the interaction effects between psychological symptoms and NSSI on SA. Third, the large sample, including many co-variables at data collection has provided enough statistical power to examine gender differences of the role.

However, several limitations should be considered when interpreting these results. First, it is difficult to establish a temporal order between psychological symptoms, NSSI and SA, due to the cross-sectional design. Moreover, the replication of these findings using longitudinal data would also assist in establishing the chronological stability of the relationships as it is possible that the persistent use of this maladaptive coping strategy this may serve to increase the long term risk. We need therefore to identify if this is the first instance of self-harm or whether it represents a history of self-harm behaviors as repeated use of this strategy may serve to habituate the individual to pain and fear of death and ultimately increase the risk of suicide. Second, due to the reliance on self-reported questionnaires it is

possible that recall bias may exist and that rates of NSSI and SA maybe under-reported because of the sensitive nature of the questions. Future studies may therefore seek to integrate more robust measures of NSSI and psychological symptoms. Third, the extent to which these findings can be generalized to adolescents in other countries or cultures is also unclear as all participants in this study were located in mainland China. Fourth, this study can not get the cut-off for NSSI to regulate emotions, whether it is possible in the short term, or at low frequency, NSSI may be helpful to emotion regulation, it also needs to be further explored in the future. Fifth, there are many other risk factors for suicide behavior (41), including the population-level risk factors, such as social culture, economic level and media and Internet publicity, especially among teenagers, the Internet is an important way to seek suicide-related information and news (8). In addition, including the individual-level risk factors, such as the presence of suicidal behavior in family members, genetic factors of specific genes, and other psychosocial, demographic and biological factors also increase the susceptibility to suicide. Although age, residence, parents' education level, family economic status and ACEs were adjusted in this study, other important influencing factors of SA may be neglected, such as emotional temperament, one study have found that affective temperament-types were independently and more strongly associated with SA than was diagnosis of a major affective disorder in psychiatric inpatients (42). Therefore, these still need to be further studied in the

sample of community adolescents. Finally, on the basis of trying to capture the impact of other influential factors, the interaction between these factors is further explored. Existing studies indicated that a variety of psychological and behavioral problems in adolescents often do not exist alone, but appear to be clustered and interrelated (43, 44).

Implications

The findings indicate that psychological symptoms and NSSI are independently associated with an increased risk for SA in school adolescents, which by extension, would imply that the combination of these factors may be particularly detrimental in increasing the likelihood of behavioral enactment. However, to the contrary, the current results suggest that in adolescent males at least, NSSI may play a functional role the buffering impact on the relationship between psychological symptoms and SA. So far, from a clinical and developmental perspective, many theories and related studies have linked NSSI to mood disorders (21, 45, 46). Study focusing on the function of NSSI have shown that adolescents may use self-harm to reduce strong negative effects as well as avoid unnecessary emotions (21). These findings are broadly consistent with the NSSI view of developmental psychopathology, particularly with current theoretical concepts. For example, in the biosocial model of mood disorders (47, 48) adverse life events may cause individuals to suffer excessive stress, which in turn leads to self-harm, which is a maladaptive strategy to relieve pain.

With these in mind, intervention and prevention programs for SA may utilize these findings to identify higher-risk individuals early and tailor programs. Clinical assessment and interventions may benefit from an understanding that problem solving is especially important in responding to psychological symptoms among males, and moreover, that NSSI among this population may be helpful rather than maladaptive under these circumstances in the short term. From this, clinicians should assist these individuals choose more adaptive solutions to problems instead of NSSI, in order to weaken the impact of psychological symptoms on risk for SA.

CONCLUSION

Psychological symptoms and NSSI are associated with an increased the risk of SA in adolescents however in some instances, NSSI may help to temper the relationship between psychological symptoms and SA, especially in males. Further research is needed to better understand the function of NSSI in individuals with psychological problems and how this might help individuals avoid transitioning toward suicidal behaviors particularly in males.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Anhui Medical University (2012534). Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

HX reviewed the topic related literature and drafted the first version of manuscript. RW involved in interpretation of the data and revision of the manuscript. YW and FT performed the study design, coordination, data collection, and the guarantors for the study. RL and ZJ worked on data analysis. All authors checked interpreted results and approved the final version.

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SUPPLEMENTARY MATERIAL

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Utilization and Acceptability of Formal and Informal Support for Adolescents Following Self-Harm Before and During the First COVID-19 Lockdown: Results From a Large-Scale English Schools Survey

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Background: Little is known about the perceived acceptability and usefulness of supports that adolescents have accessed following self-harm, especially since the onset of the COVID-19 pandemic.

Aims: To examine the utilization and acceptability of formal, informal, and online support accessed by adolescents following self-harm before and during the pandemic.

Method: Cross-sectional survey (OxWell) of 10,560 secondary school students aged 12–18 years in the south of England. Information on self-harm, support(s) accessed after self-harm, and satisfaction with support received were obtained via a structured, self-report questionnaire. No tests for significance were conducted.

Results: 1,457 (12.5%) students reported having ever self-harmed and 789 (6.7%) reported self-harming during the first national lockdown. Informal sources of support were accessed by the greatest proportion of respondents (friends: 35.9%; parents: 25.0%). Formal sources of support were accessed by considerably fewer respondents (Child and Adolescent Mental Health Services: 12.1%; psychologist/ psychiatrist: 10.2%; general practitioner: 7.4%). Online support was accessed by 8.6% of respondents, and 38.3% reported accessing no support at all. Informal sources of support were rated as most helpful, followed by formal sources, and online support. Of the respondents who sought no support, 11.3% reported this as being helpful.

Conclusions: More than a third of secondary school students in this sample did not seek any help following self-harm. The majority of those not seeking help did not find this to be a helpful way of coping. Further work needs to determine effective ways of overcoming barriers to help-seeking among adolescents who self-harm and improving perceived helpfulness of the supports accessed.

Keywords: Self-harm, adolescence, school, help-seeking, mental health, self-poisoning, self-injury

INTRODUCTION

Since the onset of the global pandemic there have been concerns about its impact on adolescent self-harm. Self-harm is defined as any act of intentional self-poisoning or self-injury, irrespective of motivation (1, 2). Evidence, however, suggests that presentations to hospital emergency departments due to self-harm in adolescents have decreased, including in England (3–5). Any reported change may reflect a proportionate change in the incidence of self-harm in the community. However, little is known about the incidence and prevalence of self-harm in the community in England since the onset of the pandemic. Furthermore, for those who have not presented to health services following self-harm during this period, little is known about the type(s) of support, if any, they have received.

Adolescent self-harm is a major public health problem (6) that is associated with numerous adverse health and social outcomes (7–9), including depression, substance misuse, poorer educational attainment, and dying by suicide (10). It has been suggested that in the years leading up to the pandemic, in England, the incidence of self-harm in adolescents has been increasing (11, 12). Self-harm can have a profound impact on the adolescents themselves, as well as their families and friends, health services, and the wider community (13, 14). Despite this, prior to the onset of the COVID-19 pandemic, approximately half of school-aged adolescents did not seek any support following an incident of self-harm (15), and only 1-in-8 presented to health services for medical treatment (16). Common reasons for this included the stigma and self-stigma associated with self-harm (17, 18), and a lack of knowledge about where to seek help (15). For those who do seek help, the previously published literature indicates that friends and family members are the most commonly reported sources of support (15). Help-seeking following self-harm is important because it represents an opportunity to offer individuals help and support which may mitigate the harmful impact of self-harm, irrespective of the motivation or intention associated with the behavior.

In this study, using data from a large sample of secondary school students in England surveyed after the onset of the pandemic, we aimed to (1) identify the prevalence of help-seeking among those with a history of self-harm; (2) examine the degree to which they perceived the support accessed as being helpful; and (3) identify the barriers to help-seeking behavior in students who did not access any support.

METHODS

The OxWell School Survey (19) is a cross-sectional survey examining the mental health and wellbeing of children and adolescents in England, conducted annually online since 2019. Students were invited to take part through their school using a parental opt-out process (20). In this study we report on the survey administered in 2020, which was completed either on school premises or from home due to partial school closures during the first COVID-19 UK national lockdown [described in greater detail elsewhere (20)].

Participants

Schools were recruited through 11 local authorities (see **Figure 1**), and students were invited to participate by their school. Students attending school years 8–13 (aged 12–18 years) from secondary educational institutions in England—including all state-maintained schools, academies, and independent schools, as well as further education colleges (FECs) in the local authority areas—were eligible to participate.

Measures
Demographics
Gender, year level (a proxy for age), whether the respondent/their parents were born in the UK (e.g. "Were you born in the UK?" *Yes/No/Rather not say*), and socioeconomic deprivation (two proxy measure: eligibility for free school meals or "school-assisted meals" and household food insecurity) were obtained *via* self-report. Being in receipt of free school meals is an official indicator of socioeconomic disadvantage in children and adolescents used in the UK. Information on school characteristics was obtained through linkage with data from the Office for National Statistics which are publicly available (21).

Self-Harm
Self-harm was defined as any act of non-fatal intentional self-poisoning or self-injury, irrespective of the nature or the motivation including degree of suicidal intent (2). Self-poisoning included the intentional ingestion of any drug where the amount exceeds that prescribed or the ingestion of non-ingestible substances, overdoses of "recreational drugs," and severe alcohol intoxication where the individual intended to harm themselves. Self-injury was defined as any injury that was intentionally self-inflicted. Detailed questions relating to self-harm were based on those used in the Child and Adolescent Self-harm in Europe (CASE) study (22).

FIGURE 1 | Sample selection process.
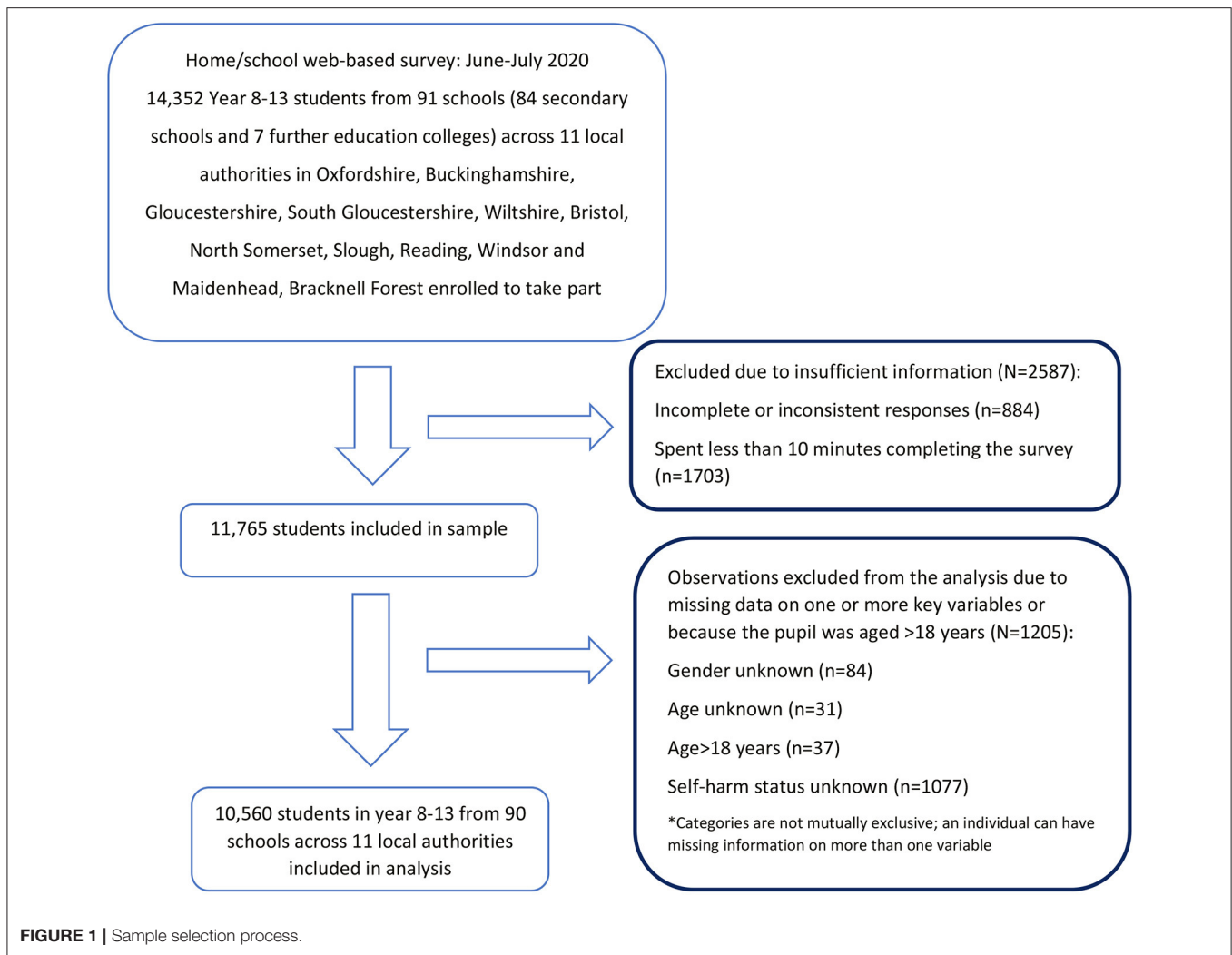
Lifetime self-harm was defined as intentional self-poisoning or self-injury which had occurred at any point prior to the survey. We used two questions to ascertain lifetime self-harm (**Supplementary Table 1**). For respondents who endorsed item *1* ("*Ever self-harmed*") their free-text item (item *8*) describing their act of self-harm was reviewed by two researchers (GG and ES) independently. They were classified with "lifetime self-harm" if their described act (item *8*) met the study criteria (23). Past year self-harm was defined as intentional self-poisoning or self-injury which occurred in the 12 months prior to survey administration. Respondents who endorsed item *1* ("*Ever self-harmed)*", had self-harmed within the past year (items *4*, "*Last self-injury*" and/or *7*, "*Last self-poisoned*"), and who described a valid method of self-harm (item *8*) were considered to have self-harmed in the past year. Self-harm in the past 6 months was defined as above, but had self-harmed within the past 6 months. Self-harm during lockdown was defined as intentional self-poisoning or self-injury which occurred between 23 March 2020 (i.e., the beginning of the

first UK lockdown) and the date of survey administration (June-July 2020). Respondents who endorsed item *1* "*Ever self-harmed*" and item *2* "*Ever self-injured*" (from "*Once or twice'* to "*Daily*") and item *3* "*Self-injured during lockdown*" (from "*Once or twice*" to "*Most days*"), or if they endorsed items *1* and *5* "*Ever self-poisoned*" ("*Yes*") and *6* "*Self-poisoned during lockdown*" ("*Yes*") were classified as having self-harmed during lockdown (provided their described act[s] of self-harm met the study criteria). All others were considered not to have self-harmed during lockdown (**Supplementary Table 1**).

Our method of self-harm ascertainment was contingent on the provision of information about the method of self-harm, in the form of free text. Some respondents who endorsed the item about self-harm did not provide further information on their act or provided information which was inconsistent with the study criteria ($n = 999$). The vast majority of those ($n = 887$, 88.8%) did not provide a free text response, 57 (5.7%) stated that they did not wish to provide further information, 18 (1.8%) described

the reason or motivation for their act rather than their act, 7 (0.7%) denied self-harming, 4 (0.4%) described an act which was not consistent with self-harm (examples cannot be provided due to small numbers), 3 (0.3%) described the location and time of their self-harm, while the remaining 23 (2.3%) provided a range of other text options (e.g., a symbol).

Respondents who reported having self-harmed were asked whether or not they received support following self-harm from any of the following: Parent, step-parent, or carer; Brother or sister; Someone else in their family; Friends; GP (family doctor); Social Worker; School or college nurse/welfare staff; Psychologist or psychiatrist; Telephone helpline; Drop-in/advice center; Residential Warden; CAMHS (Child and Adolescent Mental Health Services); Website or online forum; or No-one, and the extent to which the support sought was perceived as helpful (response categories: Not helpful at all; Not helpful enough; Just about helpful enough; Quite helpful; Very helpful). Information about the reasons for not receiving support was sought from respondents who approached no-one for support. Respondents could select one or more of the following: Did not trust anyone; Did not want help; Didn't want to burden anyone else; Didn't want the stigma; Didn't know where to get help; Worried about it not being kept confidential; Scared/worried about what people might say; Other. Respondents who reported having self-harmed were further asked whether they required subsequent medical attention (i.e., whether or not they needed medical care therefore including only those who perceived a need for medical treatment), and the source of care they sought, including: Own first aid; Family-provided first aid; School nurse/first aid at school/college; Friends helped; GP (family doctor); Ambulance/paramedics; Hospital A&E / acute mental health provision; Hospital with overnight stay on ward; Other. Respondents were permitted to select multiple sources.

Mental Health Difficulties

For information about symptoms of depression and anxiety we used the Revised Children's Anxiety and Depression Scales (RCADS-25) (24, 25). We included participants who provided a response to at least 80% of the RCADS items. We derived standardized scores (t-scores) for depression and anxiety (Child Outcomes Research Consortium (26). We also created two binary groups with RCADS t-scores $\geq$ 70 indicating "probable depression/anxiety," while a score < 70 was categorized as "no depression/anxiety." We further used the item: "Have you ever received any mental health support? Yes/No" to identify respondents with a history of mental health difficulties.

Statistical Analysis

Respondents' characteristics, prevalence of self-harm, and indicators of care are presented as unweighted and weighted proportions with corresponding 95% confidence interval.

Weights

Due to possible differences between the sample surveyed in the OxWell (19) survey and the target population (i.e., all those attending the identified schools), we applied post-stratification weights. Non-response may have arisen from multiple sources (i.e., differences in propensity to be involved by local authorities, schools and/or pupils). We calculated post-stratification weights to reduce possible non-response bias using raking and auxiliary information for a subset of demographics that could be matched with the UK Office for National Statistics (ONS) Census data for the participating counties. Weights were derived using regional census data including information on 1) type of school (independent vs. other i.e., state primary/secondary); 2) gender (male/female); 3) English as first language (we used a proxy of child and both parents born in UK); 4) age; and 5) Index of Multiple Deprivation (IMD; based on school address). The IMD is an official measure of deprivation of small geographical areas in England. It is a combined score from the following domains: income and employment, health and disability, education, skills and training, barriers to housing and services, living environment and crime. There are 32,844 small geographical areas across England which are ranked from 1 (most deprived) to 32,844 (least deprived). All analyses were conducted using Stata 14.2 (27).

RESULTS

A total of 10,560 students aged 12–18 years were enrolled in the study. **Figure 1** shows the sample selection process.

The unweighted and weighted characteristics of the analytic sample are displayed in **Table 1**. Of the 10,560 respondents, 6,653 (53.7%) were female, and 5,429 (53.3%) were students attending years 8–9 (aged 12–14 years). Lifetime self-harm was more commonly reported by females (17.2%; 95% CI 16.2–18.1) than males (7.1%; 95% CI 6.3–8.0), and by older students than younger students (school years 12–13: 16.5%, 95% CI 14.8–18.2; years 10–11: 15.5%, 95% CI 14.3–16.8; years 8–9: 9.6%, 95% CI 8.8–10.4).

Table 2 shows the unweighted and weighted prevalence of self-harm and the characteristics associated with help-seeking by gender.

1,457 respondents (12.5%) reported a lifetime history of self-harm, and past-year self-harm was reported by 1,133 participants (9.6%). Self-harm that had occurred during the period of lockdown (between 23 March 2020 and when respondents completed the survey, in June-July 2020) was reported by 789 (6.7%) respondents; 653 (9.5%) females and 136 (3.4%) males. More than one in three respondents who self-harmed (38.3%) reported not receiving any support.

Of the 1,457 respondents who had *ever* self-harmed, the highest proportion reported accessing informal sources of support (friends: 35.9%; parents or carers: 25.0%; sibling: 7.5%). Considerably fewer adolescents reported accessing clinical services (child and adolescent mental health services [CAMHS]: 12.1%; psychologist or psychiatrist: 10.2%; general practitioner [GP]: 7.4%). Just 8.6% accessed support through a website or online forum and 4.0% received support from a telephone helpline. Most respondents who believed they required medical treatment following self-harm reported using first aid provided by themselves (52.5%), friends

TABLE 1 | Characteristics of the analytic sample, unweighted and weighted proportions with 95% confidence intervals, by gender.

	Total			**Males**			**Females**		
	N	**Unweighted % (95% CI)**	**Weighted % [95% CI][a]**	**N**	**Unweighted % (95% CI)**	**Weighted % [95% CI][a]**	**N**	**Unweighted % (95% CI)**	**Weighted % [95% CI] [a]**
N = 10,560				3,907	37.0 (36.1–37.9)	46.3 [45.3–47.3]	6,653	63.0 (62.1–63.9)	53.7 [52.7–54.7]
Sociodemographic characteristics									
School year									
Year 8–9 (age 12–14 years)	5,429	51.4 (50.1–52.4)	53.3 [52.3–54.3]	2,076	53.1 (51.6–54.7)	54.7 [53.1–56.3]	3,353	50.4 (49.2–51.6)	52.2 [50.9–53.3]
Year 10–11 (age 14–16 years)	3,291	31.2 (30.3–32.1)	29.5 [28.7–30.4]	1,111	28.4 (27.0–29.9)	27.3 [25.9–28.7]	2,180	32.8 (31.7–33.9)	31.5 [30.4–32.6]
Year 12–13 (age 16–18 years)	1,840	17.4 (16.7–18.2)	17.1 [16.4–17.9]	720	18.4 (17.2–19.7)	18.0 [16.8–19.2]	1,120	16.8 (16.0–17.8)	16.4 [15.5–17.3]
Student born in the UK									
Non–UK	1,307	12.4 (11.8–13.0)	17.5 [16.6–18.4]	509	13.0 (12.0–14.1)	18.3 [17.0–19.8]	798	12.0 (11.2–12.8)	16.8 [15.7–17.8]
UK	9,168	86.8 (86.2–87.5)	81.7 [80.8–82.6]	3,364	86.1 (85.0–87.2)	80.8 [79.4–82.2]	5,804	87.3 (86.4–88.0)	82.5 [81.4–83.5]
Unknown	85	0.8 (0.7–1.0)	0.8 [0.6–1.0]	34	0.9 (0.6–1.2)	0.9 [0.6–1.2]	51	0.8 (0.6–1.0)	0.8 [0.6–1.0]
Parents born in the UK									
Non–UK	3,887	36.8 (35.9–37.7)	40.6 [39.6–41.6]	1,483	38.0 (36.5–39.5)	41.7 [40.1–43.4]	2,404	36.1 (35.0–37.3)	39.6 [38.4–40.1]
UK	6,476	61.3 (60.4–62.3)	57.6 [56.6–58.6]	2,352	60.2 (58.7–61.7)	56.5 [54.9–58.1]	4,124	62.0 (61.8–63.1)	58.6 [57.3–59.8]
Unknown	197	1.9 (1.6–2.1)	1.8 [1.6–2.1]	72	1.8 (1.5–2.3)	1.8 [1.4–2.2]	125	1.9 (1.6–2.2)	1.9 [1.6–2.2]
Free school meals									
No	7,941	75.2 (74.4–76.0)	74.6 [73.7–75.4]	2,828	72.4 (71.0–73.8)	72.2 [70.7–73.6]	5,133	76.9 (75.8–77.9)	76.6 [75.6–77.7]
Yes	802	7.6 (7.1–8.1)	7.7 [7.2–8.2]	313	8.0 (7.2–8.9)	8.0 [7.1–8.9]	489	7.4 (6.8–8.0)	7.5 [6.8–8.1]
Not known	1,817	17.2 (16.5–17.9)	17.8 [17.0–18.6]	766	19.6 (18.4–20.9)	19.9 [18.6–21.2]	1,051	15.8 (14.9–16.7)	15.9 [15.1–16.9]
Ever experienced food poverty									
No	9,220	87.3 (86.7–87.9)	87.4 [86.7–88.0]	3,402	87.1 (86.0–88.1)	87.3 [86.1–88.3]	5,818	87.5 (86.6–88.2)	87.6 [86.7–88.4]
Yes[b]	938	8.9 (8.4–9.4)	8.8 [8.2–9.4]	338	8.7 (7.8–9.6)	8.6 [7.8–9.6]	600	9.0 (8.4–9.7)	8.9 [8.2–9.7]
Not known	402	3.8 (3.4–4.2)	3.8 [3.5–4.2]	167	4.3 (3.7–5.0)	4.2 [3.6–4.9]	235	3.5 (3.1–4.0)	3.5 [3.1–4.0]
Mental health									
Symptoms of depression (RCAD_D), mean (95% CI)[c]	10,465	50.6 (50.3–50.9)	49.7 [49.5–50.0]	3,858	45.9 (45.5–46.3)	45.8 [45.4–46.2]	6,607	53.2 (53.0–53.7)	53.1 [52.8–53.5]
Symptoms of anxiety (RCAD_A), mean (95% CI)[c]	10,465	49.8 (49.5–50.0)	49.1 [48.9–49.4]	3,858	46.0 (45.6–46.3)	45.9 [45.5–46.3]	6,607	52.0 (51.7–52.3)	51.8 [51.5–52.2]
Ever received mental health support									
No	7,895	74.8 (73.9–75.6)	76.3 [75.5–77.1]	3,194	81.8 (80.5–82.9)	82.0 [80.7–83.2]	4,701	70.7 (69.6–71.8)	71.4 [70.3–72.5]
Yes	2,588	24.5 (23.7–25.3)	23.0 [22.2–23.8]	688	17.6 (16.5–18.8)	17.4 [16.2–18.6]	1,900	28.6 (27.5–29.7)	27.8 [26.7–28.9]
Not known	77	0.7 (0.6–0.9)	0.7 [0.6–0.9]	25	0.6 (0.4–1.0)	0.6 [0.4–1.0]	52	0.8 (0.6–1.0)	0.8 [0.6–1.1]

(Continued)

TABLE 1 | Continued

	Total			Males			Females		
	N	Unweighted % (95% CI)	Weighted % [95% CI][a]	*N*	Unweighted % (95% CI)	Weighted % [95% CI][a]	*N*	Unweighted % (95% CI)	Weighted % [95% CI] [a]
School characteristics									
Rural/urban									
Rural	1,713	16.2 (15.5–16.9)	15.4 [14.8–16.2]	545	14.0 (12.9–15.1)	13.6 [12.6–14.7]	1,168	17.6 (16.7–18.5)	17.0 [16.1–18.0]
Urban	8,847	83.8 (83.1–84.5)	84.6 [83.9–85.3]	3,362	86.1 (84.9–87.1)	86.4 [85.3–87.5]	5,485	82.4 (81.5–83.3)	83.0 [82.1–83.9]
Funding source									
State funded	9,245	87.6 (86.9–88.2)	87.2 [86.6–87.9]	3,284	84.1 (82.9–85.2)	84.3 [83.1–85.4]	5,961	89.6 (88.9–90.3)	89.8 [89.0–90.5]
Independent	974	9.2 (8.7–9.8)	9.8 [9.2–10.4]	523	13.4 (12.4–14.5)	13.3 [12.2–14.4]	451	6.8 (6.2–7.4)	6.8 [6.2–7.4]
Not known (N/A)	341	3.2 (2.9–3.6)	3.0 [2.7–3.3]	100	2.6 (2.1–3.1)	2.4 [2.0–3.0]	241	3.6 (3.2–4.1)	3.5 [3.0–3.9]
School type									
Primary school	23	0.2 (0.15–0.3)	0.3 [0.2–0.4]	9	0.2 (0.1–0.4)	0.3 [0.1–0.5]	14	0.2 (0.1–0.4)	0.3 [0.2–0.5]
Secondary school	10,204	96.6 (96.3–97.0)	96.8 [96.5–97.1]	3,802	97.4 (96.8–97.8)	97.5 [96.9–97.9]	6,402	96.2 (95.7–96.7)	96.3 [95.9–96.8]
Further education	333	3.2 (2.8–3.5)	2.9 [2.6–3.2]	96	2.5 (2.0–3.0)	2.3 [1.9–2.9]	237	3.6 (3.1–4.0)	3.4 [3.0–3.9]
School type – gender									
% of mixed	7,423	70.3 (69.4–71.2)	70.8 [69.9–71.7]	2,885	73.8 (72.4–75.2)	73.9 [72.5–75.3]	4,538	68.2 (67.1–69.3)	68.1 [67.0–69.3]
School index of multiple deprivation – quintiles									
1st most deprived	497	4.7 (4.3–5.1)	4.8 [4.4–5.3]	119	3.1 (2.6–3.7)	3.4 [2.8–4.0]	378	5.7 (5.1–6.2)	6.1 [5.5–6.7]
2nd quintile	1,905	18.0 (17.3–18.8)	18.2 [17.5–19.0]	567	14.5 (13.4–15.7)	15.3 [14.2–16.6]	1,338	20.1 (19.1–21.0)	20.8 [19.8–21.8]
3rd quintile	1,008	9.6 (9.0–10.1)	9.5 [8.9–10.1]	408	10.4 (9.5–11.4)	10.1 [9.3–11.2]	600	9.0 (8.3–9.7)	8.9 [8.3–9.7]
4th quintile	1,944	18.4 (17.7–19.2)	18.4 [17.6–19.2]	797	20.4 (19.2–21.7)	20.1 [18.8–21.4]	1,147	17.2 (16.4–18.2)	17.1 [16.2–18.0]
5th least deprived	4,865	46.1 (45.1–47.0)	46.1 [45.1–47.1]	1,916	49.0 (47.5–50.6)	48.8 [47.2–50.4]	2,949	44.3 (43.2–45.6)	43.7 [42.5–45.0]
Not known	341	3.2 (2.9–3.6)	3.0 [2.7–3.3]	100	2.6 (2.1–3.1)	2.4 [2.0–3.0]	241	3.6 (3.2–4.1)	3.5 [3.0–3.9]

[a] *Weighted to account differences in the distribution of selected sociodemographic variables between the study sample and the target population.*

[b] *"Yes" includes those who reported having experienced food poverty from "once or twice" to "every day".*

[c] *Excludes 95 (0.9%) observations where data were missing.*

Clustering at the local authority, school or year group level did not inform calculation of the confidence intervals.

TABLE 2 | Prevalence of self–harm and care received, unadjusted and weighted proportions with 95% confidence intervals, by gender.

	Total			Males			Females		
	N	Unweighted % (95% CI)	Weighted % [95% CI][a]	N	Unweighted % (95% CI)	Weighted % [95% CI][a]	N	Unweighted % (95% CI)	Weighted % [95% CI][a]
Self–harm									
Lifetime	1,457	13.8 (13.2–14.5)	12.5 [11.9–13.1]	285	7.3 (6.5–8.2)	7.1 [6.3–8.0]	1,172	17.6 (16.7–18.6)	17.2 [16.3–18.1]
Past year	1,133	10.7 (10.2–11.3)	9.6 [9.1–10.2]	206	5.3 (4.6–6.0)	5.2 [4.5–5.9]	927	13.9 (13.1–14.8)	13.5 [12.7–14.4]
Past six months	881	8.3 (7.8–8.9)	7.4 [7.0–7.9]	153	3.9 (3.4–4.6)	3.8 [3.2–4.4]	728	10.9 (10.2–11.7)	10.6 [9.8–11.3]
During 1st UK lockdown	789	7.5 (7.0–8.0)	6.7 [6.2–7.2]	136	3.5 (3.0–4.1)	3.4 [2.8–4.0]	653	9.8 (9.1–10.6)	9.5 [8.9–10.3]
Ever received support for self–harm, % yes by source of support (of 1,457)[b]									
Parent, step–parent, or carer	369	25.3 (23.2–27.6)	25.0 [22.8–27.3]	71	24.9 (20.2–30.3)	24.2 [19.6–29.6]	298	25.4 (23.0–28.0)	25.2 [22.8–27.9]
Brother or sister	112	7.7 (6.4–9.2)	7.5 [6.3–9.1]	24	8.4 (5.7–12.3)	8.4 [5.6–12.3]	88	7.5 (6.1–9.2)	7.3 [5.9–8.9]
Someone else in your family	54	3.7 (2.9–4.8)	3.7 [2.8–4.8]	11	3.9 (2.2–6.8)	3.6 [2.0–6.4]	43	3.7 (2.7–4.9)	3.7 [2.7–5.0]
Friend(s)	533	36.6 (34.1–39.1)	35.9 [33.3–38.4]	92	32.3 (27.1–37.9)	31.4 [26.3–37.1]	441	37.6 (34.9–40.4)	37.5 [34.7–40.3]
GP (family doctor)	115	8.0 (6.6–9.4)	7.4 [6.2–8.9]	18	6.3 (4.0–9.8)	5.9 [3.7–9.1]	97	8.3 (6.8–10.0)	8.0 [6.6–9.7]
Social Worker	64	4.4 (3.5–5.6)	4.6 [3.6–5.9]	15	5.3 (3.2–8.6)	5.4 [3.2–8.8]	49	4.2 (3.2–5.5)	4.3 [3.2–5.7]
School or college nurse/welfare staff	208	14.3 (12.6–16.2)	13.6 [11.9–15.5]	23	8.1 (5.4–11.9)	8.0 [5.3–11.8]	185	15.8 (13.8–18.0)	15.6 [13.6–17.8]
Psychologist or psychiatrist	152	10.4 (8.8–9.1)	10.2 [8.7–11.9]	26	9.1 (6.3–13.1)	9.2 [6.3–13.3]	126	10.8 (9.1–12.7)	10.5 [8.9–12.4]
Telephone helpline	63	4.3 (3.4–5.5)	4.0 [3.1–5.1]	6	2.1 (1.0–4.6)	2.0 [0.9–4.3]	57	4.9 (3.8–6.3)	4.7 [3.6–6.1]
Drop–in/advice center	9	6.1 (3.2–11.8)	6.3 [3.2–12.6]	2	0.7 (0.2–2.8)	0.8 [0.2–3.4]	7	0.6 (0.3–1.3)	0.6 [0.3–11.8]
Residential Warden	3	0.2 (0.07–0.6)	0.2 [0.07–0.6]	1	0.4 (0.05–2.5)	0.3 [0.05–0.2]	2	0.2 (0.04–0.7)	0.2 [0.04–0.6]
CAMHS	184	12.6 (11.0–14.4)	12.1 [10.5–13.9]	27	9.5 (6.6–13.5)	9.6 [6.6–13.8]	157	13.4 (11.6–15.5)	12.9 [11.1–15.0]
Website or online forum	128	8.8 (7.4–10.4)	8.6 [7.2–10.2]	14	4.9 (2.9–8.1)	5.3 [3.1–8.8]	114	9.7 (8.2–11.6)	9.8 [8.2–11.7]
No–one [c]	548	37.6 (35.2–40.1)	38.3 [35.7–40.9]	121	42.5 (36.8–48.3)	43.8 [38.1–49.8]	427	36.4 (33.7–39.2)	38.8 [36.0–41.7]
How helpful was support received (of 1,457)									
Not helpful at all	305	20.9 (18.9–23.2)	20.9 [18.9–23.2]	60	21.5 (16.7–26.2)	21.7 [17.2–27.1]	245	20.9 (18.7–23.3)	20.7 [18.4–23.1]
Not helpful enough	276	18.5 (17.0–21.0)	18.5 [16.6–20.7]	33	11.6 (8.3–15.6)	11.3 [8.1–15.5]	243	20.7 (18.5–23.2)	21.1 [18.8–23.6]
Just about helpful	329	22.6 (20.5–24.8)	22.8 [20.7–25.2]	74	26.0 (21.2–31.4)	25.6 [20.8–31.0]	255	21.8 (19.5–24.2)	21.9 [19.5–24.4]
Quite helpful	266	18.3 (16.4–20.3)	18.0 [16.0–20.0]	46	16.0 (12.3–20.9)	15.9 [12.1–20.7]	220	18.8 (16.6–21.1)	18.7 [16.5–21.1]
Very helpful	158	10.8 (9.4–12.6)	11.3 [9.7–13.2]	46	16.0 (12.3–20.9)	16.3 [12.3–21.2]	112	9.6 (8.0–11.4)	9.6 [8.0–11.5]
Not known	123	8.4 (7.1–10.0)	8.4 [7.0–10.0]	26	9.1 (6.3–13.1)	9.2 [6.3–13.3]	97	8.3 (6.8–10.0)	8.1 [6.6–9.8]
Why did you not *receive* support? % yes (of 548 who did you not receive support)[c]									
1. Did not trust anyone	226	41.2 (37.2–45.4)	40.0 [35.9–44.3]	35	28.9 (21.5–37.7)	27.7 [20.5–36.4]	191	44.7 (40.1–49.5)	45.2 [40.4–50.1]
2. Did not want help	320	58.4 (54.2–62.5)	59.3 [55.0–63.5]	82	67.8 (58.9–75.5)	66.9 [57.8–74.9]	238	55.7 (51.0–60.4)	56.1 [51.3–61.8]
3. Didn't want to burden anyone else	303	55.3 (51.1–59.4)	54.5 [50.2–58.8]	59	48.8 (39.9–57.7)	48.2 [39.2–57.2]	244	57.1 (52.4–61.8)	57.2 [52.4–61.9]

(Continued)

TABLE 2 | Continued

	Total			Males			Females		
	N	Unweighted % (95% CI)	Weighted % [95% CI][a]	N	Unweighted % (95% CI)	Weighted % [95% CI][a]	N	Unweighted % (95% CI)	Weighted % [95% CI][a]
4. Didn't want the stigma	143	26.1 (22.6–30.0)	25.0 [21.5–28.9]	26	21.5 (15.0–29.8)	20.5 [14.2–28.6]	117	27.4 (23.4–31.8)	27.0 [22.9–31.4]
5. Didn't know where to get help	67	12.2 (9.7–15.3)	11.5 [9.1–14.4]	7	5.7 (2.8–11.7)	5.3 [2.5–10.7]	60	14.1 (11.1–17.8)	14.1 [11.1–17.8]
6. Worried about it not being kept confidential	232	42.3 (38.3–46.5)	41.4 [37.2–45.7]	41	33.9 (26.0–42.8)	32.9 [25.0–41.8]	191	44.7 (40.1–49.5)	45.0 [40.3–49.9]
7. Scared/worried about what people might say	270	49.3 (45.1–53.5)	48.0 [43.6–52.3]	49	40.5 (32.1–49.5)	39.7 [31.3–48.9]	221	51.8 (47.0–56.5)	51.4 [46.6–56.2]
8. Other	106	19.3 (16.2–22.9)	19.3 [16.1–23.0]	20	16.5 (10.9–24.3)	17.2 [11.3–25.4]	86	20.2 (16.6–24.2)	20.5 [16.9–24.5]
Needed treatment? % yes (of 1,457)[b]									
My own first aid	779	53.5 (50.9–56.0)	52.5 [49.8–55.1]	113	39.7 (34.1–45.5)	39.8 [34.2–45.7]	666	56.8 (54.0–59.6)	57.0 [54.1–59.8]
Family–provided first aid	88	6.0 (4.9–7.4)	5.6 [4.6–6.9]	8	2.8 (1.4–5.5)	2.6 [1.3–5.3]	80	6.8 (5.5–8.4)	6.7 [5.4–8.3]
School nurse/first aid at school/college	59	4.0 (3.2–5.2)	3.9 [3.0–5.0]	7	2.5 (1.2–5.1)	2.3 [1.1–4.7]	52	4.4 (3.4–5.8)	4.5 [3.4–5.9]
Friends helped me	126	8.7 (7.3–10.2)	8.5 [7.2–10.1]	19	6.7 (4.3–10.2)	6.2 [4.0–9.5]	107	9.1 (7.6–10.9)	9.4 [7.8–11.3]
GP (family doctor)	42	2.9 (2.1–3.9)	2.7 [2.0–3.7]	6	2.1 (1.0–4.6)	2.0 [0.1–4.2]	36	3.1 (2.2–4.2)	3.0 [2.2–4.1]
Ambulance/paramedics	25	1.7 (1.2–2.5)	1.6 [1.1–2.3]	2	0.7 (0.2–2.8)	0.8 [0.2–0.9]	23	2.0 (1.3–2.9)	1.8 [1.2–2.8]
Hospital A&E / acute mental health provision	52	3.6 (2.7–4.7)	3.4 [2.6–4.5]	12	4.2 (2.4–7.3)	3.9 [2.2–6.8]	40	3.4 (2.5–4.6)	3.3 [2.4–4.4]
Hospital with overnight stay on ward	43	3.0 (2.2–4.0)	2.8 [2.1–3.8]	8	2.8 (1.4–5.5)	3.0 [1.5–5.9]	35	3.0 (2.2–4.1)	2.8 [2.0–3.9]
Other	126	8.7 (7.3–10.2)	8.5 [7.2–10.1]	25	8.8 (6.0–12.7)	8.7 [5.9–12.6]	101	8.6 (7.1–10.4)	8.4 [7.0–10.2]

[a]Weighted to account for differences in the distribution of selected sociodemographic variables between the study sample and the target population.

[b]Can include more than one response.

[c]Includes only those who sought no support.

Clustering at the local authority, school or year group level did not inform calculation of the confidence intervals.

(8.5%), or family (5.6%), whilst the proportion of respondents needing medical treatment who presented to medical services was <5% (**Table 2**).

Informal sources of support were reported to be the most helpful of all sources (other family members: 59.7%; sibling: 55.4%; parents or carers: 49.7%). Most respondents (54.4%) who received no support reported that they found this unhelpful. Of the clinical services accessed, the proportion of respondents who reported finding them helpful ranged from 30.0% (CAMHS) to 46.9% (psychologist/psychiatrist; **Table 2**, **Figures 2**, **3**).

Of the respondents who did not access support, more than half (59.3%) reported that they did not want help and 55.3% reported that they did not wish to burden others. Other widely cited reasons for not seeking support included concern about others' opinions (48.0%) and the possibility of a breach of confidentiality (41.4%). One in four (25.0%) reported that they did not access support because they did not want the stigma associated with self-harm, and 11.5% reported not accessing support because they did not know where to find it (**Table 2**). Of those who did not access support, one in nine (11.3%) reported this as helpful. Respondents who reported not accessing any support were more likely to have parents born outside the UK, more likely to attend male-only schools, and less likely to be eligible to receive free school meals (**Supplementary Table 2**).

We compared the patterns of supports accessed by adolescents who self-harmed during lockdown to supports accessed prior to the pandemic. Of the adolescents who reported self-harming during lockdown ($n = 789$, 6.7% of adolescents surveyed), most reported accessing informal sources of support [friends: 36.5% (95% CI 33.1–40.0); parents or carers: 23.6% (95% CI 20.7–26.7); sibling: 7.0% (95% CI 5.3–9.1)]. Smaller numbers accessed clinical services [(CAMHS: 14.5% (95% CI 12.2–17.1); psychologist or psychiatrist: 11.1% (95% CI 9.1–13.5); GP: 8.2% (95% CI 6.5–10.2)]. Just 10.2% (95% CI 8.2–12.5) accessed support through a website or online forum and 5.6% (95% CI 4.2–7.4) received support from a telephone helpline. 38.2% (95% CI 34.7–41.8) accessed no support. The overall pattern was similar in adolescents who self-harmed prior to the pandemic ($n = 668$, 5.8% of adolescents surveyed) with most accessing informal sources [friends: 35.1% (95% CI 31.5–38.9), parents or carers: 26.6% (95% CI 23.3–30.2) and sibling: 8.1% (95% CI 6.2–10.5)]. The number of adolescents accessing all other types of support was markedly smaller [(CAMHS: 9.2% (95% CI 7.2–11.8); psychologist or psychiatrist: 9.1% (95% CI 7.2–11.6); GP: 6.6% (95% CI 4.9–8.7)]. 6.8% (95% CI 5.1–9.1) accessed support through a website or online forum and 2.1% (95% CI 1.3–3.5) received support from a telephone helpline while 38.4% (95% CI 34.6–42.3) accessed no support. Nevertheless, the proportion of adolescents who received support through CAMHS was comparatively lower in adolescents who self-harmed before the pandemic [9.2% (95% CI 7.2–11.8)] relative to those who reported self-harm since its onset [14.5% (95% CI 12.2–17.1)]. Similarly, the proportion of adolescents who accessed support through a website or online forum was somewhat lower in the

pre-pandemic [6.8% (95% CI 5.1–9.1)] than since its onset 10.2% (95% CI 8.2–12.5)].

DISCUSSION

In our sample of 10,560 secondary school students aged 12–18 years, 12.5% reported lifetime self-harm and 6.7% reported self-harming during the previous three months (the period coinciding with the UK's first national COVID−19 lockdown in 2020). We observed marked differences in the reported utilization of various sources of support and the degree to which these were perceived as helpful. Accessing informal sources of support and not accessing any support were the most frequent responses. Although no formal tests for significance were conducted, many of the confidence intervals overlapped heavily and, on this basis, there appeared to be no gender differences in any categories.

Informal Support

Of all available sources of support, informal sources (Parent, step–parent, or carer; Brother or sister; Someone else in their family; Friends) were accessed by the highest proportion of respondents. These were also reported to be the most helpful of all options listed, with 60% and 50% of respondents reporting that seeking help from family members and parents/caregivers, respectively, was helpful. In the context of the national COVID−19 lockdown that coincided with our data collection period, informal sources of support may have been more readily accessible than clinical or school–based support services. However, this pattern was seen whether adolescents self–harmed prior to or since the onset of the pandemic. Furthermore, a 2014 systematic review of adolescent help–seeking behavior following self–harm (15) also reported that young people primarily turn to friends and family members for support following an act of self–harm, suggesting that COVID−19 may not have been a unique contributing factor to this finding.

Formal Clinical Support

Fewer than 1–in−8 respondents with a history of self–harm reported accessing support from mental health services, a psychiatrist, psychologist, GP, or social worker. Furthermore, clinical services were perceived to be less helpful than informal sources of support such as friends and family members. During the first UK lockdown, there was a significant reduction in the number of referrals to mental health services, including to CAMHS (28). This was driven partly by a reduced healthcare workforce due to sickness and self–isolation, and by substantial changes in service configuration and accessibility which are likely to have influenced our findings. The low prevalence of help–seeking observed in our study supports previous research in this area prior to the onset of the COVID−19 pandemic (16).

Online and Phone–Based Support

Telephone helplines and web–based forums—freely available and possibly more prominent in the COVID−19 lockdowns—were accessed by the lowest proportion of respondents (4–8%). This pattern was observed in adolescents who self–harmed prior to
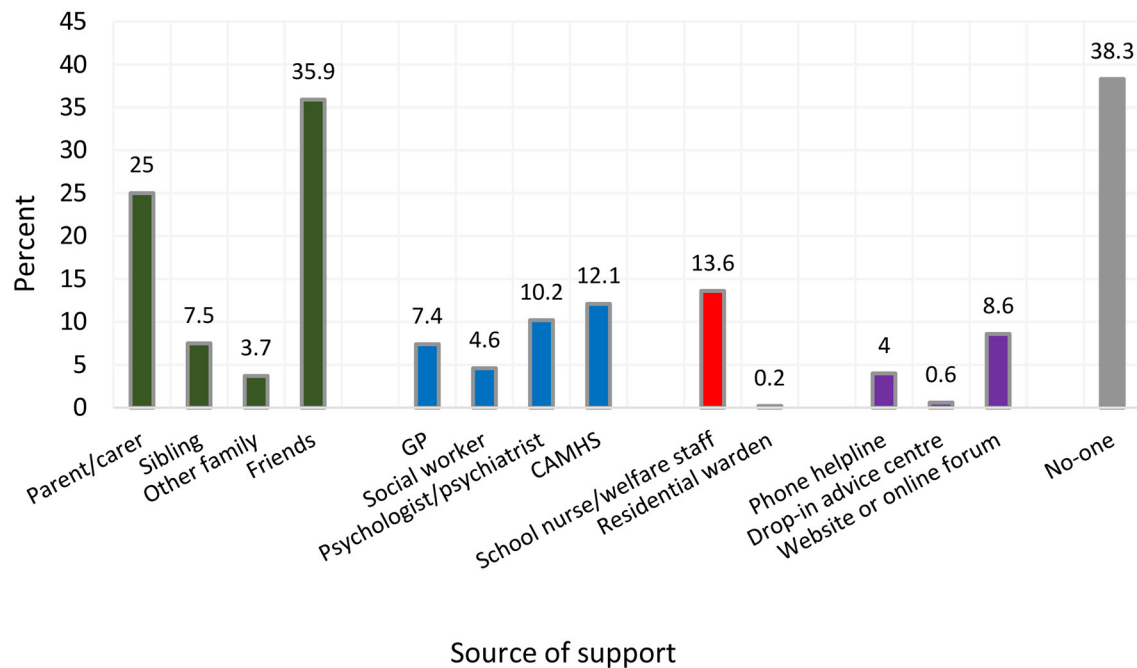
FIGURE 2 | Source of support accessed following self–harm, weighted proportions[a]. [a]Weighted to account for differences in the distribution of selected sociodemographic variables between the study sample and the target population.

FIGURE 3 | Level of satisfaction with support received by source of support, weighted proportions[a]. [a]Weighted to account for differences in the distribution of selected sociodemographic variables between the study sample and the target population.
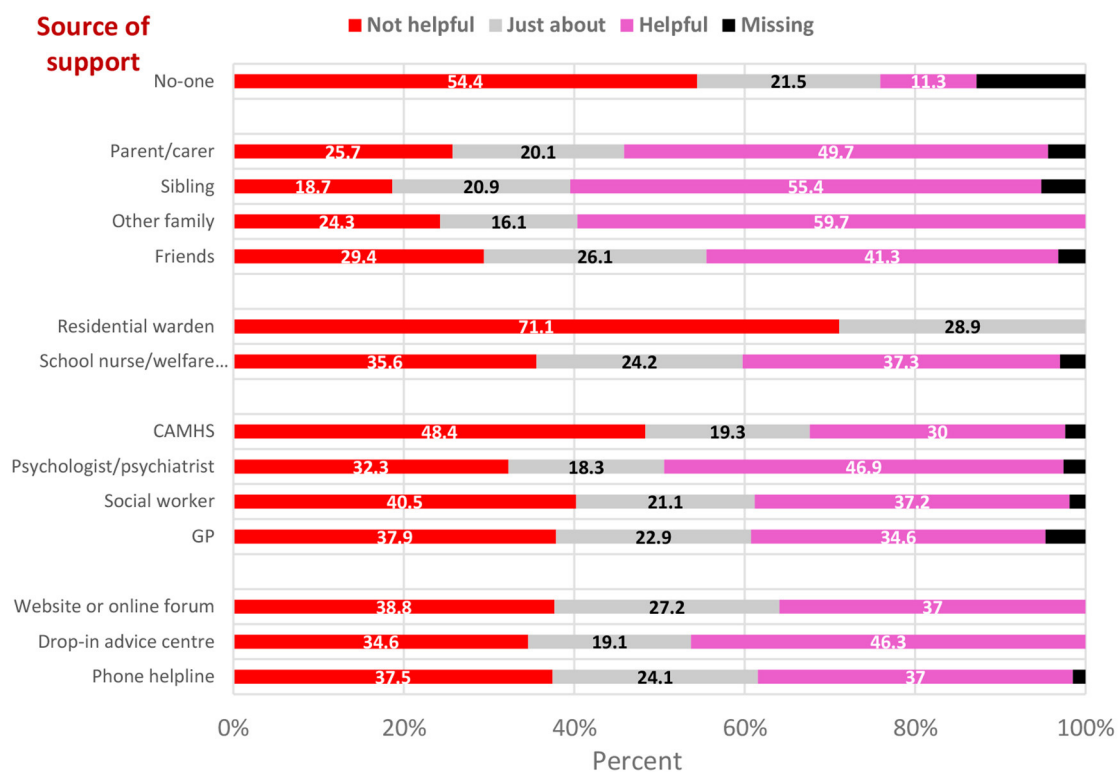
and since the onset of the pandemic. These sources were also rated as the least helpful of all available sources of support, with just over a third reporting that they found these services helpful. Our finding that adolescents did not access support from readily available, anonymous, cost–neutral sources—even in the relative absence of more formal support options due to the COVID−19 lockdown—requires further investigation. Many clinical services, along with the wider public health and research agenda, have placed considerable emphasis on developing virtual resources to support mental health (29, 30). Yet, despite being forced to spend more time in the virtual environment due to education shifting online for most students, our findings suggest that young people have not turned to such resources in times of acute distress. This may reflect a lack of awareness of these resources, or the belief they may not be helpful (or both) and highlight the importance of ensuring that if online resources are developed, they are informed by the young people themselves. Such work may be of benefit in two ways here: first, it may help us understand how to make information about available support(s) more accessible to the relevant users (e.g., *via* social media platforms). Second, if young people are aware of existing sources of support but perceive them to be unhelpful, further work may identify alternative approaches they might find potentially helpful.

No Support Accessed

Approximately two in five respondents who reported a history of self–harm did not access any sources of support. The most common reasons cited for not accessing support were 1) not wanting help; 2) not wanting to burden anybody; and 3) being scared or worried about what others might say. Other reasons included not trusting anyone and not knowing where to access support, both of which were endorsed by a higher proportion of females than males. Importantly, more than half of this group reported that not accessing any support following self–harm was unhelpful and only one in nine stated that it was helpful. Furthermore, many of the reasons most frequently endorsed by the respondents for not seeking help (e.g., stigma, feeling burdensome, and others' opinions) are related to shame and fear. This suggests that some young people who self–harm would welcome either formal or informal support to better manage their self–harm and/or the distress associated with it, yet, paradoxically, they are not accessing such support. In light of this unmet need, more work is required to understand the reasons why the young people did not seek help.

Our finding that 38% of respondents did not access any support following self–harm expands on previous review findings (15), which noted that up to one half of adolescents who self–harm do not seek help afterwards. They also support previous UK–based research indicating that most self–harm among young adolescents does not come to the attention of clinical services (6), and the common reasons provided for not accessing help following self–harm (15, 31, 32). More work could be carried out within schools and other relevant settings to address barriers such as concerns about privacy, availability of support and stigma surrounding mental health difficulties. Further work is also needed to better understand the response of 60% of adolescents who did not receive support because they did not want help, and

the extent to which they did not access any support because they perceived the support available to be unhelpful.

Medical Intervention Following Self–Harm

All respondents who reported self–harm were asked if they required medical treatment after their most recent episode of self–harm. Of these, less than one in twenty reported accessing help from an ambulance, GP, or hospital emergency department. Rather, most applied their own first aid or received assistance from friends or family members. A larger proportion of females than males reported applying their own first aid and receiving help from a family member. Adolescent self–harm may signal the occurrence of other risk behaviors posing additional hazards for young people (7), including increased risk of premature death (14, 33). Although self–harm varies substantially in terms of medical severity, it is concerning that most young people who thought they needed medical intervention did not seek appropriate help. There are likely to be high levels of untreated morbidity and distress among this population and facilitating the help–seeking of this difficult–to–reach group of young people should be considered an urgent priority. Alongside wider, population–based strategies to reduce mental health–related stigma (34), young people may benefit from decisional support aids addressing a variety of psychosocial and physical needs (35). Our findings suggest that parents and friends need more effective methods to help those who have self–harmed and to facilitate help–seeking where appropriate, and services and policymakers need to ensure that these supports are acceptable and accessible to adolescents in a timely manner. Ideally, all young people should have access to evidence–based guidance to help them manage their own self–harm (if applicable), and/or to offer support to their friends who may be engaging in self–harm. Similarly, it is important to determine which resources would be most helpful for parent and carers as well as school staff.

Consideration must also be given to the optimal social scaffolding that will support students' ongoing emotional development and minimize the risk of self–harm, and to promote protective and enabling relationships with families, schools, communities, and peers (36).

Furthermore, schools may be an important setting to address self–harm. There is some evidence of beneficial effects of several school–based programmes addressing self–harm in adolescence. Such programmes include the Saving and Empowering Young Lives in Europe (SEYLE) (37) and the Good Behavior Game (38). The Signs of Suicide (SOS) prevention programme has also reported some beneficial effect in terms of reduction in self–harm behavior (39), although the results of this programme has not been replicated in a UK population. An earlier UK school–based qualitative analysis provided some evidence about the benefit of peer support (16). Other possible approaches include developing resources tailored to the needs of specific groups (as discussed above) although their impact has not been evaluated.

Limitations and Strengths

Our findings should be considered in light of some potential limitations. First, the disclosure of self–harm remains highly

stigmatizing among many young people (17) and it is therefore possible that we under–ascertained the prevalence of self–harm in our sample (40). However, we did not collect identifiers such as name, address, or postcode to preserve students' anonymity and to encourage accurate responses to questions around self–harm and other sensitive items relevant to mental health. Second, our method of self–harm ascertainment was contingent on the provision of information about the method of self–harm in the form of a free text. Some respondents who reported self–harming did not provide further information on their acts and therefore were not classified as having self–harmed. Our estimates of the prevalence of self–harm are therefore likely to be conservative especially as a distressing memory associated with the self–harm incident might make it less likely for a student to describe what they had done. Third, our sample included students enrolled in and actively attending school; as such, we did not capture the experiences of young people who have disengaged from education and who are at increased risk of experiencing poor mental health (41). Fourth, our data were collected in the context of partial school closures resulting from a national COVID−19 lockdown and not in a standard educational setting. This may have influenced our findings. Our quantitative findings would have been strengthened by additional qualitative data to better understand the lived experience of adolescents during this time, and how they perceived access to support and services during lockdown (42). Fifth, we did not include any measure of non–binary gender identification. As this is associated with an increased prevalence of self–harm (43), this may have further contributed to an under–ascertainment of self–harm. Finally, the study did not allow for a clear separation in support sought during different timeframes. Our items about support sought after self–harm were phrased to capture support sought at any point in time although we have shown that the patterns of support accessed were similar in adolescents who only reported self–harm prior to the pandemic and those who self–harmed during the first lockdown. Our study has several strengths. Data were collected from a large sample of students, attending 90 schools across four demographically and socio–economically disparate counties in England. Data were also collected during a national COVID−19 lockdown incorporating partial school closures, providing a contemporaneous snapshot of adolescent self–harm during this unique period.

CONCLUSIONS

We found that two in five secondary school students who have self–harmed did not access any sources of support. Most implied that this was not a helpful approach, thus highlighting a group likely to benefit from more accessible and appropriate support options following self–harm. In the context of the COVID−19 pandemic's documented adverse impacts on the mental health of adolescents (44, 45), the imperative to effectively identify and support adolescents engaging in (or at increased risk of) self–harm has never been more urgent. Identifying those young people who self–harm but do not subsequently access support (who may be at increased risk of poor outcomes) should be

considered a particularly high priority. Young people primarily turn to friends and family members for support following an act of self–harm. These friends and family members may experience distress because of their concern for the young person's well–being and also because they may not feel they have the skills and knowledge on how best to support the young person who has self–harmed, highlighting an important group of individuals who may benefit from guidance and support themselves.

DATA AVAILABILITY STATEMENT

All authors that were Oxford-based members of the OxWell research team at the time of data analysis (GG, KM, and MF) had full access to all the data in the study and accepted responsibility to submit for publication. Fully anonymised extracts of the data can be provided to academic research collaborators upon reasonable request, following a review process by the research team to ensure uses of the data fall under the remit of the intended purposes set out in the privacy information and to prevent duplication of analyses. The data are not publicly available due to ethical and information governance restrictions. The full list of questions and other details are available on a project-specific 'OxWell' OSF website along with publication of the study protocol (see: https://osf.io/sekhr/). Full data dictionaries can be made available upon approval for access to data extracts.

ETHICS STATEMENT

Pupils under 16 years gave active assent to participate; those 16 years and over consented to the study. The study received ethical approval (Ref R62366/RE0010) from the University of Oxford Medical Sciences Division Research Ethics Committee (MSDREC).

AUTHOR CONTRIBUTIONS

MF and KM conceived the OxWell School Survey and obtained funds. All authors worked on conceptualization and methodology. GG designed and performed the analyses. RB wrote the first draft of the manuscript. All authors critically reviewed the manuscript and approved the final version for submission.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.881248/full#supplementary-material

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Investigating Predictive Factors of Suicidal Re-attempts in Adolescents and Young Adults After a First Suicide Attempt, a Prospective Cohort Study. Study Protocol of the SURAYA Project

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Introduction: Suicide is the fourth leading cause of death in youth. Previous suicide attempts are among the strongest predictors of future suicide re-attempt. However, the lack of data and understanding of suicidal re-attempt behaviors in this population makes suicide risk assessment complex and challenging in clinical practice. The primary objective of this study is to determine the rate of suicide re-attempts in youth admitted to the emergency department after a first suicide attempt. The secondary objectives are to explore the clinical, socio-demographic, and biological risk factors that may be associated with re-attempted suicide in adolescents and young adults.

Methods: We have developed a single-center prospective and naturalistic study that will follow a cohort of 200 young people aged 16 to 25 years admitted for a first suicide attempt to the emergency department of Lyon, France. The primary outcome measure will be the incidence rate of new suicide attempts during 3 months of follow-up. Secondary outcomes to investigate predictors of suicide attempts will include several socio-demographic, clinical and biological assessments: blood and hair cortisol levels, plasma pro- and mature Brain-Derived Neurotrophic Factor (BDNF) isoforms proportion, previous infection with *toxoplasma gondii*, and C-Reactive Protein (CRP), orosomucoid, fibrinogen, interleukin (IL)-6 inflammatory markers.

Discussion: To our knowledge, the present study is the first prospective study specifically designed to assess the risk of re-attempting suicide and to investigate the multidimensional predictive factors associated with re-attempting suicide in youth after a first suicide attempt. The results of this study will provide a unique opportunity to better understand whether youth are an at-risk group for suicide re-attempts, and will help us

identify predictive factors of suicide re-attempt risk that could be translated into clinical settings to improve psychiatric care in this population.

Clinical Trial Registration: ClinicalTrials.gov, identifier: NCT03538197, first registered on 05/29/2018. The first patient was enrolled 05/22/2018.

INTRODUCTION

Suicide is a major public health concern, causing more than 700,000 deaths per year worldwide (1). Moreover, as suicidal behaviors prevalence increases during adolescence (2), suicide is reported to be the fourth leading cause of death among people aged 15 to 29 (1). Having a history of suicide attempts is the most important risk factor for suicide, with a recent study reporting a higher risk of suicide mortality for 6 months following a suicide attempt, with a peak mortality risk at 1 month (3). Similarly, the risk of suicide re-attempt is at its highest in the first 6 months after an index attempt, and declines over time (4). The dangerousness of the means and its lethality increase with age (5). With fewer studies focusing on adolescents and young adults, suicide re-attempts are reported to occur in this population in 12% at 3 months (6), 17% at 6 months (7), and in 25–31% at 1 year (8).

The biopsychosocial model of suicide theorizes suicidal behaviors as a result of complex trait and triggering factors including socio-demographic, clinical, and biological determinants (9). Identified individual risk factors for suicide and suicide re-attempts include: a diagnosed psychiatric disease, family history of suicide and psychiatric illness, substance abuse, impulsivity, sexual or physical abuse and bullying, active suicidal ideation, conflicts with romantic relationship, and, most importantly, a personal history of suicide attempt (10).

Regarding the biological underpinnings, most studies conducted in adults have shown that suicidal behaviors could be associated with lower baseline, chronic, and/or reactivity of cortisol levels (11–13), suggesting a failure of the hypothalamo-pituitary-adrenal (HPA) axis stress-response system. Other biological markers of interest involve proinflammatory markers such as C-Reactive Protein (CRP) and interleukin (IL)-6 (14–16), a history of exposure and seropositivity to *toxoplasma gondii* (17), and low levels of Brain-Derived Neurotrophic Factor (BDNF) (18, 19), although the evidence to support their implication is less consistent (20, 21).

These biological processes may be particularly relevant during the transition from adolescence to adulthood, a critical period of development characterized by exposure to interpersonally-themed stressors, increased impulsivity and risk-taking behaviors, and onset of severe psychiatric disorders (22).

Altogether and despite the known burden of youth suicide, this population has been poorly investigated and there is scarce knowledge regarding the potential factors that may differentiate those who will make repeated attempts from those who will not. Therefore, this study is aimed to define the incidence of suicide re-attempt in young first-attempters, and to investigate the association between socio-demographic, clinical, and biological (HPA axis activity with blood and hair cortisol, pro-inflammatory markers with CRP, fibrinogen, orosomucoid and IL-6, infection with *toxoplasma gondii*, and neuroplasticity imbalance measured by the proportion of mature, and pro-BDNF isoforms) variables. Given their specific characteristics, we hypothesize that young first-attempters would be at higher risk of early suicide re-attempt compared to adults.

METHODS

The present prospective cohort SURAYA (SUicide Re Attempts in Young Adults) is currently underway in Lyon (France) and is expected to end in October 2022. The study will involve two investigation centers: recruitment and baseline data collection will take place in the Psychiatric Crisis Unit of Edouard Herriot Hospital (Hospices Civils de Lyon, Lyon, France), and the primary outcome and data at 3 months in the Centre de Prévention du Suicide (*Centre Hospitalier le Vinatier, Bron, France*). The sponsor of the study is the "*Centre Hospitalier le Vinatier,*" Bron, France. The study is conducted in accordance with the recommendations provided in the current version of the Declaration of Helsinki. This study was approved by the local ethics committee (Comité de protection des personnes Sud Méditerranée III—on 01/02/2018) and by the National Agency for the Safety of Medicines and Health Products (ANSM registration number 2017-A03129-44). The study was preregistered in a public database, first registered on 5 May 2018 (https://clinicaltrials.gov registration number: NCT03538197).

Participants

The inclusion criteria are: (1) be hospitalized for a first suicide attempt in an emergency psychiatric unit, (2) be between 16 and 25 years old, (3) speak fluent French. Participants under curator- or guardianship were not eligible. Interrupted, but not aborted, suicide attempts will also be included. Medical records, when

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Abbreviations: AUDIT, Alcohol Use Disorders Test; BDNF, Brain-Derived Neurotrophic Factor; BIS-10, Barratt Impulsiveness Scale 10; C-SSRS, Columbia-Suicide Severity Rating Scale; CAST, Cannabis Abuse Screening Test; CRP, C-reactive protein; CTQ, Childhood Trauma Questionnaire; CUDIT-R, Cannabis use Disorders Identification Test, revised; DMN, Default Mode Network; DSM-5, Diagnostic and Statistical Manual of Mental Disorders, Fifth edition; HPA, Hypothalamic-pituitary-adrenal; IgG, Immunoglobulin G; IgM, Immunoglobulin M; IL, Interleukin; MDQ, Mood Disorder Questionnaire; PQ-B, Prodromal Questionnaire-Brief; QIDS-SR16, Quick Inventory of Depressive Symptomatology, self-report, 16-item; RFL, Reasons for Living; RSFC, Resting State Functional Connectivity; STAXI-2, State-Trait Anger expression Inventory 2.

available, will be consulted to avoid errors of inclusion. We will also use the "lifetime suicidal behaviors" section of the C-SSRS to detect false inclusions. All participants will be required to provide written informed consent after a full and fair description of the objectives and needs of the study. Consent for minors will be obtained from the participant and at least from one parent as legal representative.

Study Design

The overall study design is shown in **Figure 1**. According to our sample size calculation (see below), 200 adolescents and young adults will be recruited in the study. Upon enrollment, baseline data will be collected. Clinical and socio-demographic data will be investigated through the computerized clinical chart and through relatives if necessary. Psychiatric diagnoses will be established according to the Diagnostic and Statistical Manual of Mental Disorders, Fifth edition (DSM-5) during a standardized psychiatric interview. During hospitalization, participants will complete standardized and validated questionnaires. The morning after admission to the emergency unit, a first blood sample will be taken from fasting patients at 7:00 am for biological measurements. Two other blood samples will be collected and stored at −80°C for future research purposes (one EDTA sample and one PAXgene blood RNA tube). Patients who are not fasting will be rescheduled. All inpatients will benefit from usual psychiatric care and will receive appropriate referrals upon discharge. They will also be integrated into the VigilanS brief contact intervention program (23), which

is currently being rolled out nationally, and has demonstrated efficacy in reducing suicide re-attempts (24).

Baseline Measures
Socio-Demographic Factors
The following information will be collected: age, gender, marital and occupational status, education level, socio-economic status, urbanicity level, migratory status, psychosocial issues (including conflicts with parents, access to healthcare), potential traumatic events, and exposure to suicide in the last 6 months.

Psychometric Measures and Clinical Factors
Personal and family medical history, current psychiatric diagnosis and treatments, method of attempted suicide will be collected. Psychometric assessments will be performed using a detailed assessment form containing a battery of validated self-administered questionnaires in their French translation. The following dimensions will be documented: depressive symptoms severity with the Quick Inventory of Depressive Symptomatology (QIDS-SR16) (25), risk for bipolar disorder with the Mood Disorder Questionnaire (MDQ) (26), risk for psychosis with the Prodromal Questionnaire-Brief (PQ-B) (27), hazardous alcohol consumption with the Alcohol Use Disorders Test (AUDIT) (28), nicotine dependence with the Fagerstrom Questionnaire (29), cannabis abuse with the Cannabis Abuse Screening Test (CAST) (30) and the Cannabis Use Disorders Identification Test, revised (CUDIT-R) (31), impulsiveness with Barratt Impulsiveness Scale (BIS-10) (32), anger with the State-Trait Anger Expression Inventory 2 (STAXI-2) (33),
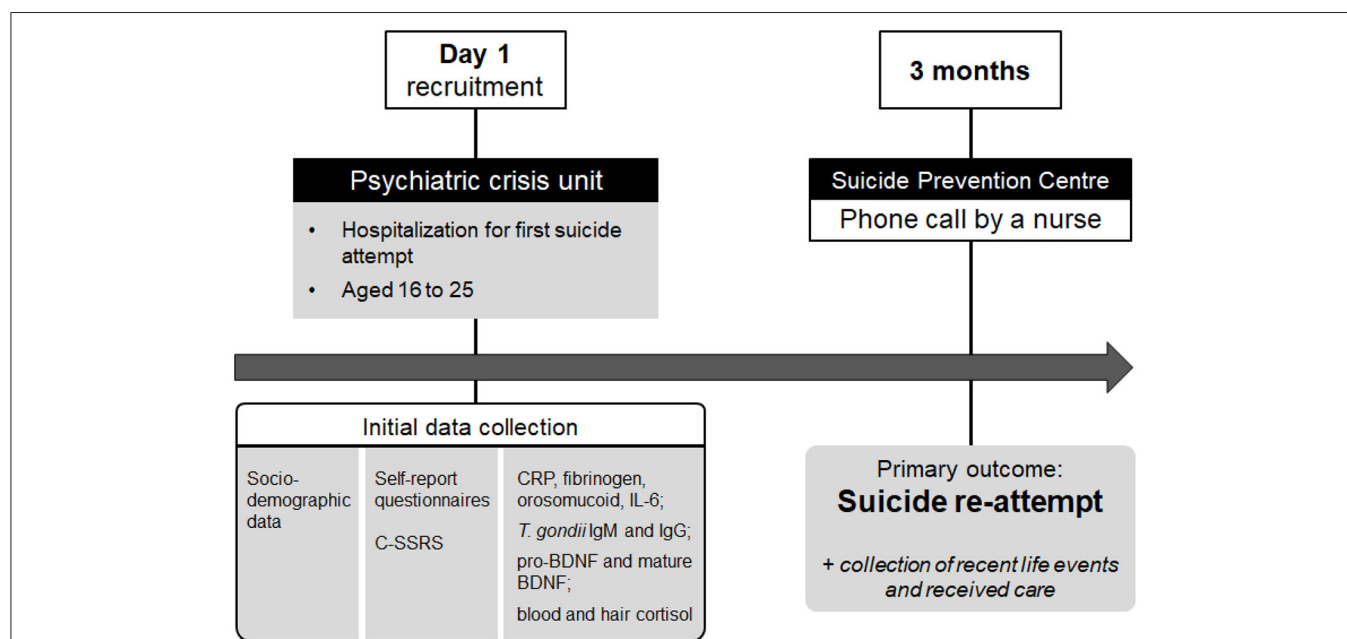
FIGURE 1 | Study design. On day 1, first-time suicide attempters aged 16 to 25 will be included in the SURAYA prospective cohort study upon their hospitalization in a psychiatric crisis unit. During their stay, socio-demographic, clinical and biological data will be collected. Three months later, participants will be contacted to retrieve the primary outcome: the presence or absence of a second suicide attempt *(re-attempt)* within the first 3 months. *C-SSRS, Columbia Suicide Severity Rating Scale; CRP, C-Reactive Protein; BDNF, Brain-Derived Neurotrophic Factor; Ig, immunoglobulin; IL-6, interleukin-6; SURAYA, SUicide Re Attempts in Young Adults*.

childhood traumatic experiences with the Childhood Trauma Questionnaire (CTQ) (34), protective factors against suicidal behaviors with the Reasons For Living (RFL) inventory (35).

Moreover, patients will complete non-validated self-reports: visual analog scales for subjective moral pain, physical pain, suicidal ideation intensity, and a 12-item questionnaire on negative life events during the last 6 months.

The Columbia Suicide Severity Rating Scale (C-SSRS) will be administered by a trained clinician. The C-SSRS is a semi-structured interview with solid psychometric properties designed to assess grading of suicidal ideation and behaviors, validated in various general and clinical populations, including adolescents and adults presenting for psychiatric care (36). In a recent study by Lindh et al. (37), C-SSRS appears to perform well in predicting suicide attempts within 3 months, compared to other suicide risk scales.

Biological Factors

The levels of CRP, orosomucoid, fibrinogen, cortisol, IL-6, and anti-toxoplasma gondii immunoglobulin G (IgG) and immunoglobulin M (IgM) will be measured in the blood as routine analyses by the central biological laboratory of the hospital.

To assess a potential imbalance between neurotrophic and proapoptotic systems (38), we will measure the proportion of mature BDNF and pro-BDNF respectively, as exploratory analyses. Plasma mature BDNF and pro-BDNF levels will be assessed by enzyme-linked immunosorbent assay (Biosensis, BEK-2211/2237) in collaboration with biologists from Hospices Civils de Lyon. As a measure of chronic stress exposure in contrast to blood cortisol analysis, we will measure hair cortisol levels. Hair strands will be cut carefully with scissors as close as possible to the scalp, and stored at room temperature in aluminum foil. Cortisol levels will be determined from the 3 cm segment of hair closest to the scalp. This represents hair growth over the 3-month period prior to sampling based on an average hair growth of 1 cm/month. In collaboration with University Hospital of Bordeaux, assays will be performed by Liquid Chromatography with tandem mass spectrometry as previously detailed in the study of Brossaud and colleagues (2021) (39).

Outcomes

Three months after the initial hospitalization for a first suicide attempt, participants will be contacted by phone to retrieve the primary outcome: the presence or absence of a second suicide attempt *(re-attempt)* within the first 3 months following the first suicide attempt. The data will be collected by a nurse blinded to the patients' initial characteristics, and will be further controlled by 3 independent reviewers to avoid misclassification. Other information regarding recent life events and received care will be gathered. If the patient cannot be reached, their trusted person, previously designated by the patient, will be contacted. In case of no reply, the primary care physician or medical records will be consulted. A suicide attempt is defined as a non-fatal self-directed potentially injurious behavior with the intent to die as a result of the behavior. Secondary outcomes will be baseline socio-demographic, clinical, and biological factors.

Statistical Analysis

Statistical analysis will be performed using R software version 4.02. The significance level alpha will be set at 0.05, and all statistical tests will be 2-tailed.

Sample Size Calculation

Based on the largest survey study conducted in France by Vuagnat and colleagues (2019) (4), we estimated that 12.4% of the population will be readmitted for suicidal attempt within the 3 months following a first suicide attempt that led to hospitalization. This is also in accordance with the study from Spirito and colleagues (2003) (6) conducted in a comparable sample of youth individuals (12%). Using the Wald Confidence Interval method, we calculated that a sample of 200 participants will be sufficient to reach a precision of $+/- 4\%$ calculated as 95 $CI = p +/- 1.96$ sqrt $(p (1-p)/n)$, with $p = 0.124$.

Primary Outcome

First, the classic incidence rate will be calculated by dividing the total number of new re-attempt cases by the total number of suicide attempters. Next, the person-time incidence rate will be calculated by dividing the total number of new re-attempt cases by the sum of the person-time of attempters. This proportion will be compared to the estimated 12.4% based on the literature.

Secondary Outcomes

Chi-squared ($\chi 2$) tests will be used to assess the relationship between re-attempts and qualitative variables; independent *t*-test and Mann-Whitney will be used to compare parametric and non-parametric variables between the two groups of re-attempts and no re-attempts. Variables with a *P*-value lower than 0.2 will be included in a multiple Cox regression model to estimate the adjusted hazard ratio (AOR) with a 95% confidence interval (CI) for the risk factors associated with re-attempt suicide. In all the tests, the confidence interval will be 95%, and $P < 0.05$ to be considered significant.

DISCUSSION

The main purpose of the SURAYA study is to assess the incidence of suicide re-attempt after a first attempt in a cohort of young people aged 16 to 25. The study's main strength is the homogeneity of participants: a narrow age group relevant to a critical period of neurodevelopment, and an incipient cohort in terms of onset of suicidal behaviors. There is little research focusing on suicidal behaviors in adolescents and young adults, and we do not currently know whether this group is at a higher risk of early suicide re-attempt compared to a general adult population.

Taken separately, most suicide risk factors previously identified are reported to be weak predictors of later suicidal ideation and behavior. In order to gain a comprehensive view of the potential prognostic factors of suicide re-attempts, we carefully collected a wide range of socio-demographic, clinical, and biological data relevant to suicidality; we used both self- and clinician-administered validated scales for more reliability across psychometric evaluations. We emphasized on emerging

psychiatric disorders, addictions, psychotrauma, impulsivity and anger, environmental triggering factors, and severity of the first suicide attempt with the C-SSRS.

Beyond these features, we chose to include participants regardless of their psychiatric diagnosis, to capture transnosographic correlates of suicide re-attempts, and thus minimize the effect of potential confounding factors of comorbid psychiatric disorders. However, ICD10 diagnostic criteria will be included in the analysis of conditions such as depression or borderline personality disorder being particularly prevalent in the included population. Attenuated psychotic symptoms (i.e., ultra-high risk population), measured by the PQ-B, are also an interesting symptomatic dimension, as the onset of the disorder can frequently be manifested by an act of aggression. A recent meta-analysis of suicide risk during this time period suggests that suicidal and self-harming thoughts and behaviors were highly prevalent in the ultra-high risk population (40).

Impulsivity can be described as a general pattern of behavior (trait-impulsivity), as responses that are not conformed to their context (action-impulsivity), or as inability to delay reward or to take future consequences into account (choice-impulsivity). Due to a delayed development of top-down prefrontal areas relative to subcortical regions involved in desire and fear, adolescents and young adults are particularly susceptible to impulsive behaviors (41), which suggests an increased risk of suicidal behaviors. This dimension therefore constitutes an interesting criterion for suicide re-attempt (42).

For biological measures, we will explore whether suicide re-attempt could be associated with alterations of the HPA axis, neuroplasticity, and inflammation, including a recent toxoplasmosis infection. These biological systems are highly connected since glucocorticoids dysregulation could lead to increased inflammatory activity and impaired neuroplasticity (43, 44).

Cortisol is the key hormone of the stress-response system, and failure of the HPA axis in response to stress may underlie suicidal crises (22). Most findings, conducted in the general population, suggest that both lower and higher baseline and stressor-induced cortisol levels have been associated with suicide, consistent with allostatic load theories resulting from the adaptation to the environment (22, 45). Accordingly, we will quantify blood cortisol levels as a measure of an acute stress provoked by the suicide attempt, and, in collaboration with the University Hospital of Bordeaux, we will assess hair cortisol, as a retrospective indicator of cumulative cortisol levels during the last 3 months preceding the attempt. To date, hair cortisol has been used in various settings as a reliable marker of long-term exposure to stress (46–48). A recent meta-analysis investigating the association between hair cortisol levels and depression found contradictory results (49). Nonetheless, because altered functioning of the HPA axis has been strongly involved in major depressive disorder (50), depression is a potential confounding variable of cortisol measures and will be considered in the analysis. Similarly, thyroid dysfunction may result in depressive symptoms (51). Thyroid function tests were not systematically performed in the cohort, thus we cannot rule out depression with subclinical hypothyroidism.

BDNF is able to cross the blood-brain barrier and its plasma levels reflect the central nervous system levels (52). In addition, studies suggest that the mature form of BDNF and its precursor pro-BDNF could have opposite functions on neural plasticity: while mature BDNF promotes neuronal survival and growth, pro-BDNF induces neuron apoptosis (53). It thus appears essential to measure not only total BDNF, which does not reflect this balance between pro-BDNF and mature BDNF.

For the past few years, the immune system has been a growing focus of interest in suicide biomarker research. Particularly, studies have suggested a dysregulation of anti- and pro-inflammatory cytokine balance (54, 55). However, in a recent systematic review (56), the role in suicidal behaviors of central and peripheral interleukins, their genes and polymorphisms, remained inconclusive. The authors underline the heterogeneity of the samples, as well as potential confounding factors of inflammation, which are often not taken into account. As an exploratory measure of peripheral inflammation, we have chosen to measure the levels of IL-6, one of the most studied pro-inflammatory cytokines. Additionally, we will measure fibrinogen, orosomucoid, and CRP, three non-cytokinic inflammatory factors. CRP is an acute-phase inflammatory protein synthesized in response to serum IL-6 increase (57) which has been associated with suicide (15, 16), whereas fibrinogen and orosomucoid are two other acute-phase proteins which has not yet been investigated in suicidal behaviors. For further studies, others peripheral non-cytokinic biomarkers of interest are serum S100B, that have been associated with suicidal ideation and behaviors in adolescents (58), and the renin-angiotensin system, at the interface between inflammation and the HPA axis, with polymorphisms of the angiotensin-I converting enzyme associated with suicide attempts and completions (59). Interestingly, combining different inflammatory markers into an inflammatory index as did O'Donovan et al. (16) could be a valuable approach.

The neuroimmune network hypothesis proposes reciprocal interactions between the immune system and the brain. In addition to activation of the HPA axis, peripheral cytokines are able to reach the brain through humoral, neural, and cellular pathways (60). Functional neuroimaging studies in adults suggest that systemic inflammation is associated with altered resting state functional connectivity (RSFC) within several brain networks associated with cognition and mood regulation (61–63). Notably, Marsland and colleagues (2017) (61) showed that within the default mode network (DMN), higher levels of IL-6 were positively correlated with connectivity of the subgenual anterior cingulate cortex and negatively correlated with the dorsal medial prefrontal cortex. Another study reported that induced inflammatory state was associated with decreased connectivity between salience network regions, including the insula, amygdala, dorsal anterior cingulate cortex, and anterior prefrontal cortex (63). Few studies have examined these associations in youth, yet scarce data point to different networks than adult studies (64, 65). Likewise, little is known about the functional connectivity patterns associated with suicidal behaviors in adolescence and young adulthood, which contrasts with the substantial changes of these RSFC during this unique

neurodevelopmental phase (66). Interestingly, recent studies comparing young depressed patients with or without a history of suicide attempt showed reduced connectivity between the anterior DMN and the salience network (67), and decreased RSFC between left prefrontal-right anterior cingulate cortices, the latter being related to higher trait-impulsivity in attempters (68). Long-term alterations of functional connectivity could lead to structural changes in underlying brain areas (69). Of particular interest to our study, one prospective study showed that reduced baseline gray matter volume and white matter integrity in frontal areas differentiated adolescents and young adults with mood disorders who later attempt suicide (70), highlighting the need to combine neuroimaging markers with other biopsychosocial markers in future studies.

When interpreting our results, we will take into account potential limiting factors. First, since all inclusions will take place in Edouard Herriot University Hospital, we expect a center-effect bias. Inpatients of our unit may have more severe disorders and suicidal behaviors. Besides, patients admitted to the unit do not exhibit severe behavioral problems nor are hospitalized without consent, which may exclude a certain group of suicide attempters. This could lead to a lack of representativity and limit the external generalizability of the results. Second, loss to follow-up is common in longitudinal studies and could potentially cause selection bias. In our study, we have not included the risk of drop-outs in the calculation of the number of subjects needed. However, a follow-up period extending over a relatively short period of 3 months could reduce loss to follow-ups. To further limit this bias, we prefer phone calls at 3 months over face-to-face consultations. If the patient could not be reached, we set up a 3-level data retrieval process by gathering information from his/her designated trusted person, contacting his/her primary care physician, and finally by consulting his/her medical records. In further cases of inability to obtain information, we have planned a statistical management of missing data. Third, COVID-19 pandemic occurred during the inclusion phase. Recruitment was slowed down due to fluctuating demand for access to care, and to the reorganization of the Department of Psychiatry in our University Hospital. Psychosocial distress due to the pandemic and its consequences could modify suicidal behaviors (71). In addition, there may be stress and inflammation confounding bias related to the COVID-19 status of some inpatients. From March 2020, every patient underwent a SARS-CoV-2 RT-PCR upon admission and only those who were negative were hospitalized in the unit, thus, there was no COVID-19 positive inclusion in this study. Nonetheless, we cannot rule out the possibility of such patients being included prior to the systematic implementation of COVID-19 testing, when the virus circulation was lower in France, i.e., from approximately November 2019 to February 2020. *Post-hoc* subgroup analyses could be needed to assess the impact of potential COVID-19 infection during this time period. Either way, it would be interesting to compare the repercussions of the COVID-19 pandemic on the onset of suicidal behaviors in a future study.

Since preventive interventions have successfully managed to reduce suicide mortality in the general population (72), we hope that the findings of this study will pave the way for early and targeted interventions in youth.

TRIAL STATUS

The recruitment of patients into the trial began in May 2018 and is scheduled to end in October 2022. Preliminary analyses conducted on a sample of the 73 first patients of the cohort (70.8% females; mean age: 19.72 years, SD 2.44) revealed a re-attempt rate at 3 months of 17.81%, supporting a trend toward a higher risk of suicide re-attempt in this population as compared with the literature on adults.

V7 (12/07/2021): MS5 Addition of several blood tests; update of associated investigators and other study stakeholders, update of scientific collaborators.

V6 (04/22/2021): MS4 18 months extension of the recruitment period of the study, as a consequence of COVID-19.

V5 (03/30/2020): MS3 12 months extension of the recruitment period of the study.

V4 (06/03/2019): MS2 12 months extension of the recruitment period of the study.

V3 (07/26/2018): MS1 modification of the inclusion criteria, extension of the study to minors from 16 years of age, and 6 months extension of the recruitment period of the study.

V2 (02/08/2018): Approval of the initial protocol by the ethics committee.

V1 Initial protocol before submission to the ethics committee.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Comité de protection des personnes Sud Méditerranée III—01/02/2018. Written informed consent to participate in this study was provided by the participant, and the participants' legal guardian for minors.

AUTHOR CONTRIBUTIONS

EP and MH conceived and designed the study. AF, BC, BH, CM, EA, FM, LS, MW, and NB collected the data. EA, BC, and JB contributed data or analysis tools. EA, EL, EP, JB, and MH wrote the first draft of the manuscript. All authors contributed to the article and approved the submitted version.

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Suicide Screening Tools for Pediatric Emergency Department Patients: A Systematic Review

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Background: According to the Centers for Disease Control and Prevention, suicidality and suicidal behavior among youth continues to increase significantly each year. Many of those who die by suicide interact with health services in the year before death. This systematic review sought to identify and describe empirically tested screening tools for suicidality in youth presenting to Emergency Departments (ED).

Objective: (1) To identify and compare existing tools used to screen for suicidality in children and adolescents who present to the ED and (2) to ascertain the prevalence of suicidality in pediatric populations found with these tools.

Methods: We searched Ovid Medline, CINAHL, Scopus, and Cochrane databases for primary research studies that identified and evaluated screening tools for suicide risk in pediatric ED patients. A total of 7,597 publications published before August 25, 2021 met search criteria and were screened by two independent reviewers based on our inclusion and exclusion criteria, with any conflicts resolved via consensus meetings or an independent reviewer. A total of 110 papers were selected for full text review, of which 67 were excluded upon further inspection. Covidence was used to extract and synthesize results.

Results: 43 articles were eligible for inclusion. Most studies ($n = 33$) took place in general pediatric EDs; the quality was generally high. Patients ranged from 4-24 years old, with most screening tested in patients 12 years and older. The most researched tools were the Ask-Suicide Screening Questions (ASQ) ($n = 15$), Columbia-Suicide Severity Rating Scale (C-SSRS) ($n = 12$), Suicidal Ideation Questionnaire (SIQ) ($n = 11$), and the Risk of Suicide Questionnaire (RSQ) ($n = 7$). Where screening was applied to all patients, about one-fifth of pediatric ED patients screened positive; where suicide screening was applied to psychiatric patients only, over half screened positive. Positive screens were more likely to be female and older than negative screens and they were more likely to be assessed and admitted.

Conclusion: Several validated screening tools exist for the purpose of screening pediatric populations in EDs for suicidality. Such tools may help to support early detection and appropriate intervention for youth at risk of suicide.

Systematic Review Registration: https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=276328, identifier: 276328

Keywords: suicide, youth, pediatric, emergency, screening

INTRODUCTION

Nearly one in every five young people have seriously considered suicide, and almost 10% reported having attempted suicide (1). According to the Centers for Disease Control and Prevention (CDC), suicide among individuals ages 10-24 has increased in prevalence every year from 2007 to 2018, with a total increase of nearly 60% in that time (2). Youth are especially vulnerable, given their stage of development, and their decreased autonomy in scheduling and presenting for medical care compared to adults.

Existing research shows that many individuals who die by suicide consult health services prior to their death: 9% on the day of death, 34% during the week prior, and 61% in the month before their death (3); emergency department visits are particularly prevalent among suicide decedents (4). Therefore health services represent a key venue for the detection and management of suicide risk in young people. Screening patients is an efficient way of identifying potential suicide risk in youth in healthcare settings.

The goal of screening is to identify the subset of patients displaying non-negligible suicide risk, which is then assessed further by a clinician (5). Screening may be done "universally" with all patients regardless of presenting complaint or "selectively" focused on patients with an increased prevalence of suicidality, such as psychiatric patients (6). The screening modality may be verbal, paper-based, or via a computer or tablet; an ideal suicide screening tool is brief, feasible to administer, has good psychometric properties, and is sensitive enough to detect non-negligible risk (5).

Evidence suggests that screening for suicidality does not increase suicide risk (7); these findings hold for youth (8, 9). Moreover, screening for suicidality in acute care settings appears to be acceptable to youth and parents (10). Based on the now substantial evidence base for screening and the recent increase in youth suicidality, there is mounting support for the implementation of suicide screening as a part of routine healthcare for youth (11). Currently, there is no standard of care for screening youth for suicidality in emergency department (ED) settings, which tend to serve as the frontline of acute healthcare. This systematic review aimed to identify and describe empirically tested screening tools for suicidality in youth presenting to Emergency Departments (ED).

METHODS

This study was registered with PROSPERO, the international prospective register of systematic reviews (registration number # CRD42022276328) and followed the guidelines set forth by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement (12).

Eligibility Criteria

To be eligible, articles had to meet the following inclusion criteria: (1) involve suicide-related screening tools that were empirically applied to the ED patient population; (2) include primary data collection from ED patients; (3) have tested the screening tool on the pediatric population, which we defined as samples that were mostly under the age of 21 years old; (4) have tested the screening tool on a research population that includes both suicidal and not suicidal patients.

Exclusion criteria were articles that were: (1) about screening tools that have not yet been applied to patients; (2) narrative and systematic reviews; (3) not peer reviewed; (4) about screening tools that only apply to adult-only populations; (5) focused only on other care settings, such as prehospital, inpatient, and outpatient settings; (6) focused on screening for polymorphisms or other blood screening that could serve as a marker of increased risk; (7) solely focused on individual risk factors of suicidality that are not compiled into a screening tool; (8) not available in the English language; and (9) focused on suicide attempters only (because we were focused on screening tools to detect suicide risk, not to further stratify or measure known suicide risk).

Information Sources and Search Strategy

A comprehensive literature search was conducted by a medical librarian on August 25th, 2021, using the following bibliographic databases from inception: Ovid MEDLINE® (ALL-1946 to Present); CINAHL with Full Text (EBSCO); Cochrane Library (Wiley); Ovid PsycInfo (1967 to Present); and Scopus (Elsevier). No article type, date, or language restrictions were included in the search. Controlled vocabulary and keywords for self-injurious behaviors, smartphones, and mobile applications were included in the search. The full Ovid MEDLINE search strategy is available in (**Supplementary Table 1**).

Study Selection Process

The 10,207 results produced from the database searches were imported into Covidence, a systematic review management system, and were de-duplicated. The remaining 6,584 citations were screened by title and abstract against predetermined, aforementioned inclusion and exclusion criteria by two independent reviewers, with discrepancies resolved by consensus or a third reviewer.

The remaining full-text articles were screened against predetermined inclusion and exclusion criteria by two independent reviewers, with discrepancies resolved by consensus or a third reviewer.

Reference lists and forward citations for included articles were gathered and deduplicated, producing 1,013 additional citations for screening, for a total of 11,220 studies imported for screening. In total, there were 110 articles selected for full-text review, 43 of which met inclusion criteria for this study. See (**Supplementary Figure 1**) for the PRISMA flow diagram outlining the study selection process.

Data Extraction and Quality Assessment

We created two templates for study extractions: one for study characteristics and findings data, and one for risk of bias assessment. The first template included the following: title, authors, year, country, study aim, study design, start date, end date, population description, inclusion criteria, age range, exclusion criteria, type of presentations, type of ED, method of screening, total number of participants, total approached, sample description, screening tool(s) used, definition of a positive,

percent positive, factors associated with a positive screening result, and outcomes associated with a positive screening result. Where studies included samples from multiple age groups or settings, we extracted only the data that pertained to the ED and youth. The risk of bias template was based on the NIH Quality Assessment Tool for Observational Cohort and Cross-sectional Studies [https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools]. Two reviewers conducted extraction for each article independently using Covidence software, with discrepancies resolved by consensus or a third reviewer.

Study Synthesis

Due to the heterogeneity of the screening tools and populations identified, the data were unsuitable for a meta-analysis. In this narrative synthesis, we identify the most widely used screening tools and present results for each of these tools: a description of the tool, its definition of a positive screen, where and how they were applied in located studies, prevalence of positive screens, and factors and outcomes associated with a positive screen.

RESULTS

Characteristics of Included Studies

A total of 43 papers were deemed eligible for this systematic review, given the aforementioned criteria. The studies are summarized in **Table 1**. Most studies were conducted in the United States ($n = 38$), three studies in Canada, and one each in the United Kingdom and Australia. Six studies were published before 2010, 20 were published between 2010 and 2019 and 17 papers were published since 2020. Most studies were cross-sectional ($n = 31$) rather than cohort studies ($n = 12$). Almost all of the studies took place in pediatric general EDs ($n = 33$), with a handful of studies taking place in general EDs ($n = 5$), psychiatric EDs ($n = 3$), one pediatric psychiatric ED, and one urgent care center. Sample sizes of adolescent ED patients ranged from 30 (33) to 31,610 (19). Twelve years old was the most common lower age limit for screening ($n = 12$). However, seven studies started screening patients at 8 years of age and other studies conducted screening with patients as young as four (17), five (53), and six (44) years old. Sixteen studies focused only on patients presenting with psychiatric or behavioral chief concerns, while the rest focused on patients presenting with psychiatric or medical/surgical concerns or in a few cases (23, 29, 34), medical/surgical patients only. Patients in studies of psychiatric samples tended to be younger, with most ($n = 10/16$) having a mean age between 13 and 15, as opposed to 14 and 16 ($n = 18/27$) in the general/non-psychiatric studies. Almost every study had more girls than boys ($n = 37$) in their sample, ranging from 39% female (43) to 73% female (18). Most studies had majority White patients but, notably, ten studies had samples with predominantly Black/African American participants. Generally, the quality of included studies was high. Almost all the studies had a clear aim, clearly specified and defined study population, consistency in recruitment, and valid measures. In studies that reported the enrollment rate, most studies ($n = 27$) enrolled more than 50% of those eligible.

Screening Tools

The most common screening tools being tested or implemented were the Ask Suicide-Screening Questions (ASQ) ($n = 15$), the Columbia-Suicide Severity Rating Scale (C-SSRS) ($n = 12$), the Suicidal Ideation Questionnaire (SIQ) ($n = 10$), and the Risk of Suicide Questionnaire (RSQ) ($n = 7$) (**Table 2**; several studies used more than one screener). Several studies used less well-established suicide screening tools or used general mental health screeners that included a suicide item (see "Other Suicide Screening Tools" below). Of note, some studies used more than one screening tool. Most studies involved the routine administration of the screener by clinical staff ($n = 27$), most often by nurses ($n = 13$). The other studies relied on research staff to administer the screener ($n = 16$). Many of the studies asked that a parent or caregiver not be present while the screener was administered. Where modality was specified ($n = 30$), most screeners were administered verbally ($n = 20$) or on a computer/tablet ($n = 8$), while two studies used paper-based screening.

Ask Suicide-Screening Questions (ASQ)

The ASQ is a screening tool that was developed by Horowitz et al. (36) for patients aged 10 to 21 years old. Fifteen studies tested or implemented the ASQ. In development, the team used the SIQ as the criterion standard and studied 17 candidate screening questions for evaluating suicide risk in young patients based on risk factors for suicide in adolescents, including suicide attempt history, suicidal ideation, depression, hopelessness, substance abuse, and social isolation. Against the SIQ, the ASQ had a sensitivity of 96.9 and specificity of 87.6. The final tool is comprised of four simple questions to evaluate suicide risk in youth populations: (1) In the past few weeks, have you wished you were dead? (2) In the past few weeks, have you felt that you or your family would be better off if you were dead? (3) In the past week, have you been having thoughts about killing yourself? (4) Have you ever tried to kill yourself? If the patient responds "yes" to Question 4, one must inquire how and when the attempt occurred. If the patient answers yes to any of the first four questions, a fifth question, (Q5) "Are you having thoughts of killing yourself right now?", is asked to aim to assess the acuity of current risk. A "yes" response to any of the four questions (Q1-Q4) indicates a positive screen. In more recent analyses, the importance of a patient choosing the "no response" option has become evident: patients who intentionally endorsed "no response" (as opposed to "yes" or "no") were of a similar profile to those who endorsed "yes" (29), such that a positive screen is often operationalized as a "yes" or "no response" to any item and a negative screen is "no" to all items. In our review, we found that the tool was most often administered verbally in pediatric EDs, typically in samples of patients with both medical/surgical and psychiatric complaints ($n = 11$).

In studies of patients with all chief complaints (including psychiatric and medical/surgical), the positivity rate ranged from 8% (6) to 29% (47). In studies that only included patients with psychiatric chief complaints (or studies that included a breakdown of solely psychiatric presentations), positivity rates ranged from 36% (20) to 66% (47). In contrast, in studies with

TABLE 1 | Characteristics of included studies.

References	Country	Study design	Setting	Age range (years)	Screening tool	Total n	Sample description	Type of presentation
Ballard et al., (13)	US	Cohort	PED	8 to 18	RSQ	442	47% female 91% Black/A-A Median age 14 years (IQR 11–15)	Psychiatric only
Ballard et al., (14)	US	Cohort	PED	8 to 18	ASQ	768	53% female 66% Black/A-A Mean age 13.4 years	Psychiatric only
Brent et al., (15)	US	Cohort	PED	12 to 17	ASQ, Death Implicit Association Test, C-SSRS, PHQ-9	1,679	64% female 56% White, 23% Black/A-A, 22% Latinx Mean age 15.1 years (SD 1.6)	Some psych, some med/surg
Burke et al., (16)	US	Cross-sectional	PED	14 to 24	BHS	12,001	65% female 52% Black/A-A, 32% White, 9% Hispanic Mean age 15.79 years (SD 1.40)	All
Cappelli et al., (17)	CAN	Cross-sectional	PED	4 sto 17	HEADS-ED	313	58% female Mean age 14.3 years	Psych only
Cappelli et al., (18)	CAN	Cross-sectional	PED	12 to 17	HEADS-ED	639	73% female Mean age 15.2 years (SD 1.4)	Psych only
Crandal et al., (19)	US	Cross-sectional	PED	12 to 17	C-SSRS	31,610	49% female 45% Hispanic/Latino, 31% White, 6% Asian/Pacific Islander, 4% Black/A-A Mean age: 14.5 (SD 1.9)	Depressed patients only
Cwik et al., (20)	US	Cohort	PED	8 to 21	ASQ	2,466	54% female 67% Black/A-A, 24% White, 10% other/biracial, 3% Hispanic Mean age 13.4 years (SD 2.6)	Psych only
Czyz et al., (21)	US	Cohort	Psych ED	13 to 24	Self-Assessed Expectations of Suicide Risk Scale. C-SSRS	340	58% females 66% White, 20% Black/A-A, 3% Asian, 4% Hispanic, 8% other Mean age 17.6 years (SD 3.3)	Psych only
DeVylder et al., (6)	US	Cohort	PED	8 to 18 years	ASQ	15,003 (4,666 psych, 10,337 all comers)	**Overall**: 53% female 68% Black/A-A; Mean age 14.5 years (SD 3.1) **Selective Sample**: 55% female 68% Black/A-A Mean age 14.0 years (SD 3.1) **Universal Sample**: 52% female 68% Black/A-A Mean age: 14.7 years (SD 3.2)	Part psychiatric (selective phase), part all comers (universal phase)
DeVylder et al., (22)	US	Cohort	PED	8 to 17	ASQ	87	60% female 69% Black/A-A, 22% White Mean age 15.1 years (SD 2.0)	Psychosis patients only
Fein et al., (23)	US	Cross-sectional	PED	14 to 18	BHS-ED	857	56% female Mean age 16.2 years (SD 1.3)	Non-psychiatric
Folse et al., (24)	US	Cross-sectional	ED	12 to 24	RSQ	39	72% female 69% White, 28% Black/A-A Mean age 18 years (SD 3.3)	All
Folse and Hahn, (25)	US	Cross-sectional	ED	12 to 24	RSQ	59	61% female 68% White, 27% Black/A-A, 3% Hispanic Mean age 19 years (SD 2.5)	All
Gipson et al., (26)	US	Cohort	Psych ED	13 to 17	C-SSRS	178	56% female 74% White, 20% Black/A-A, 3% Hispanic, 2% Asian Mean age 15.3 years (SD 1.3)	Psych only

(Continued)

TABLE 1 | Continued

Scudder et al.

Pediatric Emergency Department Suicide Screening

References	Country	Study design	Setting	Age range (years)	Screening tool	Total n	Sample description	Type of presentation
Haroz et al., (27)	US	Cohort	PED	10-18 med 8-18 psych	ASQ	13,420	53% female 63% Black Non-Hispanic, 25% White non-Hispanic, 7% Hispanic, 5% other Mean age 14.3 years	All
Hatkevich et al., (28)	US	Cross-sectional	PED	12 to 17	C-SSRS	5909	59% female 25% Hispanic, 42% non-Hispanic White, 18% non-Hispanic Black/A-A Mean age ~ 15 years	All
Hengehold et al., (29)	US	Cross-sectional	PED	12 to 17	ASQ	3,388	56% female 61% White, 33% Black/A-A Mean age ~14.5 years	Non-psychiatric
Herres et al., (30)	US	Cross-sectional	PED	14 to 24	BHS-ED	3,523	67% female 9% Hispanic, 31% White, 52% Black/A-A Mean age 15.9 years (SD 1.5)	All
Hill et al., (31)	US	Cross-sectional	PED	11 to 21	CSSRS	12,827	59% female 48% Hispanic/Latinx, 27% non-Hispanic White, 19% non-Hispanic Black/A-A, 3% Asiam Mean age 14.5 years (SD 2.2)	All
Hill et al., (32)	US	Cross-sectional	PED	11 to 19	CSSRS	12,401	57% female 48% Hispanic/Latinx, 72% White, 19% Black/A-A, 3% Asian Mean age 14.6 (SD 2.1)	All
Hooper Weatherly, (33)	US	Cohort	Other	14 to 18	CSSRS	30	60% female 73% White, 23% Black/A-A Mean age 15.6 years	Psych only
Hopper et al., (34)	AUS	Cross-sectional	PED	13 to 18	RSQ; SIQ	100	40% female Mean age 14.5 years	Non-psychiatric
Horowitz et al., (35)	US	Cross-sectional	PED	Not reported	RSQ, SIQ, SIQ-JR	144	54% female 49% White, 26% Black/A-A,15% Hispanic Mean age 13.6 years (SD 2.5)	Psych only
Horowitz et al., (10)	US	Cross-sectional	PED	10 to 21	RSQ-Revised, SIQ	156	56% female, 67% Black/A-A, 15% White, 5% Hispanic, 14% mixed/other Mean age 14.6 years (SD 2.8)	Some psych, some general
Horowitz et al., (36)	US	Cross-sectional	PED	10 to 21	ASQ, SIQ, SIQ JR	524	57% female 50% White, 30% Black/A-A, 9% Hispanic, 2% Asian, 9% other Mean age 15.2 years (SD 2.6)	All
Horwitz et al., (37)	US	Cohort	Psych ED	15 to 24	C-SSRS	473	53% female 69% White, 17% Black, 5% Asian, 2% Hispanic, 7% Multiracial Mean age 19.4 years (SD 2.9)	Psych only
Kennedy et al., (38)	US	Cross-sectional	Ped psych/BH ED	8 to 17	Childhood Acuity of Psychiatric Illness (CAPI) has a suicide item	553 (for CAPI)	57% female Mean age 14.0 years (SD 2.36)	Psych only
King et al., (39)	US	Cross-sectional	ED	13 to 17	SIQ JR	298	50% Females 83% White, 16% Black/A-A, 2% American Indian /Alaskan Native, 3% Asian, 5% Hispanic. Mean age 15.0 years (SD 1.4)	All
King et al., (40)	US	Cross-sectional	PED	13 to 17	SIQ JR	245	53% female 80% White, 22% Black/A-A, 10% American Indian or Alaskan Native, 3% Asian, 6% Hispanic Mean age 15.3 years (SD 1.4)	All

(Continued)

TABLE 1 | Continued

References	Country	Study design	Setting	Age range (years)	Screening tool	Total n	Sample description	Type of presentation
King et al., (41)	US	Cohort	PED	12 to 17	C-SSRS, ASQ, Computerized Adaptive Screen for Suicidal Youth (CASSY)	Study 1: 6,536 Study 2: 4,050	Study 1: 59% female 48% white, 22% Black/A-A, 25% Hispanic Mean age 15.0 (SD 1.7). Study 2: 64% female, 56% White, 19% Black/A-A, 25% Hispanic Mean age 15.0 years (SD1.7)	All Presentations for Study 1 Enriched with psychiatric presentations for Study 2
Lantos et al., (42)	US	Cross-sectional	PED	12 to 24	ASQ	T1: 19,265 T2: 9,984	54% Female 60% White, 18% Black/A-A Median age 15 years (IQR 13–16)	All
Lanzillo et al., (43)	US	Cross-sectional	PED	10 to 12	ASQ, SIQ-Jr	79	39% female 49% White Mean age 11.2 years (SD 0.8)	Some psych, some general
Latif et al., (44)	US	Cross-sectional	PED	6 to 17	C-SSRS	879	55% female 63% Non-Hispanic Black/A-A Mean age 13.4 years (SD 2.8)	Psych only
Manning et al., (45)	UK	Cross-sectional	PED	10 to 19	CYP-MH SAPhE, C-SSRS	163	66% female 87% White British/Irish Mean age 14.3 years (SD 1.8)	Some psych, some general
Patel et al., (46)	US	Cross-sectional	Urgent care	12 and older	2-item screener (life NOT worth living? have you wanted to kill yourself?); CSSRS	4,786	56% female 69% White, 13% Black/A-A, 9% Hispanic Age: 56% between 12–14 years old 43% between 15–19 years old	All
Powell et al., (47)	US	Cross-sectional	PED	10 to 21	SIQ, SIQ-JR ASQ	522	57% female 50% White, 30% Black/A-A, 9% Hispanic, 7% Other Mean age 15.3 years (SD 2.6)	All
Roaten et al., (48)	US	Cross-sectional	ED	12 to 17, then 10 to 17	ASQ	9,577	6% female 72% White Hispanic, 5% White non-Hispanic, 21 Black non-Hispanic Mean age 14.9 years (1.8 SD)	All
Rutman et al., (49)	US	Cross-sectional	PED	12 to 17	SIQ SIQ-JR	78	60% female 53% White, 35% Hispanic, 5% Black/A-A, 8% other	Depressed patients
Stanley et al., (50)	US	Cross-sectional	PED	10 to 21	SIQ/SIQ-JR, RSQ single item (Q4)	524	57% female 50% White, 30% Black/A-A, 9% Hispanic Mean age 15.2 years (SD 2.6)	All
Stanley et al., (51)	US	Cross-sectional	PED	10 to 21	ASQ, SIQ, SIQ-JR	524	57% female 50% White, 30% Black/A-A, 9% Hispanic Mean age 15.2 years (SD 2.6)	All
Sullivant et al., (52)	US	Cross-sectional	PED	12 to 21	ASQ (C-SSRS but not in ED)	138,598 overall (# in ED not specified)	Not specified	All
Williams et al., (53)	US	Cross-sectional	ED	5 to 18	Crisis Assessment Tool (CAT)	225	53% female Mean age 14.1 years (SD 2.7)	Psych only

PED, Pediatric Emergency Department; ED, Emergency Department.
ASQ, Ask Suicide Questions; SIQ, Suicidal Ideation Questionnaire; CSSRS, Columbia Suicide Severity Rating Scale; BHS, Behavioral Health Screen; RSQ, Risk of Suicide Questionnaire; PHQ, Patient Health Questionnaire; HEADS-ED, Home, education, activities/peers, drugs/alcohol, suicidality, emotions/behavior, discharge resource.

TABLE 2 | Suicide screening tools used most often with pediatric emergency patients.

Screening Tool	Studies	Content	Number of Items	Percent positive
ASQ	(6, 14, 15, 20, 22, 27, 29, 36, 41–43, 47, 48, 51, 52)	1) In the past few weeks, have you wished you were dead? 2) In the past few weeks, have you felt that you or your family would be better off if you were dead? 3) In the past week, have you been having thoughts about killing yourself? 4) Have you ever tried to kill yourself? If the patient responds "yes" to Question 4, one must inquire how and when the attempt occurred. If the patient answers yes to any of the first four questions, a fifth question, (Q5) "Are you having thoughts of killing yourself right now?"	4 (5 if positive)	All patients: 8% (6) to 29% (47). Psych patients: 36% (20) to 66% (47). Medical/surgical patients: 3% (48) to 10% (36)
CSSRS	(15, 19, 21, 26, 28, 31–33, 37, 41, 44, 52).	Level of recent ideation in terms of intensity, frequency, duration, controllability, deterrents, reasons, and behavior pattern	Up to 7 items	All patients: 19% (Hill et al., (32)) Psych patients: 66% (33) to 86% (45)
SIQ/SIQ JR	(10, 34–36, 39, 40, 43, 47, 49–51)	Self-reported screening tool that assesses suicidal ideation on a 7-point scale with statements about frequency of suicidal thoughts or risk factors. Some critical items directly assess serious self-destructive behavior.	SIQ: 30 (9 critical items). SIQ JR: 15 (6 critical items)	All patients: 4% (40) to 29% (47). Psych patients: 40% (10) to 66% (47). Medical/surgical patients: 0% (34) to 10% (47)
RSQ	(10, 13, 24, 25, 34, 35, 50)	(Q1) Are you here because you tried to hurt yourself? (Q2) In the past week, have you been having thoughts about killing yourself? (Q3) Have you ever tried to hurt yourself in the past (other than this time)? (Q4) Has something very stressful happened to you in the past few weeks (a situation that was very hard to handle)?	4	All patients: 28% (24) to 51% (25). Psych patients: 48% (13). Medical/surgical patients: 22% (34)

patients with only medical/surgical complaints or studies that included a breakdown of solely non-psychiatric presentations, the positivity rates ranged from 3% (48) to 10% (36). A few papers explored the ASQ's effectiveness in screening younger populations, as young as 8 years old (6, 14, 20, 22, 27). Those who screen positive on the ASQ tend to be more often female (6, 14, 20, 22, 29, 42, 47), older (14, 20, 22, 29, 42); and, in "all comer" samples, to present with a psychiatric/suicide-related complaint (6, 22, 43). Being Black/African- American was protective in some studies (14, 42) and a risk factor in others (20, 22, 29). Those with a positive ASQ result were more likely to be admitted (6, 14, 22, 48) and more likely to re-present with to the ED (6), especially with a suicide-related complaint (14, 20, 27). In studies that examined criterion validity, the ASQ had acceptable sensitivity (60-93%) and specificity (43–92%) in predicting future attempts (6, 14, 20, 27, 41). It also performed well against the longer SIQ with a sensitivity of 97% and specificity of 88% (36).

Columbia-Suicide Severity Rating Scale (CSSRS)

The C-SSRS is a measure used to identify and assess individuals at risk for suicide, with a special focus on ascertaining levels of recent and lifetime ideation and behavior. Evidence around its psychometric properties has been mixed (54–58). Twelve studies located in the current review tested or implemented a version of the Columbia Suicide Severity Rating Scale (C-SSRS).

The screener version [used in Hooper Weatherly (33), Crandal et al. (19), Latif et al. (44), Brent et al. (15), Hill et al. (32), Hill et al. (31)] is up to seven items in length. Patients are asked in the past month "have you wished you were dead or wished you could go to sleep and not wake up" (Yes/No) or "actually had any thoughts of killing yourself?" If the patient endorses the second question, they are asked if they have: been thinking about how they might do this; had these thoughts and had some intention of acting on them; or started to work out or worked out the details of how to kill themselves and intend to carry out the plan. Finally, all patients are asked if they have ever "done anything, started to do anything, or prepared to do anything" to end their life, and if so whether that occurred in the past 3 months. A positive is usually defined as a yes to any recent ideation or yes to suicide attempt, though one paper excluded passive ideation from its definition of a positive (33). The full C-SSRS assessment (used in King et al. (41), Horwitz et al. (37), Manning et al. (45), Gipson et al., (26), Czyz et al., (21)) is more detailed: in addition to assessing the level of recent ideation, it assesses ideation at the patient's worst point, as well as assessing its intensity, frequency, duration, controllability, deterrents, and reasons. For behavior, the full assessment breaks behavior into actual, interrupted attempt, aborted, and preparatory behavior, and its lethality.

The C-SSRS was administered to a variety of patients: six studies applied the tool in a psychiatric sample and six applied it to a mixed medical/psychiatric sample. The youngest patients who received the CSSRS were aged six (44), but most studies' lower age limit was at least 12 years of age. Most studies implemented the C-SSRS into routine clinical workflow by nurses, behavioral health providers, and medical assistants. In the psychiatric samples, positivity ranged from 66% (33) to 86%

(45). Some studies reported more granular detail on psychiatric positives: for example (44), reported that 40% of patients in their psychiatric sample were deemed "high risk" on the C-SSRS screener and Gipson et al. (26) reported that 45% of psychiatric patients had recent active ideation and 30% had a lifetime attempt. In "all patient" samples, there was still a significant positivity rate on the C-SSRS, reaching as high as 19% (31). Hatkevich et al. (28) used the attempt item from the C-SSRS to examine how wording affected patients' likelihood of screening positive. Comparing a directly phrased question asking about "suicide attempt" to an indirectly phrased question providing the definition of an attempt, they found that 10% of patients endorsed both, 3% endorsed the directly phrased questions, and 3% endorsed the indirectly phrased one. Patients who were positive on the C-SSRS were more often female (19, 26, 28, 31, 32, 37, 45), older (19, 32, 44), and less likely to be Hispanic (19, 31, 32). In studies with psychiatric samples, rates of admission (33, 44) were higher among those who screened positive. Ideation intensity (26, 37) and severity (21) on the C-SSRS was associated with future suicide-related visits, showing that the tool has predictive validity in this pediatric emergency patient population.

Suicidal Ideation Questionnaire (SIQ)

Eleven studies tested or implemented the SIQ. The SIQ is a 30-item self-reported screening tool that was developed by Reynolds (59) for high school students in grades 10-12 (and the 15-item SIQ-JR for students in grades 7-9) to screen for suicide risk (60). The tool has acceptable psychometric properties (61, 62) and was quickly applied to healthcare settings. The SIQ used to screen patients 15 years and older and the SIQ-JR for those patients 10 to 15 years old. The tool was most often administered via a written self-reported questionnaire in pediatric EDs ($n = 10$), typically in samples of patients with both medical/surgical and psychiatric complaints ($n = 8$). Most studies that included the SIQ ($n = 7$) were applying it as a gold standard against which to test other, shorter, screening tools.

The screening tool assesses suicidal ideation on a 7-point scale with statements about frequency of suicidal thoughts or risk factors; for example, a patient would rank "I thought it would be better if I was not alive" on a scale from "I never had this thought" (0) to "almost every day" (7). These point scales are added up to give rise to a score between 0 and 180 for the SIQ, or 0–90 for the SIQ-JR. A score of 41 or greater on the SIQ, a score of 31 or greater on the SIQ-JR, or an endorsement of a recent suicide attempt constitute a positive screen and warrant further psychiatric evaluation. Nine critical items (six on the SIQ-JR) directly assess serious self-destructive behavior, with endorsement of three or more of these items (two on the SIQ-JR) constituting a positive screen for suicidal ideation, regardless of total score (10).

In samples that included patients with any chief complaint, the positivity rate of the SIQ ranged from 4% (40) to 29% (47). In studies that only sampled patients with psychiatric chief complaints, or studies that included a breakdown of solely psychiatric presentations, positivity rates ranged from 40% (10) to 66% (47). In contrast, in studies with patients with only medical/surgical complaints, or studies that included a breakdown of solely non-psychiatric presentations, the positivity rates ranged from 0% (34) to 10% (47). Those who screened positive on the SIQ tended to more often be female (39, 47), and more often presenting with psychiatric complaints: in universal screening studies, the proportion of positive screens that were positive ranged from 77% (10, 47) to 87% (43). King et al. (39) showed that the SIQ had good concurrent validity with a measure of hopelessness, a risk fact for suicide.

Risk of Suicide Questionnaire (RSQ)

Seven studies tested or implemented the RSQ. The RSQ is an older four-item screening tool that was developed by Horowitz et al. (35) to be administered by triage nurses in EDs to children between the ages of 8–21 years old. The tool was originally developed from 14 potential screening questions from several sources, which were validated among several pediatric clinicians and mental health specialists, as well as a sample of pediatric psychiatric patients and nonpatients. The final tool includes four questions and was validated cross-sectionally using a "gold standard" assessment comparison with the SIQ. The tool was most often administered via a verbal questionnaire administered by research staff in pediatric EDs ($n = 5$), typically in samples of patients with both medical/surgical and psychiatric complaints ($n = 4$).

The RSQ asks four questions: (Q1) Are you here because you tried to hurt yourself? (Q2) In the past week, have you been having thoughts about killing yourself? (Q3) Have you ever tried to hurt yourself in the past (other than this time)? (Q4) Has something very stressful happened to you in the past few weeks (a situation that was very hard to handle)? A positive screen is defined as answering "yes" to any question. Folse et al. (24) used a broader definition of positive to include "no response" accompanied by nonverbal behaviors of concern.

The positivity rate based across studies ranged from 28% (24) to 51% (25) of "all comers". Only one study sampled solely patients with psychiatric chief complaints and reported an overall positivity value, of 48% (13). In contrast, one study sampled solely patients with non-psychiatric complaints and found a positivity rate of 22% (34). Positive screens were much more likely to have a psychiatric presenting complaint (10, 50). One study (50) focused only on the fourth question of the RSQ ("Has something very stressful happened to you in the past few weeks?") and found that nearly 80% of patients screened endorsed this item, a very high rate of positivity, leading to concerns about the specificity of this tool. It is notable that Hopper et al. (34) found that one-fifth of their non-psychiatric sample screened positive on the RSQ while screening negative on the SIQ, suggesting an issue with false positives. Where criterion validity was reported, the RSQ was found to have high sensitivity (50–98%) but low specificity (37–79%) against the longer SIQ (25, 34, 35). Folse and Hahn (25) concluded that the RSQ had inadequate reliability in their sample.

Other Suicide Screening Tools

We located several less-frequently used suicide screening tools, as well as some general mental health screeners that included suicide-related items.

Brent et al. (15) applied the Death Implicit Association Test with a cohort of medical and psychiatric ED patients aged

12–17 years. The IAT was predictive of 3-month attempts in a risk-saturated sample, with an AUC of 0.59 but performed better in patients who were non-suicidal at baseline (AUC = 0.67). Czyz et al. (21) applied the Self-Assessed Expectations of Suicide Risk Scale, which consists of three questions on a 0 (not at all confident) to 10 (extremely confident) scale. It rates the patient's confidence that they will: not attempt suicide; be able to keep from killing themselves if serious suicidal thoughts occur; and tell someone about suicidal thoughts if they occur. In a cohort of 340 13- to 24-year-olds visiting a psychiatric ED, the area under the curve (AUC) for a future suicide attempt was 0.79 for the full Scale and 0.80 for the second item on its own. The optimal cut-off for that item was 6.5/10, which generated a sensitivity of 79% and specificity of 76%; this item was also the strongest predictor of time-to-suicide attempt. King et al. (41) developed and validated the Computerized Adaptive Screen for Suicidal Youth in two larges samples of pediatric ED patients. They found high predictive accuracy of the tool for future suicide attempts, with areas under the curve of 0.87–0.89. It was also brief: the mean number of items administered was 11. Manning et al. (45) tested the Children and Young People-Mental Health Self-harm Assessment in Pediatric healthcare Environments (CYP-MH SAPhE) in a sample of 10–19 year-old psychiatric and medical ED and inpatients. The tool focuses on in-situ risk, with questions like "Right now, do you wish you were dead?" (endorsed by 42% of psychiatric patients, 0% of medical patients) and "At the moment, do you have a plan to end your life?" (endorsed by 21% of psychiatric patients, 0% of medical patients). The tool demonstrated high reliability, congruence with the CSSRS, and predictive validity. In a pediatric urgent care center, Patel et al. (46) applied a two-item screener to all patients aged 12 and older: "In the past week including today, have you felt like life is NOT worth living?" and "In the past week including today, have you wanted to kill yourself?". Two per cent of their patients screened positive and the tool was congruent with the CSSRS. Patients screening positive were more likely to be female and less likely to be White.

There were several studies that presented general mental health screeners that included suicide-related items. Three studies used the Behavioral Health Screener (BHS): one used the full tool (16) and two used the abbreviated ED version (BHS-ED; (23, 30)). Several BHS items assess the presence of suicidal thoughts and behaviors ("Have you felt that life is not worth living?"; "Have you thought about killing yourself?"; "Have you made a plan to kill yourself?"; and "Have you tried to kill yourself?") over the patient's lifetime and past week. In a sample of 14- to 24-year-old "all comers," Burke et al. (16) found lifetime attempt in 9% of ED patients and past-week attempt in 1.7%. Using the same age range, Herres et al. (30) found lifetime active suicidal ideation in 20% of patients, lifetime attempt in 9% of patients, and past-week attempt in 1.5% of patients. In a group of non-psychiatric ED patients aged 14–18, Fein et al. (23) found that 6% had made a lifetime attempt and 0.7% had a past-week attempt. The HEADS-ED tool was used in two studies (17, 18), both of which enrolled psychiatric patients only. The tool has one item on suicidality with three levels: none, ideation only, gesture/plan. Cappelli et al. (17) found that 25% of patients were positive for gesture/plan and 78% were positive

for ideation/gesture/plan. Those who endorsed suicidality were more likely to receive a consult and admission. In another psychiatric sample, Cappelli et al. (18) reported 31% positivity for gesture/plan and 70% positive for ideation/gesture/plan: again, these patients were more likely to receive consult and admission. The Childhood Acuity of Psychiatric Illness scale also has an item assessing levels of suicidal ideation/gesture from low (none/mild) to high (moderate/severe): in a psychiatric sample, Kennedy et al. (38) found that 8% of 8- to 11-year-olds were in the high category compared to 32% of 12- to 17-year-olds. Finally, the Crisis Assessment Tool is 38-item measure that assesses 6 domains, including child risk behaviors like acute suicide risk, from 0 (no evidence that the item requires action) to 3 (severe or immediate need for action). Williams et al. (53) found that 57% of their psychiatric sample had acute suicide risk at level 3 (severe concern). These patients were more likely to be female and to be admitted.

DISCUSSION

Suicide rates are increasing among youth (2), and EDs provide a potential venue for detection and management of suicide risk. We located four commonly used screening tools for suicidality in pediatric ED patients (the ASQ, CSSRS, SIQ, and RSQ), as well as several less widely researched tools. The studies were generally of good quality, and the amount of research on this topic appears to have increased significantly in the past decade. The vast majority of research was conducted in the United States, which may reflect the increasing focus on screening from accreditation and advocacy organizations (44, 63) in that country.

Most of the screeners were identified were brief and feasible to implement in routine care. They uncovered suicide risk in about half of psychiatric samples and up to 20% of medical/surgical patients. This differential finding reflects the strong association between psychiatric morbidity and suicide (64), while also showing that some presentations for non-psychiatric reasons may harbor a surprising level of suicide risk (4). The RSQ seemed to be associated with very high positivity rates, leading to concerns about false positives (i.e. patients who screen positive on the tool who are not actually experiencing suicidality) and unmanageable numbers of consults. Many of the false positives on the RSQ were likely due to an item about recent stressors and this presumably is the reason for the decline of that tool in the last decade. It was notable that across several screening tools, being female was associated with a positive screening result. Although males are more likely than females to die by suicide, females are more likely to both ideate about and attempt suicide (65). At a time when youth suicide rates among Black youth are increasing (66), it was promising to see that a significant number of studies included majority Black/African-American patients.

The COVID-19 pandemic has been associated with a significant increase in rates of suicidality in youth (67, 68). Although a significant number of the studies in our review were published after 2020, just three of the studies included data that was collected during the pandemic. Two of these studies showed an increase in the positive suicide screening rate during the pandemic compared to before (31, 42); the other study (19) did not compare rates before and after but showed a dramatic dip

in the number of screenings administered during January and April 2020. As well as showing the disruption the pandemic caused to usual care, these findings support the earlier finding that rates of suicidality among youth appear to have increased during the pandemic.

Although screening for suicidality with a single screening tool may be efficient, the risk factors (and protective factors) for suicide are complex and dynamic: it should be noted that detecting suicide risk with a simple screener is merely the first step in understanding and managing suicide risk clinically in youth. Once risk is detected using a screener, a more detailed suicide risk assessment by a trained behavioral health provider should address a range of contributing factors, such as: behavioral health morbidity; past, recent and current suicidality; stressors and adversity; impulsivity and aggression; social supports and coping mechanisms; treatment engagement; access to lethal means; and feelings of hopelessness, shame, and guilt. Once the clinician has a better sense of the patient's needs and resources, they may tailor an intervention to that patient's circumstances. Clinical interventions shown to prevent subsequent future suicidal behavior in youth include Dialectical Behavior Therapy for Adolescents and Cognitive Behavioral Therapy (69).

The current systematic review has several limitations to bear in mind. Given our suicide-focused search strategy, we may have failed to identify additional general mental health screeners that include suicide-related items. We focused on the ED setting, so these findings may not be applicable to other care settings. We also limited our review to studies published in English, which may affect the generalizability of the findings to international settings. Finally, because of the heterogeneity of tools and analyses, we were not able to conduct a meta-analysis of the results. However, we believe that this systematic review will be useful to those seeking to implement suicide screening with the pediatric emergency patients.

When selecting a suicide screening tool for pediatric emergency settings, it is important to consider several factors that may impact its success. First, it is important to decide whether to implement the tool universally (with all patients regardless of presenting complaint) or only with patients with psychiatric presenting complaints. The former approach may be more resource-intensive than the latter but will allow for the detection of suicide risk that might otherwise be missed (6). In choosing a screening tool, it is important to select one that is supported by research but is also feasible within a busy ED setting: it should be brief and easy for non-specialists to administer (5). Computer-based approaches allow for standardization and privacy but require hardware and sometimes proprietary software; verbal administration has the potential for a more impactful interpersonal connection and

disclosure but can be stymied by negative framing (70) and poor fidelity (71). It is also important to develop a protocol around how to support patients who screen positive in terms of assessment, intervention, and follow-up. If resources are very limited, an ED might choose a tool with a high threshold to minimize the number of positives, while other EDs may prefer a screening tool that detects very low levels of suicidality to avoid missing a patient at risk. In this review, we found that there are several well-supported tools available for screening suicide risk in young ED patients, and the tool chosen may be informed by the needs and resources of the department.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author.

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"My Heart and My Brain Is What's Bleeding, These Are Just Cuts." An Interpretative Phenomenological Analysis of Young Women's Experiences of Self-Harm

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Engagement in self-harm, defined as intentional self-poisoning or self-injury irrespective of the apparent purpose of the act, is increasing, particularly among girls and young women. Understanding the behavior from the perspective of those who self-harm is, therefore, vital in designing effective interventions and treatments. The current brief research report presents a key theme from an Interpretative Phenomenological Analysis of the experience of self-harm among eight young women, aged between 18 and 29. The theme *Is Self-Harm Bad?* concerns the way in which participants both acknowledged and resisted a negative conception of self-harm that was often constructed from other people's attitudes. Three subthemes explore the reasons why participants were reluctant to endorse self-harm as bad: Self-Harm is the Symptom, Self-Harm Works (Until it Doesn't) and Self-Harm is Part of Me. The findings highlight the disparity between the characterization of self-harm as a highly risky behavior and the lived experience of self-harm as a functional means of emotion regulation. From a clinical perspective, the findings explored in this brief report suggest that highlighting the risks of self-harm may not be a sufficient deterrent. The recently revised draft National Institute for Health and Care Excellence (NICE) guidance recommends that everyone presenting to hospital following self-harm should be given a comprehensive psychosocial assessment, of which the function is, in part, to understand why the person has self-harmed. The current study underlines the importance of seeing past the behavior to the underlying causes and exploring the meaning of self-harm to the individual in order to implement effective preventative interventions.

Keywords: self-harm, interpretative phenomenological analysis (IPA), stigma, qualitative, suicide

INTRODUCTION

Self-harm, defined as intentional self-poisoning or self-injury irrespective of the apparent purpose of the act (1), carries risks for the individual, including a significantly higher chance of subsequently dying by suicide (2). These risks lie behind the clinical imperative to "*reduce recurrence*" of self-harming behaviors (p. 1) (1). However, such efforts may be hampered by different

conceptualisations of self-harm by clinicians (and other potential help-givers) and the individuals who engage in self-harm. While clinicians may see self-harm as a maladaptive and risky behavior, those who engage in it may see it as a *"necessary pain"* (p. 154) (3), and a vital way of coping with otherwise intolerable distress (4).

The failure to appreciate these different perspectives can have important consequences. Individuals who self-harm have been described as manipulative or impossible to help, leading to frustration and a lack of empathy in front-line medical staff (5). Emotional or angry reactions by parents to their children's self-harm may increase feelings of guilt and distress, resulting in further self-harm (6). Negative responses such as these to self-harm disclosure (or the anticipation of them) can affect an individual's willingness to seek help and lead to self-harm being carried out in secret (7, 8).

In their benefits and barriers model, Hooley and Franklin identify social norms, and specifically the cultural non-acceptability of self-harm, as one of five factors that dissuade most people from engaging in self-harm (9). They describe how people who self-harm may bypass the social norms barrier by hiding the behavior from others, or by finding a different set of norms among a group of people who also self-harm. However, even if such measures spare the individual from the approbation of others, the awareness that self-harm is viewed negatively by society still persists. Qualitative research can provide an insight into how the widely-held, negative view of self-harm affects those who engage in it. The current brief research report presents new evidence from an Interpretative Phenomenological Analysis (IPA) of the experience of self-harm among young women who reported difficulty identifying and describing feelings. Two themes from this study have been published elsewhere (10). In this report, we focus on the way in which the participants' experience of self-harm fitted, or conflicted with, the idea that it was a maladaptive, unhealthy way of coping.

METHOD

The method for this study was described in Norman et al. (10). In brief, eight women, aged between 18 and 29 ($M = 22$, $SD = 4.14$), were recruited from Middlesex University and the general public, having taken part in an online survey about self-harm. IPA studies are commonly based on a small number of participants, to allow an in-depth analysis of each case (11). The main study focussed on self-harm in people who had difficulties identifying and expressing feelings, and therefore the inclusion criteria required that participants scored above 51 on the Toronto Alexithymia Scale (TAS20) (12). Additionally, to focus on recent experiences, all participants had self-harmed within the past five years (three within the past year). Four semi-structured interviews were conducted in person, three took place online via Skype and a further one via Skype messenger at the participant's request. The interviews were carried by the lead author, a Samaritan listening volunteer. They opened with a broad question, asking participants about their experience of self-harm. Follow-up questions and prompts encouraged participants to elaborate on their feelings in relation to self-harm, both at

the time and in retrospect. The spoken interviews ranged from 49 min to 1 h 40 min (average 71 min). Due to connection issues, the interview conducted via Skype messenger took 4 hours, 13 min.

The study was granted ethical approval by Middlesex University Ethics Committee (reference 4083). Steps were taken to ensure the participants' wellbeing, including the collaborative drawing up of a safety plan, and the use of a Visual Analogue Scale (VAS) at the start and end of the interview to gauge the impact on mood (13). Participants were fully briefed about the nature of the study and the voluntary nature of their participation, and provided written or oral (recorded) consent.

Interpretative phenomenological analysis was chosen because it is a phenomenological method focussed on participants' subjective experience, while acknowledging the interpretative role of the researcher in the analytic process (11). The interviews were transcribed verbatim. Following several readings, each transcript was analyzed separately to identify descriptive, linguistic and conceptual comments (11). Emergent themes were developed and then combined into subthemes and super-ordinate themes, which were then compared and combined across the dataset. These stages were carried out by the lead author; the second author independently reviewed one transcript. The lead author made reflexive notes throughout the period of data collection and analysis to aid reflection on the interpretative process.

Four themes were identified: The Obscure Self; Words Fail Me; Control and Compulsion; and Is Self-Harm Bad? The first two themes were presented in Norman et al. (10). This current brief report focuses on the last of the four themes: *Is self-harm bad?*

FINDINGS

Self-Harm Is Bad But…

This theme explores participants' feelings toward self-harm, in particular the way in which they both acknowledged and resisted the social construct of self-harm as "bad."

All the participants expressed, either explicitly or implicitly, the view that self-harm is an unhealthy, negative behavior. At the start of each interview, participants were asked a very general question about their experiences of self-harm.

> P3: *"Well I think I started self-harming when I was 17 in high school and [pause] I it got it was real bad for about two years and I would do the whole you know we're gonna we're gonna stop doing this because it's bad and my best friend hates that I do it, and then keep doing it."*

The word "bad" is used twice in this short extract, first to describe the seriousness of her engagement in self-harm and second as a reason why she felt she ought to stop. The perception of self-harm as bad was endorsed, or even formed, by the reaction of her best friend, whose judgment she presumably valued. An experience shared by the participants was that friends, parents and health practitioners often (although not exclusively) responded unfavorably to self-harm, creating a negative construct against which participants had to position themselves. For example, six

participants described having to manage other people's reactions to their scars. Here, P1 remembered going out with her boyfriend and other friends.

P1: "*When I got to the pub I sat at the table and I started taking [my cardigan] off and my boyfriend was "No you can't take that off".*"
I: "*How did you feel about that?*"
P1: "*And I was just sort of I don't know it was like a punch in the stomach. Um cos then you're then sort of like not only me feeling really embarrassed and inadequate but thinking oh my god he feels embarrassed about me, like he's embarrassed to be with this person who's got these scars so and so and I sort of immediately went back into my shell and did my not talking to anyone kind of face and I think a few minutes later he sort of I think he realized that what he said wasn't appropriate and he apologized and he was like no no no you can do whatever you want*"

Her boyfriend's instinctive reaction to P1 revealing her scars in public, and in front of friends, suggested that he saw the scars as embarrassing or even shameful. P1 inferred that he was ashamed, not only of the scars, but of her as a person. Her first reaction was to hide both her scars and also her own feelings. Such negative encounters caused participants to feel guilty, which sometimes increased their recourse to self-harm.

P4: "*Then after it would be like guilt for doing it. But then you feel like you need to punish yourself more because you punished yourself in the first place.*"

Another consequence of other people's reactions was to deter participants from seeking help. P6 described how she had felt better able to manage self-harm safely before other people found out about it.

P6: "*There wasn't any reason to tell anyone. there was a lot of reasons not to tell anyone. I think to be honest, that was the time with the least risk and virtually no escalation because it didn't include anyone else's thinking, questioning, understanding, misinterpretation, stereotypes or pressures.*"

However, while the construct of self-harm as 'bad' was acknowledged by participants, it was also resisted. For example, in the extract above, P1 appeared to push back against her boyfriend's initial reaction to her scars, describing his response as "*not appropriate*". Having observed this conflict in how participants viewed self-harm, we identified reasons why it might occur. Three subthemes were identified.

Self-Harm Is a Symptom

The first reason why participants appeared to resist the idea of self-harm as 'bad' was that they viewed it as a symptom of underlying mental health difficulties or life stresses. It was necessary to look beyond the behavior to the distress that it signaled.

P8: "*Like I wrote a song, like and it was just like, like "you say I should stop, I shouldn't do this to myself. You say you've had enough. You can't help if I don't want the help. Do you not see I just don't need it. Really, my heart and my brain is what's bleeding, these these these are just cuts."*"

Through her song P8 expressed her frustration that people appeared unable to see past her cuts to the pain underneath. She herself downplayed the significance of the cuts. To her they were an external manifestation of the internal 'bleeding'. Constructing self-harm as the problem appeared to give other people permission to absolve themselves of any responsibility for her distress. They blamed her for choosing to self-harm and placed the onus for her recovery onto her ("*You can't help if I don't want the help*"). In another example, the participant described how self-harming behaviors caused clinicians to jump to an immediate and, in her view, unhelpful diagnosis.

P1: "*There's a bit of a tendency at the moment when someone's self-harmed once, they immediately have emotional unstable personality disorder and they don't care about the other symptoms at all and I'm kind of like and whenever that happens then there's all the trouble, there's the medic- needs medication doesn't need medication blah blah blah*"

Self-Harm Works (Until It Doesn't)

The second reason why participants appeared to resist the construction of self-harm as 'bad' is because it worked for them. All described self-harm as a means of coping and, to a varying extent, necessary to them at certain times in their lives. Self-harm was used to manage an emotional experience that was overwhelming or difficult to understand.

P4: "*It felt like it was a relief for me, I don't know if it was like, it gave me the ability to feel something other than just sadness.*"
P7: "*It kind of just made me forget, and make me focus about, on something else, because when I cut I focussed on that, and also the process after cutting.*"

At the extreme, two participants explicitly described how they felt it saved them from taking their own lives. For P5 self-harm was bad but not as bad as killing herself. She credited self-harm for suppressing suicidal thoughts.

P5: "*It keeps me alive to a certain degree [...] and if I have to decide between self-harm and suicide, um self-harm is the lesser of two evils, and I have to say, when I'm not psychotic and when I can actually think things through rationally, self-harm is a good way to calm down suicidal thoughts, it's a compensation, and if I can self-harm and not kill myself and I don't know any other way not to kill myself then in my mind, like self-harm is better than me trying to kill myself in a way.*"

However, the same participant acknowledged that at times this 'rational' logic would break down and self-harm would not be sufficient to protect her from potentially lethal actions.

P5: "*It will come to a point when my mind set turn to I'll do whatever to myself and I don't care whether that will kill me or not. [...] It does work to a point that it doesn't.*"

Self-Harm Is Part of My Story

The third reason why participants appeared to feel conflicted about the idea of self-harm as 'bad' lay in the role it played in their own narratives. If they were to acknowledge the social construct of self-harm as bad, participants would in effect be implying that

they, as people who had self-harmed, were also bad. At the time of their self-harm, that was, indeed, how they sometimes felt.

> P5: *"It gives a perfect reason for why self-harm is the right thing to do, because if I'm a bad person then I deserve that pain and that sort of state of mind and everything that comes with it."*

In contrast, the five participants whose last self-harm had occurred over a year ago, expressed greater acceptance of their past behavior. Their reflections often revealed a complex mix of feelings, as illustrated in this extract from P2's interview:

> I: *"So, how would you say self-harm, if you would, has self-harm affected your life?"*
> P2: *"I thought about that, and I still don't know. All I know is it was a big part of my life and who I was for a really long time and it shaped me into the person that I am today but at the same time that I'm glad that I don't do it anymore, and I hope that I never do it again, um but I think ultimately considering the end product, where I am now, I think it was, [sigh] I can't say that, I want to say that it was a good thing because it kind of ended up in me getting help from my parents and talking to them about it and I don't know what the alternative would have been if I never, if I never did it. So I'm hesitant to say that I think it was a good thing because it brought me closer to my friends and my family."*

P2, and three other participants, explicitly articulated their belief that self-harm had shaped the people they had become. This person (the "*end product*") was someone P2 was proud to be and therefore she could not write off self-harm as wholly negative. Here, P2 focussed on the benefit self-harm brought to her which was ultimately to make her closer to the people around her. Other participants argued that self-harm had made them more empathetic, particularly with people going through similar experiences. At the same time, P2 acknowledged that she was glad that she no longer self-harmed, and she was reluctant fully to endorse self-harm as a positive experience ("*I'm hesitant to say..*"). This extract appears to illustrates P2's attempts to create a narrative which gives meaning to her own story whilst acknowledging the accepted view of self-harm as an unhealthy behavior.

DISCUSSION

Through the identification of conflicting feelings held by the young adult participants about their self-harm, the current study extends our understanding about the subjective experience of this behavior. Participants both acknowledged and resisted the idea that self-harm was "bad." Three reasons for this resistance were identified: first, that self-harm was a symptom of underlying problems; second, that self-harm worked and served a useful function for participants; and third, that self-harm was an integral part of their personal narratives, which had contributed to the people they had become. The findings highlight the disparity between the characterization of self-harm as a highly risky behavior (14) and the lived experience of self-harm as a functional means of emotion regulation.

The analysis revealed how participants had to position their self-harm in the context of other people's, often negative, views. Many studies have highlighted similar stigmatizing responses to self-harm (15), including in medical settings (16, 17). The fear of stigmatized reactions can have serious consequences for help-seeking (18). For example, one study found that the perceived distinction between "genuine" self-harm and people who were "attention seeking" appeared to increase individuals' propensity to self-harm in secret and to avoid asking for help (19).

Other people's negative perceptions of self-harm may also contribute to the individual's sense of guilt, leaving them "*trapped in a maintenance cycle of shame and self-injury*" (p. 58) (20). This idea is captured in the experiential avoidance model of self-harm, which proposes that self-harm may be maintained in part by the desire to avoid the negative feelings of remorse that may arise as a result of the act itself (21). This cycle was evident in the accounts given by the participants in the current study. However, although other people's negative views of self-harm led to feelings of guilt and shame, they were also resisted, for the reasons identified in the three subthemes.

The first subtheme described how participants felt self-harm was not in itself "bad," but rather was the symptom of underlying problems. Similarly, participants in Rayner and Warne's study (20) identified the need for medical staff to validate the individual rather than focus only on their self-harming behaviors. Elsewhere, the outcome measures conventionally used in trials of treatments for self-harm, such as a reduction in the frequency of self-harm or lower engagement with services have been criticized by participants (22). Such measures were rejected in part because they dealt only with the symptom of self-harm rather than the psychological or contextual issues, and failed to consider what "recovery" might look like to the individual.

The second reason why participants appeared to resist the idea of self-harm as bad was that it worked for them. The functions served by self-harm for participants mirrored those identified in the wider literature, particularly regarding affect regulation and self-punishment (23–25). The anti-suicide function of self-harm has also been observed in other studies, including in both community (26) and clinical (27) adolescent samples. Harris (28) identified how self-harm has an 'internal logic' for those who engage in it, which medical professionals, who may view self-harm as an irrational behavior, can struggle to understand.

Conceptualizing self-harm as bad, therefore, may alienate people who feel it serves a unique and useful function in their lives, enabling them to cope with difficult emotional experiences and, at an extreme, helping them avoid suicidal behavior.

Nevertheless, there is considerable evidence that self-harm of any kind is one of the highest risk factors for subsequent death by suicide (29–31). It also carries risks of scarring or organ damage. Evidence from the current study and elsewhere shows that individuals who self-harm are not oblivious of the risks (3, 8). However, Woodley et al. (8) identified a cognitive dissonance in the way their participants held apparently contradictory beliefs about the dangers and benefits of self-harm, that, at times, led them to downplay the risks. Participants in the current study also described how they sometimes self-harmed without knowing

whether they wanted to live or die – an ambivalence which has been observed in other studies (32).

The third subtheme suggested that participants were reluctant to condemn self-harm as bad in order not to condemn their past selves. Viewed with hindsight, self-harm had become part of their story. These reflections appear to chime with the idea that self-harm may coincide with developmental challenges in adolescence that begin to resolve in adulthood (33). Other qualitative accounts have similarly highlighted the way people make sense of self-harm as a formative experience within their personal narrative (34, 35). Sutherland et al. (36) found that an attitude of acceptance and self-compassion was helpful in the process of recovery. This may explain the contrast in the current study between the guilt participants felt at the time self-harmed and the more benevolent feelings about past behaviors. Adopting an attitude of acceptance may be fundamental to enabling individuals to stop self-harming and to find other ways of coping.

IMPLICATIONS

The new UK draft guidelines on the assessment, management and preventing reoccurrence of self-harm (1) underline the importance of conducting a psychosocial assessment after an incident of self-harm, in order to "*develop a collaborative therapeutic relationship with the person*" and to "*begin to develop a shared understanding of why the person has self-harmed.*" (p. 11) (1). The current study provides strong support for this objective, in particular the need to look beyond the behaviors to the underlying individual and environmental factors, and to understand the function played by self-harm. Demonstrating an understanding of the meaning of self-harm to the individual can encourage help-seeking (6) and may be essential in the process of stopping (37). For the guidance to be put into effective practice, training and support will be needed for those who come into contact with people who have self-harmed, in both clinical and non-clinical settings, to ensure that disclosure experiences are positive and not alienating (16). Even brief training programmes have been shown to be effective in changing attitudes toward people who self-harm (38).

This study also suggests that care is needed in the way in which the risks of self-harm are communicated to people who engage in it. In the subtheme, *Self-Harm Works,* participants described the benefits of self-harm, whilst acknowledging the risks. While the current study was not focussed on the process of stopping self-harm, other accounts of self-harm cessation suggest that a re-evaluation of the risks vs. the benefits may over time become a motivation for stopping (39, 40). There is also evidence that changes in life circumstances, or the social or environmental context in which self-harm occurs, may shift an individual's perceptions of the risks and benefits (41, 42). However, the current study suggests that emphasizing the risks of self-harm when individuals still perceive them to be outweighed by the benefits, or if they are ambivalent about the risks, may be ineffective and potentially counter-productive. Elsewhere, people who self-harm have indicated that they may respond better to interventions that acknowledge the need to manage rather than

eradicate self-harm, for example through harm minimization strategies (22, 43).

Limitations

The limitations of the study as a whole, including the different communication channels used for the interviews and the various lengths of time since participants' last self-harm, are discussed in Norman et al. (10). With regard to the current report, it should be noted that the original research question concerned the experience of self-harm among people who reported difficulties identifying and describing their feelings. It was not the original purpose of the study to explore the effect of other people's negative views of self-harm on those who engage in it. A study with that purpose might choose different questions for the interview and more explicitly discuss the question with participants. Alternatively, other analytical methods such as discourse analysis might be used to understand the way in which the social discourse surrounding self-harm affects the way in which participants themselves talk about it. Because the participants all scored highly on the TAS20 it is not possible to say whether their experiences and thoughts about self-harm could be generalized to a wider population. However, it is notable that the subthemes presented here found resonance in other qualitative studies of self-harm, with no such inclusion criteria.

CONCLUSION

The findings presented here provide additional insights into the way in which people who self-harm have to navigate the prevailing negative perception of the behavior. Understanding the processes by which people who self-harm may simultaneously acknowledge and resist the idea of self-harm as "bad" is vital step toward the goal of reducing recurrence.

DATA AVAILABILITY STATEMENT

Due to the sensitive nature of this research, participants of this study were not asked for consent for their data to be made available to others for further research, so supporting data is not available.

ETHICS STATEMENT

This study was reviewed and approved by Middlesex University Psychology Department Ethics Committee, 6 June 2018, reference 4083. The participants provided their written informed consent to take part in this study.

AUTHOR CONTRIBUTIONS

The study formed part of the lead author, HN's, doctoral thesis, supervised by the other three, named authors. HN conceived of and designed the study, with the support of the other authors. Material preparation, data collection, transcription, and analysis were performed by HN. LM independently reviewed one

transcript. Themes were derived by HN and discussed with LM. The first draft of the manuscript was written by HN and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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An Analysis of Young Clients' Communications About Their Suicidality on a Text Message Helpline: "I'm Scared of What I Might Do to Myself"

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Background: Youth suicide is a major international concern and prevention is a priority. In most cases suicidal behavior would be preceded by a period of suicidal ideation. Although feeling suicidal is recognized as a risk factor for suicide, there is little research which captures young people's own experience of suicidality in a moment of crisis.

Aims: This study aimed to explore young people's own accounts of their suicidality in the moment in which they experienced it.

Method: This qualitative study examined clients' experience of suicidality as communicated during a text message helpline counseling interaction. The data consisted of 125 text transcripts of an interaction during which a client was experiencing suicidality. These were obtained from a New Zealand based youth helpline service. The data was analyzed using thematic analysis.

Findings: The analysis showed that clients' experienced suicidality as a normal part of their life; that it was understood as a form of coping and that it was seen as a legitimate way to communicate distress. Clients described rapid fluctuations in the intensity of their suicidality and a feeling of being out of control. Despite this, they also communicated ambivalence about acting on their suicidality, and a recognition of the need to get help.

Conclusions: This study offered unique insights into young people's experience of suicidality and opens up opportunities for prevention. It underlines the importance of identifying chronic suicidality early and providing intervention and support prior to a suicidal crisis. The findings point to the potential that text counseling services might have in providing support to young people who are experiencing suicidality in the moment that they need this.

Keywords: youth suicide, crisis helpline, youth mental health, suicide prevention, text counseling

INTRODUCTION

Youth suicide is a major global health concern (1, 2), and youth suicide rates in New Zealand are the second highest in the developed world (3). There are, however, significant challenges in providing help to young people who are experiencing suicidality (4, 5). Some of these challenges might be attributed to young people's reluctance to reach out for help (6–8). However, research also indicates that services may be failing to provide timely and helpful support to young people experiencing suicidality (9). It is vital to improve our knowledge of how young people experience suicidality to identify risks and opportunities to prevent suicide in this vulnerable age group.

While not all young people who experience suicidal ideation will go on to attempt suicide, this is thought to be a necessary precursor to suicide attempts (10), with some research suggesting that suicidal ideation predicts future suicide attempts (11, 12). Suicidal ideation is thought to occur relatively frequently amongst young people, with some estimates as high as 29% (1, 13, 14). However, rates of suicidal ideation amongst youth are likely to be even higher than estimated, as young people are often reluctant to disclose this (1).

With high rates of suicidality amongst young people, it is important to understand the dynamics of this experience in order to identify needs and opportunities for intervention. Some research documents the broad patterns of suicidality, suggesting that at the start of adolescence, the risk of the first onset for suicidality significantly increases, peaking at age 16, and remains elevated until the young person's early twenties (14, 15). However, findings from longitudinal trajectory studies suggest that, within this, there is immense heterogeneity among young people experiencing suicidality and that different courses of suicidality exist (7, 16–19). Despite differences in trajectories, there is a general consensus among researchers that suicidality among young people is thought to be dynamic, with some studies suggesting that an escalation often occurs over time (14, 15).

Variability in suicidality over short time periods has also been documented among young people. Using mobile phone technology, Czyz and colleagues captured daily records of young people's suicidality in the month following a suicide attempt and found considerable day-to-day fluctuations in the frequency, duration, and urge severity of suicidal ideation (20). Although this study offered a fine-grained account of young people's experience of suicidality, the study was limited as young people had to choose their responses from predetermined answers, which would have reduced the opportunity to explore less well-recognized patterns of suicidality.

Many studies suggest that suicidality among youth is often a recurring experience (21), with research indicating that if a young person experiences suicidality, they are at increased risk of future suicidal ideation, attempts, and suicide (12, 22–24). In line with this, a number of studies suggest that the experience of suicide among young people can be pervasive and ongoing (7, 25, 26). Despite this, the escalation from ideation to action appears to occur very rapidly (27). For example, one study showed that only 21% of young people who attempted suicide had planned their suicide attempt for more than 24 h in advance (26). As impulsivity has been associated with an increased risk of suicidality among young people, it is clearly important to understand more about the period immediately prior to the enactment of suicidal behavior (28).

Although growing attention has been given to the course of suicidality, there is still limited understanding of young people's own experience of feeling suicidal (29). Young people's own accounts of suicidality have the potential to add depth and nuance to the existing knowledge about the dynamics of the phenomenon. A relatively small number of qualitative studies have explored young people's own experiences of suicidality through interviews (25, 30–32). This research has drawn attention to the emotional state of young people experiencing suicidality, highlighting their experience of despair, shame, and social disconnection (25). There is also research that suggests that there may be important shifts in motivation and intentionality within episodes of suicidality (30–34). An enhanced understanding of the emotional states and motivations of young people experiencing suicidality might open up opportunities for more targeted intervention during crisis periods.

Due to the stigma associated with suicide, ethical concerns, and young people's reluctance to seek support for their difficulties, only a few studies provide direct access to "in the moment" experiences of suicidality. Although some recent research on internet forums has captured more direct expressions of suicidality in the moment they are felt, the data is often limited by the constraints of the platform on which the young people are communicating (35–38). In order to refine suicide prevention in this age group, it is vital to understand young people's own experiences of suicidality (17, 29). This article seeks to address gaps in the literature by exploring young people's real-time communications about their suicidality during a period of crisis.

MATERIALS AND METHODS

This article draws from a qualitative analysis of young clients' communications about their suicidality, provided in the context of a text counseling interaction with a helpline service. The service was run by a youth development agency, Youthline, which provides a free interactive text message counseling service for youth 12–24 years of age experiencing distress. Youthline's text counseling service operates between 8 am and midnight, seven days a week. The text message service can be accessed by any young person in New Zealand, provided they have mobile phone reception. It is an anonymous service that does not require young people to sign up, register, or provide personal information (39). The text counseling sessions consist of asynchronous exchanges between a trained volunteer counselor and a client, which are automatically recorded and stored in text format. While clients text the service with a range of issues, suicidality is a major theme in the content of these counseling sessions and a significant concern for the organization. Counselors generally aim to prevent suicide by talking the young client through their crisis and referring them for ongoing mental health support if

required. While clients are anonymous to the service, the police can be called in to locate a client when there are significant concerns about their safety.

For the purposes of this study, we analyzed text counseling transcripts to identify common patterns in the clients' communications about their suicidality, including the reasons they provided for feeling suicidal, where they had sought help, and why. This article, however, addresses the more focused question: "How do those clients who say they are suicidal, describe their experience of this phenomenon?"

A social-constructionist epistemology informed our research with an awareness that suicide is always constructed by someone for a particular purpose and in some context (40). Our position was also influenced by a youth empowerment perspective, which recognizes the importance of understanding the meaning that young people themselves give to their experiences (41). This approach requires a reflexive awareness of the researcher's own positioning in relation to the research participants and the analysis (42). The first researcher was a clinical psychology doctoral student who was working in a community mental health setting at the time of the study. The second researcher was a clinical psychologist and academic who served as the supervisor on the project. Both researchers were particularly conscious of needing to challenge their professional preconceptions to allow the experience of the young clients to be heard more clearly.

Data Collection

The data consisted of text message counseling transcripts which Youthline stored as part of their usual clinical and audit practices. The criteria for a text conversation to be included in the analysis was that the client communicated experiencing suicidality while messaging the service. A Youthline staff member searched for the word "suicide" in their database on 7 February 2017 and collected 200 of the most recent text message transcripts.

The researchers then reviewed the 200 transcripts to ensure they included references to current experiences of suicidality, including suicidal ideation, suicide planning and suicide-related behaviors. To distinguish between non-suicidal self-injury and suicidality, only text interactions where the client communicated explicit references to wanting to die or end their life were included. Of the 200 conversations collected by Youthline, five were excluded as they were repeats, and 70 were excluded as they did not meet the study criteria. The 70 excluded transcripts included: one conversation where the client texted that they were not a young person; 17 transcripts where the client was communicating concerns for someone else who was experiencing suicidality; 42 transcripts where the client was distressed but was not experiencing any current suicidality; and ten conversations where the client's experience of suicidality was unclear, and the counselor did not ask about the client's current suicidality.

This resulted in 125 text message counseling transcripts where the client communicated experiencing current suicidality. The data contained all text communication between the counselor and the client. In total, 5,933 text messages were included in the analysis. The text message interactions ranged between 4 and 184 text messages, with the average text conversation consisting of 47 messages. Saturation, the point at which additional data does not appear to generate new themes, is commonly used to determine sample size in qualitative research (43). In this study, saturation was judged to have been reached with the 125 transcripts available, with no need to request further transcripts from Youthline (43).

Data Analysis

In order to locate recurring themes in the data, the researchers employed thematic analysis. This form of analysis was appropriate for this study as it is thought to be useful when exploring an under-researched area. Furthermore, as it allows for the latent aspects of the data to be identified by going beyond the semantic content of the texts, it was consistent with a social-constructionist epistemological position (42, 44). While the research question offered a foundation to guide the interpretation of the data, specific themes were not predetermined and instead were identified during the analytic process. This method of analysis allowed us to identify the themes associated with our research question whilst also permitting what the young people communicated to inform new findings (44).

The data was analyzed using Braun and Clarke's approach to thematic analysis (44). This provided a flexible method for identifying, analyzing, and interpreting themes within the transcripts. Throughout the analysis, the researchers discussed and reviewed the themes to ensure trustworthiness, using consensus and reflexive discussion as the basis for our decisions (42, 45).

Following Braun and Clarke's guidelines, the first step in the analysis was becoming familiar with the content by reading and re-reading the text message conversations multiple times (42). This allowed us to clarify the research question addressed in this article. Once we had identified this research question, we went through all the data and extracted any communications that related directly to the clients' experiences of suicidality. This research question necessitated that we focus specifically on the clients' communications (using the counsellor's questions and responses only as context for locating or understanding the meaning of the clients' communications).

The analysis began with multiple readings of the transcripts, which helped us to generate initial codes to organize the data into meaningful categories. Each transcript was coded with as many codes as were relevant. Extracts and quotes from the conversations were recorded under each code to support the elucidation of content and meaning. In order to keep true to the clients' communicated experience, minimal changes were made to grammar and misspellings, and "text speak" was not altered. Once all the data had been coded, the preliminary themes were identified, with the relevant data placed under each theme. The research team then reviewed the themes to ensure the themes were well supported, captured the range of clients' experiences, and sufficiently well differentiated from one another. While this is described as a linear process, as Braun and Clarke note, analysis often involves an iterative process of moving backwards and forwards between the data and high levels of analysis (44).

We were conscious of ethical considerations in researching sensitive issues such as suicide. Youthline consented to the study,

and we worked closely with the counseling team to ensure clients were protected. As clients were anonymous to the organization it was not appropriate or feasible to gain client consent to use their counseling transcripts in this study. While there are ethical issues related to using these transcripts without the clients' permission, these considerations were carefully weighed against other imperatives including the value of improving the suicide crisis service for young people and the discomfort clients might experience if they were approached via their mobile phone numbers to request retrospective consent. Analyzing anonymised file data, previously collected in the course of usual practice, is common practice in health organizations, and is considered part of an obligation to evaluate and improve their services. Consistent with these audit practices, all data was carefully anonymised before being provided to the researchers. Furthermore, in writing up the research, we have avoided highlighting idiosyncratic responses or the details of any specific situation described by a client to protect client privacy further. The research was approved by the University of Auckland Human Participants Ethics Committee.

FINDINGS

Through the analysis, we identified eight themes that reflected clients' experiences of suicidality.

A Normal Part of Life: "Thoughts Are Becoming Part of an Everyday Thing Now"

Many clients described experiencing persistent and ongoing suicidal thoughts marked by an ongoing feeling of hopelessness. This theme illustrated how suicidality was communicated as a chronic and pervasive experience that had become a re-occurring and normal part of their lives.

Clients texted that they thought about suicide all the time. They frequently communicated experiencing suicidality for days, weeks, and even years. As one client messaged, "I'm always thinking about it these days" (Client 109). Clients talked about their suicidality as being a pervasive experience, describing their suicidal thoughts as "really loud" (Client 117), "really strong" (Client 68), and "oppressive" (Client 85). Due to the chronic nature of their suicidality, clients communicated feeling like they were in a constant struggle. For example, one client messaged, "Every time I close my eyes for more than like 5 min I imagine myself dying" (Client 59). They messaged that they had little hope of no longer experiencing suicidality. As one client texted, "They've calmed down but there's always going to be that thought in my mind" (Client 67).

Clients also messaged that their experience of suicidality was recurring. As one client texted, "this is a very common occurrence for me" (Client 115). They noted a range of different experiences of suicidality in the past, such as suicidal ideation, suicide attempts, and sometimes periods in respite and hospitalization. These clients often reported having attempted suicide multiple times. For some of these clients, these attempts were very recent, such as the day before they messaged the service.

These clients communicated that as their experience of suicidality was so frequent and persistent, suicide had become a normal part of their life. As one client texted, "Thoughts are becoming part of an everyday thing now" (Client 104). For many, their experience of suicidality had become part of how they saw themselves; as one client texted, "I want to kill myself. Which is kind of normal for me" (Client 25). They often conveyed that their experience of suicidality had become part of their identity. For example, when asked about the frequency of their suicidal thoughts, one client replied, "Most of the time. Nobody is even surprised anymore more cause I have 'chronic' suicidal ideation" (Client 117).

A Form of Coping: "Death Is a Better Option"

A number of clients described suicide as being an understandable response given what they were experiencing and a logical way to solve their problems. This theme captured how suicidality was often understood as a way of coping.

The clients communicated seeing suicide as being a reasonable response given their emotional pain. Suicide was seen as a way to relieve their distress and escape from their painful emotions. This is shown in the interaction below.

Client 39: I'm just really fed up and exhausted of trying to get better all the time.
Youthline 39: Getting better can be a slow process and understandable that you're feeling discouraged.
Client 39: Yeah, it just seems like death is a better option.
Youthline 39: Do you think death is a better option or do you want the pain to stop, just trying to understand where you're at.
Client 39: Both. I want the pain to stop and I think death is the best chance of that happening.

Clients often did not speak of the finality of taking their life and instead described it as a way to gain "instant relief" (Client 68) and peace from their strong and unwanted emotions. Clients also communicated that suicide would solve their problems, often conveying the idea that it was a logical and reasonable option. For example, one client texted, "the best way for me get out of this is kill myself" (Client 83). They conceptualized suicide as being a coping strategy in itself, which was viewed as accessible and understandable. For instance, when asked by their text message counselor what coping strategies they had used in the past, one client gave attempting suicide as an answer (Client 87). Furthermore, clients frequently described suicide as being their only option, as this client texted, "It seems like the only way to escape everything" (Client 117).

Ambivalence About Suicide: "Part of Me Wants to and Part of Me Doesn't"

Many clients conveyed feeling ambivalent about taking their life. This theme highlighted the uncertainty and internal life-or-death debate that clients frequently communicated in their texts.

Clients often talked about feeling ambivalent about taking their life and texted that despite not wanting to be dead, suicide was always an option. For example, one client messaged, "There's

obviously a part of me that doesn't want to die but all my other problems just seem to overrule the small part of me that wants to live" (Client 117). A number described experiencing a constant internal conflict, where they were unsure or did not want to take their life but felt unable to cope with their painful emotions or difficult situation. For example, one client messaged, "I don't really want to commit suicide, I just want the pain to end (Client 57). Clients frequently said that it was not that they wanted to be dead, but they wanted to solve their problems. As this client messaged, "I want to leave this world. But I don't want to die" (Client 112). They described being afraid of taking their life and did not want to do it but could see no other option. For instance, one client texted, "I'm scared to do it. I know deep down I don't want to but I can't see any other way out" (Client 89). Clients communicated being confused and uncertain about taking their life and frequently texted that they did "not know what to do". For example, one client messaged, "I don't know what to do because I just want everything to end" (Client 113).

Clients also communicated ambivalence regarding having a plan to take their life and what means they would use. They often used words such as "maybe", "not yet", and "probably" when answering questions surrounding intent. For example, in response to being asked about the likelihood of them acting on their suicidal thoughts, one client texted, "Part of me wants to and part of me doesn't at the moment I'm just sitting at a riverbank thinking. It's just a difficult decision but I just feel really down" (Client 83).

A Way to Communicate Distress: "I Just Don't Have Anyone I Can Talk to"

For many clients, their suicidality was a way of communicating their distress and pain. This theme discussed how clients often used suicidality to convey their anguish and connect with others.

Clients repeatedly said that suicidality was a way to express their pain. For example, one client texted, "Sometimes I have outbursts where I cry and say stuff but I never actually have intentions of doing it you know?" (Client 73). Often, when a client's desire to take their life was explored further by their counselor, it was found that their suicidality was a way to express their distress, and they did not want to die. This is highlighted in the interaction below.

Client 78: I wanna die.
Youthline 78: Hey hearing that you want to die. Just wanting to check your safety do you currently have a plan to end your life?
Client 78: No I just sick of being me and hurting.
These clients appeared to express suicidality as a way to receive support from others. An example of this is shown in the text message interaction below.
Client 14: I really want to die, I have no reasons to live anymore.
Youthline 14: We r concerned for u Are u intending to suicide tonight?
Client 14: No, I just don't have anyone I can talk to.

Increasing Intensity: "It's Getting Worse"

A number of clients communicated that although they always experienced some kind of suicidal ideation, the intensity of their suicidality varied over time. This theme highlighted how clients described their experience of suicidality as dynamic, with clients noting a gradual worsening and rapid shift in intensity over short time periods.

These clients communicated that their suicidal ideation was increasingly getting "worse" and "stronger". They frequently texted that their suicidal thoughts continued to increase in frequency and intensity over days and weeks. This is highlighted in the text interaction below.

Client 100: I just don't really know what to do.... it's getting worse.
Youthline 100: When you say it's getting worse what do you mean?
Client 100: Like the whole suicide thing.. it's on my mind more and more each day.

For many, as their suicidal ideation increased in intensity, so too did their behaviors that could increase their risk to themselves, such as not taking their medication and planning how they would take their life. For example, one client messaged, "Well ever since feeling like killing myself last Friday I've just felt odd and it's kind of been getting worse and worse every day which is why I don't feel like taking my antidepressants" (Client 47).

While most clients noted that their suicidality as a whole was worsening over time, clients also described the intensity of their suicidality increasing and decreasing over a short space of time, such as over hours or days. This is highlighted in the quotes below.

Client 60: My thoughts are very violent.
Youthline 60: What sort of violent thoughts are you having, just concerned for your safety.
Client 60: I don't know they've gone back to being murmurs in my head.

It was often unclear what exacerbated or alleviated these clients' distress. At times, they communicated increased suicidality in response to arguments with parents and friends and when they were experiencing strong emotions, such as anger and sadness. While other clients noted their suicidality increased when they were by themselves, particularly at night. For example, one client messaged, "It usually happens at night. When I'm alone it's just being alone makes me feel worse because that's when my mind goes crazy" (Client 100).

Out of Control: "My Head Takes Over"

A number of clients described their experience of suicidality as being out of their control. This theme explored how clients communicated having limited control over their experience of suicidality, highlighting the helplessness many described experiencing.

These clients conveyed a sense of their suicidality as being an external force that had consumed them. This is shown in the interaction below.

Client 7: My head takes over and I can't get away from it.
Youthline 7: Can u tell us more about what u mean about your head taking over?"

Client 7: I try distract myself but my thoughts just win. They always come back so much worse and they get so unbearable to the stage where I'm hurting myself, taking pills, drinking and more.

Clients frequently described having no control over this force, often conveying a sense of helplessness. As one client texted, "I can't make it stop" (Client 59). They communicated feeling like they had very little or no control over their risk of attempting suicide. For example, one client messaged, "I'm scared because I don't know what's going to happen next or whether suicide will get to me first before the help starts working mainly" (Client 91). Clients repeatedly texted that they were unsure if they could keep themselves safe. They also had difficulty answering questions regarding the likelihood of them acting on their suicidal thoughts and often responded to questions regarding intent with "I do not know". For instance, one client messaged, "No one knows…one day I might actually go too far with my attempts or self-harm. Even I don't know. Till the time comes" (Client 19). They also communicated being frightened that they would take their life. As this client texted, "I'm scared of what i might do to myself" (Client 72).

Clients also often described experiencing a constant battle with their experience of suicide. For example, one client messaged, "It is very hard: (I don't know how much longer I can fight:)" (Client 50). They texted saying they felt "tired" and described feeling defeated with the constant struggle with their suicidality. As this one client texted, "I've given up trying and I'm already gone" (Client 37).

Planning Suicide: "I Have Made a Plan on How. Several Plans. In Case Others Fail"

Around half of the clients communicated having thought of how they would suicide, while the other half described experiencing suicidal thoughts with no plan or intent to act on their thoughts. This theme discussed the different levels of suicidal intent communicated by clients, highlighting that many had thought about how they would suicide, some were in the process of taking their life, and the remaining clients were experiencing suicidal thoughts with no intent.

The analysis suggested that around half of the clients communicated having thought about how they would suicide. These clients frequently talked about having very specific and detailed plans to end their life. They described having put a lot of thought into how they would take their life and reported thinking about their plan for a long time. Clients discussed leaving suicide notes for their loved ones and described researching ways to kill themselves online. For example, one client texted,

> "Um so it would probably be about 1 or 2 in the morning and a Saturday and I'll be at my uncles. I'd have a note for my parents when they come to pick me up to tell them why. But I'd probably hang myself in the shed with a belt" (Client 101).

Often, clients noted multiple ways they could suicide and consequently had more than one suicide plan. For example, one client messaged, "I have made a plan on how. Several plans. In case others fail. It'll just happen when the time and day is right" (Client 23). These plans involved jumping off buildings or bridges, hanging, overdosing on a range of substances, cutting, and running into traffic. For instance, one client texted, "Well my school is in town so I figured at break I'd wonder off find some rope and hang myself. Or jump off a building" (Client 118).

At times, clients said they had started preparing and carrying out their suicide plan, such as stockpiling medication. For instance, one client messaged, "I have taken like 5 anti-depressants from my brother every month for the past year and a bit. They are in my drawers" (Client 113). A small number messaged that they planned to take their life right then. For example, one client texted, "Yip before I go to bed I am going to use all my sister's sleeping pills and hope I don't wake up in the morning" (Client 110). Some clients were already attempting suicide before or while messaging in to Youthline. This is shown in the interaction below.

Client 119: Im hurting myself!!
Youthline 119: What do you mean?
Client 119: Im cutting and i feel like it.
Youthline 119: Is that really going to help?
Client 119: Yep cut deeper and deeper.

The majority of these clients said they did not want other services to get involved, such as emergency services or a mental health crisis team. This is highlighted in the interaction below.

Youthline 52: We are really concerned for ur safety right now. Can u please text us with ur address?
Client 52: Why do you want my address?
Youthline 52: We are concerned about u. U have said u have cut urself, taken pills and alcohol & we want to help u by getting u support right now. We can do this together. If u need the ambulance, we can call them. If we know where u r we can contact ur local crisis team to help.
Client 52: No. I just want to die.

These clients often declined Youthline's offer to call them and did not answer when their text message counselor tried to call them. However, at times they did eventually engage with supports, such as the mental health crisis team or emergency services or agreed to speak with Youthline over the phone. For instance, in the above example (Client 52), the client gave their contact details and Youthline was able to connect them with further support.

Interestingly, clients very infrequently described their suicidality as being impulsive. However, a small number of clients implied that their suicidal plans were impulsive and messaged that they planned on using whatever means they could find first or whatever was most accessible. For example, one client texted, "I'm alone and on the streets upset and I don't care how I'm just going to find a way to jump in front of a speeding truck, train, buildings, bridge, cliff anyway I find first" (Client 56). For those few who described their suicidal plans in this way, it often seemed in response to interpersonal difficulties, such as a fight with a family member or a peer. Of note, these clients often still described

experiencing ongoing and persistent suicidality that preceded their current crisis.

The remaining half of the transcripts suggested that clients experienced suicidality with no intent to act on their thoughts. These clients communicated experiencing frequent suicidal thoughts but had not thought about how they would take their life and had no obvious plan to kill themselves. As one client texted, "I'm not suicidal. Passively wanting to die and being actively suicidal are different things" (Client 32). This theme highlighted the heterogeneity among clients in regards to their suicidal intent.

Recognizing Help Was Needed: "I Need to Get Help"

A number of clients acknowledged needing help and support from others for their suicidality. This theme discussed how clients recognized that they needed help for their suicidality and what help they wanted.

These clients acknowledged they needed support from family or friends and sometimes more formal supports, such as a mental health crisis team, respite services, and school counselors. For example, one client texted, "I actually want to kms [kill myself], it's just idk [I don't know] I hate living I need to get help:/" (Client 22). However, at times, clients said they did not want support from others, which included talking to family, friends, or professionals. For instance, one client messaged, "No i DONT WANT HELP (Client 56). Clients also oscillated between wanting and receiving support from the service. These clients refused to answer their counsellors' questions or responded in a manner that was challenging. This is reflected in the interaction below.

Youthline 28: Do u have a plan 2 end ur life?
Client 28: Yeah.
Youthline 28: Can you please share more about your plan?
Client 28: No… You don't need to know.

Despite sometimes expressing reluctance about having a service intervene in their suicidal plans, clients repeatedly communicated wanting "someone to talk to" and support people who would listen to them. As one client texted, "My suicidal thoughts are back and I need help and no one's listening to me" (Client 48). They described wanting their support people to "care", trying to understand their feelings without judgment, and not minimizing their experience. For example, one client messaged, "I just need someone who understands me and would let me open up" (Client 22). Clients often said they did not want to be told what to do and instead wanted space to talk and be heard. As one client texted, "I know people care but I feel like I just need a friend. Who doesn't try and fix me or doesn't get it, but is just there" (Client 93).

DISCUSSION

This research offers unique insights into young people's experiences of suicidality in the moment of reaching out for help. The findings of this research counter the perception that young people are unwilling to ask for help with suicidality and instead suggests that some are desperately seeking timely help to manage and overcome their suicidality. The difficulty of engaging suicidal youth with help has often been attributed to their developmental priorities and concerns including an investment in autonomy and mistrust of authority (6–9). It might however be that many young people do in fact want help, but that services themselves are not well set up to respond to young people's distress in a respectful, timely, and developmentally appropriate manner (9, 46).

The findings of this research also challenge the idea that youth suicidality is necessarily unpredictable and impulsive and instead suggests that some young people are experiencing an ongoing struggle with suicidality. Although the young people who texted the helpline were clearly in a state of crisis, suicidality was frequently perceived as a persistent and ongoing experience, which was described as a constant and exhausting struggle (7, 26). Our findings highlight the importance of recognizing patterns of chronic suicidality amongst young people This underlines an urgent need for accessible primary mental health services specifically designed to be acceptable to youth (46).

As these young people's experience of suicidality was so frequent and chronic, suicide was often communicated as being a normal part of their life and seemed to have been integrated into their sense of self. These young people's individual struggles with suicidality might be reinforced by representations of suicidality as ubiquitous and normative, as has been suggested by researchers who have considered this phenomenon in contemporary youth cultures (47–49). The potential normalization of suicide amongst some young people highlights the need for a delicate balance of reducing understandings of suicide as a viable option whilst simultaneously decreasing the stigma associated with talking openly about suicide (48).

Interestingly, young people did not speak about the finality of ending their life and instead conveyed a perception that suicide would bring them peace and salvation. For many young people in this study, their motive was not solely to die, and other functions of their suicidality appeared to be in wanting to solve their problems or escape from emotional pain. It seemed that young people viewed suicidality as being a coping strategy in itself. Suicidal ideation and behaviors were often conveyed as being the only way these young people could cope with their difficulties and solve their problems (50–52). Our study also captured the lack of control that young people felt in dealing with the experience of suicidality itself. This is in line with the findings of Lachal and colleagues' meta-synthesis of qualitative studies, which suggested that young people experience a loss of self-control during episodes of suicidality (52). This highlights the value of interventions that might improve young people's sense of mastery, problem-solving ability, and emotion regulation skills (25, 53).

The young clients in our study also conveyed that suicide was a way for them to communicate pain and distress (32, 54). This is in line with research, which suggests that suicidality among young people might serve an interpersonal function (31). Some researchers have argued that revenge was an aspect of this communication (29). However, our findings did not support

this and instead indicated that the motivation behind suicidal young people's behavior was to alleviate and share their suffering (55, 56). Some researchers have argued that young people might lack the language to convey emotional pain effectively (25, 33). However, it may also be that young people are not given opportunities and encouragement to express their unhappiness. This may be especially pertinent in New Zealand, where young people feel their expressions of distress are silenced by those around them, including their families and broader society (46, 57). This underlines the importance of opening communication channels for young people to convey their distress prior to the point at which they are in crisis.

One of the most practically pertinent findings of this research was that suicidal youth often experience ambivalence surrounding taking their life. In our study, the clients who contacted the helpline were largely uncertain about whether they wanted to kill themselves. This ambivalence suggests a unique opportunity for counselors to ally with the part of the client that wishes to live. Similar ambivalent intent has been demonstrated among young people who attempt suicide and requires further research and clinical attention (12, 30, 32). Services that operate 24-h a day may be particularly important for young people experiencing suicidality, so that they have access to support in their moment of indecision.

Our analysis also underlined the heterogeneity and dynamic experience of suicide both within and among young people. Many of the text messages suggested that the intensity of young people's suicidality gradually worsened over time (14, 15). However, within this steady worsening, clients also appeared to experience intense fluctuations in their suicidality over very short periods of time. This is congruent with previous research, which suggests that suicidality may be dynamic and changing (20). This finding supports the need to take the possibility of rapid fluctuations of suicidality into account when designing and carrying out risk assessments with young clients.

While not all of the clients whose transcripts were analyzed in this study communicated having a suicide plan, many did communicate that they had clear plans of how they would take their life and had considered a method of suicide. These methods were often accessible, such as overdosing on over the counter medication and hanging themselves. This highlights the importance of suicide prevention initiatives, including suicide safety planning, that targets restricting access to suicide means where possible (57, 58). The suicide plans the young people described were often also highly detailed, some indicating that multiple options for carrying this out had been considered. This suggests that suicidal young people may spend prolonged periods thinking about ways they could take their life. This supports other research noting that young people's experience of suicidality may precede any noticeable "at risk" behaviors (7, 26). Although these findings contrast with many of the dominant understandings of youth suicide as being impulsive, they are congruent with studies that have found premeditation is a stronger predictor of suicidality than impulsivity (15, 59). However, this finding may also reflect a particular subsection of the youth population who can avert a suicidal impulse long enough to reach out for help.

Although less common, some young people in the study also texted an immediate intent to take their life and noted carrying out suicidal behaviors before and while messaging the service. This suggests that, although some youth may be ambivalent about suicide, others experiencing suicidality do experience imminent intent and attempt suicide (1, 60). Although these young people frequently communicated not wanting emergency support, it is important to emphasize that they did message in for help. This indicates that young people experiencing suicidality may want support at their critical or heightened moment of distress, but it may be a specific kind of support responsive to their individual needs and wants (61).

Importantly, our analysis suggests that young people experiencing suicidality often acknowledged that they needed help, indicating they had some insight into their difficulties and contrasts with previous research, which found suicidal youth do not recognize the need for support (6, 8). Previous research indicates that young people are more willing to engage with text counseling support in a crisis than with telephone or face-to-face counseling. This underlines the importance of making accessible helplines available to young people who are experiencing suicidality (62). Further research is urgently needed to establish whether the advantages of accessibility and acceptability of text counseling for young people are matched with their effectiveness in preventing suicide.

Limitations

Due to the anonymity allowed by the helpline service, the clients' data was unknown. Consequently, important information, such as the client's age, gender, and ethnicity remained undetermined. However, this research aimed not to provide a statistical generalization to specific populations but to gain an in-depth understanding of young people's communication of their experience of suicidality. Further limitations of the data related to the context of the counseling session. While, in some cases, the counsellors' questioning was able to elicit further information, it was also constrained by the counsellors' responses and the format and purpose of the counseling situation.

CONCLUSIONS

There is limited research in the youth suicide literature from the perspectives of young people themselves. This study provided further understanding of suicidality among young people by focusing on how they themselves communicated their experience of the phenomena in real-time. The insights they provide into the experience of suicidality have important implications for both prevention and early intervention strategies in youth suicide.

DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the data consists of sensitive material collected during a crisis helpline interaction. We only have ethics permission for the authors access to these. Requests to access the datasets should be directed to kl.gibson@auckland.ac.nz.

ETHICS STATEMENT

AUTHOR CONTRIBUTIONS

JV was the first author and carried out the research. KG supervised the research, assisted with the data analysis, and write up. All authors contributed to the article and approved the submitted version.

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Factors associated with suicidality among school attending adolescents in morocco

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Suicide amongst adolescents is a growing epidemic accounting for 6% of all adolescent deaths. Even though 79% of adolescent suicides occur in low- and middle-income countries, where suicide is the second leading cause of death, research is relatively lacking. As such, we aim to gain a greater understanding of suicide in said countries by assessing ideation and planning and associated factors in Morocco. Global Schools Health Survey data was analyzed. Approximately 14.4 and 12.9% reported ideation and planning respectively during the prior year in 2016, indicating a decrease from the reported rates of ideation of 16.0 and 17.0% and planning of 14.6 and 15.0% in 2006 and 2010 surveys respectively. Increased ideation was found to be positively associated with identifying as female and increasing age, whereas planning was positively associated with a lower educational level and living in a rural area. Both were positively associated with increased hunger frequency. Several factors increased the likelihood of ideation: bullying, feeling lonely, current cigarettes smoking, and current marijuana use. Studying factors associated with suicide is challenging, alternatively, factors affecting ideation and planning can be assessed. Sociocultural differences may impact trends in a specific region, though countries in said region may have comparable trends. The study adds to the limited data available in the region. Reverse causality and under-reporting could be the main limitations of this study. Interventions taking into account those results should be tested to decrease such a prevalence.

KEYWORDS

suicide, Suicidality, adolescents, Morocco, MENA, wellbeing

Introduction

Suicide among adolescents is a growing epidemic affecting youth globally accounting for 8.5% of all causes of mortality amongst young adults aged 15–29; it is the second cause of death among adolescent worldwide (1). Even though the absolute number of suicide cases among adolescents is lower than that of older adults, it poses a significant public health threat affecting individuals, families, and communities alike through multiple dimensions including economic, social and psychological (2). Although low- and

middle-income countries account for 79% of suicide cases among adolescents, research delving into suicide, associated risk factors, and prevention is often neglected in said countries (3). Prior studies have highlighted the scarcity of data and research in Muslim-majority countries, which in turn impacts assessment of prevalence, effective intervention planning and education, and prevention (4). Suicide is defined as the act of taking one's own life intentionally. While suicidal ideation is defined as having thoughts of wishing you were dead (would be better off not living) but without having plans to commit suicide, and suicidal planning is having a detailed suicidal plan (5). Though the rates of suicidal ideation and suicidal planning are higher than suicidal attempts and completed suicide, the prevalence of completed suicide is staggering. According to the National Institute of Mental Health, in 2018 1.4 million Americans attempted suicide and 47,173 died as result of suicide, of which 6,769 were between the ages of 10 and 24 (6). According to the WHO, every 40 seconds one person dies as a result of suicide.

Suicide is complex to understand for both the victims and researchers alike. As such, it is a multidimensional complex public health threat that is challenging to truly decipher and understand. Although suicidality is hard to predict, there has been multiple studies exploring the potential risk factors of suicide including psychological, sociological, and biological factors. A study exploring suicide and its associated risk factors on both population and individual level concluded that individual risk factors include family history, loneliness, traumatic events, interpersonal stressors, and non-mental chronic disease (7). About 20% of adolescents experience mental health disorders, depression and anxiety being most common, which precipitate most of suicide and suicidal attempts (8, 9). It is hypothesized that adolescents would utilize online search engines to explore methods for suicide, which could be used to explore associations and target interventions. A study conducted in Italy, found an association between Google search volumes for the term "suicide" and the volume of death due to suicide in the following 3 months; however, no correlation was found with the terms "how to commit suicide" and "commit suicide." The difference in correlation is thought to be due to the search being linked to other factors such as personal interest and suicide bereavement (10). According to the World Health Organization and the United Nations Children's Fund, health systems and international organizations need to place more emphasis on the importance of adolescents' mental health (1).

Suicide is associated with a wide variety of risk factors and demographics that are different/heterogeneous between different regions of the world (1). Research studies conducted in Europe and North America indicate that the rate of suicide differs between genders and a correlation exists with multiple associated factors including life satisfaction and mental illness (11). Some studies have shown that the male sex, parental and/or personal mental health problems, belonging to the LGBTQI+ community, substance intoxication, substance use

disorders, and pathologic internet use are associated with increased risk of suicide (12). The rates of completed suicide amongst boys is 3 times that of girls; however, the rates of incomplete suicidal attempts are 2 times higher in girls as compared to boys. It is estimated that between 1 in 50 to 1 in 100 suicidal attempts are completed suicides. The gender discrepancy in the rates of completed suicide and suicidal attempts is hypothesized to be due to girls using less lethal methods as compared to boys (12). However, relatively limited research is conducted in the Middle East and North Africa due to multiple variables including lack of reporting due to the associated social stigma and cultural restrictions. The available studies often combine countries together or use older datasets. Socio-cultural differences play a significant role in the perception of suicide, which may impact reporting of suicide cases. When assessing suicidality and associated risk factors, it is important to assess both suicidal ideation and planning within a specific sociocultural context. Unfortunately, due to limited suicide research in the Eastern Mediterranean Region, there is relatively limited information as compared to other regions (13). A 2017 study assessing suicide in Morocco using the 2010 dataset of the Global Schools Health Survey found that 16.6% of adolescents have expressed suicidal ideation, and a positive correlation existed between suicide and increasing age, food insecurity, anxiety, loneliness, bullying, substance abuse, and cigarette and marijuana smoking (14). Additionally, a recent study evaluating suicidal ideation amongst adolescents in Lebanon found that out of the 1,810 adolescents enrolled, 28.9% expressed suicidal ideation, which was associated with psychological abuse, child physical abuse, alcohol dependence, fear, impulsivity, bullying, internet addiction and identifying as female (15).

The following study primarily aims are to 1) estimate the prevalence of suicidal ideation and suicide planning amongst school attending adolescents in Morocco and compare it to prevalence of other countries during the same period, 2) explore associations between suicidal ideation and planning and demographic variables and 3) explore the potential association between suicidal ideation and planning and risky behaviors amongst school attending adolescents. We hypothesis that suicidality is positively associated with worse mental health wellbeing and increased risky behaviors.

Materials and methods

Study setting and sample

Morocco, located in the Southern Mediterranean in Northwest Africa, is an amalgamation of African, Arab, and European cultures 15. According to the world bank, Morocco is classified as a lower middle-income country with a population of approximately 37 million, of which 30% are youth between the ages 15 and 29 (16, 17). Though multiple languages are

spoken across Morocco, Arabic is the official national language (18). Over the past two decades, primary school enrollment significantly increased, and it was reported to be 99.1% in 2018 (19).

The following study is a secondary data analysis of an open access data available for the cross-sectional study the "Global Schools Health Survey (GSHS)" conducted in 2016 in Morocco. The GSHS is a collaborative joint effort between the World Health Organization and the United States Centers for Disease Control and Prevention to assist countries globally to accurately assess behaviors amongst school attending young adolescents with low administrative cost. The GSHS is a self-administered questionnaire exploring 10 pillars: Alcohol use, Dietary behaviors, Drug use, Hygiene, Mental health, Physical activity, Protective factors, Sexual behaviors, Tobacco use, and Violence and unintentional injury (20). Inclusion criteria was based on class level and not on age, recruiting participants in grades 7–12. Exclusion criteria include individuals not enrolled in school at the time of the study. Necessary ethical approvals were obtained by the national authorities such as Ministries of Public Health and Education. Participation in the survey is voluntary, and students may opt out.

A total of 6,745 school-attending adolescents between the ages of 13 and 17 participated in the study, with a student response rate of 93% 23. Participants were enrolled in schools in either rural or urban areas in Grades 1 ASC - 2nd yr. Bac (equivalent to grades 7–12).

Measures

The Global Schools Health Survey that was conducted in Morocco assessed, except for alcohol use and sexual behaviors, all other 8 core modules in the questionnaire.

Suicidality was assessed by measuring suicidal ideation and suicidal planning, using the questions "During the past 12 months, did you ever seriously consider attempting suicide?" and "During the past 12 months, did you make a plan about how you would attempt suicide?" respectively. Participants' demographics including age, sex, weight, educational level, hunger frequency, and school setting were collected. The four questions regarding parental involvement were first dichotomized into yes or no as per the following: "Reported that their parents or guardians most of the time or always checked to see if their homework was done," "Reported that their parents or guardians most of the time or always understood their problems and worries," "Reported that their parents or guardians most of the time or always really knew what they were doing with their free time," and "Reported that their parents or guardians never or rarely went through their things without their approval." The variable parental involvement was then the sum of the previous four dichotomized variables with higher scores indicating higher levels of parental involvement. Additionally, mental health and

wellbeing were assessed using two questions: "Most of the time or always felt lonely" and "Most of the time or always were so worried about something that they could not sleep at night." Victimization due to bullying was assessed with "Were bullied during the past 30 days." Additionally, substance use was measured using multiple different questions: "Currently smokes cigarettes," "Currently uses marijuana," "Ever used amphetamines or methamphetamines," and "Used drugs before age 14 years."

Statistical analysis

Demographics were summarized using frequency distributions. Chi-squared tests were used to evaluate the association between different demographic variables and suicidal ideation and planning. Univariate and Multivariate logistic regressions were used to explore the simultaneous associations between potential associated factors and suicidal ideation and planning while controlling for age, sex, school grade, weight, parental involvement, and hunger frequency. Unadjusted and Adjusted Odds Ratios and their 95% confidence intervals were reported. A p-value less than or equal to 0.05 was considered significant. The analysis was conducted using IBM SPSS Statistics Version 26.0, Armonk NY, USA.

Results
Global trends

The prevalence of suicidal ideation and planning amongst adolescents in Morocco in 2016 was 16.0% (95% CI: 15.1–17.0) and 14.6% (95% CI: 13.7–15.5) respectively. During the prior decade the prevalence of both suicidal ideation and planning increased from 14.4 and 12.9% in 2006 to 17.0 and 15.0% in 2010. Using GSHS data conducted around the same year, the results in Morocco were comparable to that of other Eastern Mediterranean Region (EMR) countries such as Lebanon. Liberia had the highest percentage of both suicidal ideation and planning amongst school attending adolescents with 26.8 and 36.5% respectively in comparison to other countries in which the GSHS was administered. Myanmar had the lowest percentage of suicidal ideation and Indonesia had the lowest percentage of suicidal planning: 8.7 and 6.3% respectively. The trends also suggest that the Americas region has the highest overall prevalence of suicidal ideation. Table 1 includes global trends of suicidal ideation and planning from each of the five regions the GHSH was conducted.

TABLE 1 Global trends of suicidal ideation and planning among school attending adolescents based on the GSHS across the 5 different regions.

Region	Country	Year of survey	Suicidal ideation (%)	Suicidal planning (%)
EMR	Morocco	2016	16.0	14.6
	Morocco	2010	17.0	15.0
	Morocco	2006	14.4	12.9
	Lebanon	2017	17.7	8.9
	Kuwait	2015	17.2	17.2
	Afghanistan	2014	19.1	17.5
	Yemen	2014	16.1	14.4
	Iraq	2012	17.4	16.1
	Tunisia	2008	21.0	13.9
	Jordan	2007	17.8	17.8
Africa	Liberia	2017	26.8	36.5
	Mauritius	2017	15.8	14.3
	Mozambique	2015	18.6	20.6
	Seychelles	2015	21.5	21.8
Americas	Jamaica	2017	26.4	25.0
	Trinidad and Tobago	2017	22.2	21.9
	Anguilla	2016	22.8	22.3
	Guatemala	2015	20.7	16.6
South-East Asia	Bhutan	2016	11.5	13.8
	Indonesia	2016	9.3	6.3
	Myanmar	2016	8.7	6.5
	Thailand	2015	11.8	12.9
Western Pacific	Tonga	2017	12.4	14.0
	Vanuatu	2016	14.9	20.6
	Philippines	2015	10.2	14.9
	Brunei Darussalam	2014	9.5	6.6

Participants' characteristics

Overall, 53.1% of participants identify as male whereas 46.9% as female. The majority were of age 15 or older (54.6%), in ASC classes (grades 7 to 9) (66.9%) and living in rural areas (51.2%). Of participants, 8.7% reported the lowest level of parental involvement. About 1 in 10 of the respondents indicated that they were always or, most of the time hungry due to not having food at home. The mental health parameters assessed indicated that 20.1 and 17.6% felt lonely and were so worried they could not sleep respectively. Approximately 39% of the participants reported that they were bullied during the prior month. At least 8% currently smoke cigarettes, 7% currently use marijuana, 8% ever used amphetamines or methamphetamines, and 15% reported ever using drugs. Table 2 delves into the demographics and characteristics of all participants.

Bivariate and multivariate analysis

Suicidal ideation was found to be associated with multiple demographic variables, lack of parental involvement and risk behavior variables ($p < 0.05$) as indicated in Table 3. Bivariate associations revealed that adolescents who identified as male were less likely to express suicidal ideation as compared to females and an increase in hunger frequency increases the likelihood of suicidal ideation. Adolescents with increased parental involvement were associated with lower rates of suicidal ideation. Mental health and risky behavior parameters increased the likelihood of suicidal ideation. Multivariate analysis revealed an increase in suicidal ideation with increased age, identifying as female, lower school grade, lack of parental involvement and increased hunger frequency. In the multivariate analysis, the mental health and risky behavior parameters increased the likelihood of suicidal ideation: felt lonely most of the time

TABLE 2 Demographics and characteristics of the students that participated in the GSHS Morocco 2016.

Variables	Categories	N (%)
Age	11 years old or younger	100 (1.5)
	12 years old	713 (10.7)
	13 years old	1,050 (15.8)
	14 years old	1,147 (17.3)
	15 years old	1,065 (16.1)
	16 years old	1,152 (17.4)
	17 years old	713 (10.7)
	18 years old or older	693 (10.4)
Sex	Male	3,488 (53.1)
	Female	3,085 (46.9)
School Grade	1 ASC (grade 7)	1,600 (24.4)
	2 ASC	1,322 (20.2)
	3 ASC	1,459 (22.3)
	Common Core	761 (11.6)
	1st year Bac	697 (10.6)
	2nd year Bac (grade 12)	706 (10.8)
Weight	Normal	4,761 (78.7)
	Underweight	507 (8.4)
	Overweight	625 (10.3)
	Obese	155 (2.6)
Location	Rural	3,452 (51.2)
	Urban	3,293 (48.8)
Hunger Frequency during the past 30 days	Never	4,288 (65.6)
	Rarely	706 (10.8)
	Sometimes	865 (13.2)
	Most of the time or always	680 (10.4)
Level of Parental Involvement	None	577 (8.7)
	Level 1	2,883 (43.5)
	Level 2	1,726 (26.1)
	Level 3	1,055 (15.9)
	Level 4	383 (5.8)
Most of the time or always felt lonely during the past 12 months	Most of the time or always	1,317 (20.1)
	No	5,240 (79.9)
Most of the time or always were so worried about something that they could not sleep at night during the past 12 months	Most of the time or always	1,171 (17.6)
	No	5,489 (82.4)
Were bullied during the last 30 days	Yes	2,466 (38.9)
	No	3,869 (61.1)
Currently smokes cigarettes	Yes	534 (8.3)
	No	5,913 (9.7)
Currently uses marijuana	Yes	453 (7.1)
	No	5,951 (92.9)
Ever used amphetamines or methamphetamines	Yes	464 (8.1)
	No	5,276 (91.9)
Used drugs before age 14 years	Yes	593 (71.3)
	No	239 (28.7)

TABLE 3 Chi-squared and regression analysis of demographics and risk factors associated with suicidal ideation.

Variable	Category	Suicidal ideation (%)	Bivariate association		Multivariate association	
			Unadjusted OR	95% CI	Adjusted OR	95% CI
Age	11 years old or younger	9.2	0.495	0.233–1.052	0.192*	0.071–0.521
	12 years old	12.6	0.707*	0.523–0.957	0.397*	0.25–0.633
	13 years old	13.8	0.781	0.595–1.024	0.456*	0.301–0.689
	14 years old	15.8	0.919	0.708–1.192	0.610*	0.420–0.887
	15 years old	16.5	0.968	0.745–1.257	0.654*	0.457–0.937
	16 years old	17.6	1.042	0.808–1.344	0.730	0.525–1.017
	17 years old	18.8	1.135	0.86–1.498	1.030	0.751–1.413
	18 years old or older	17.0	1.000		1.000	
Sex	Male	15.0	0.868*	0.758–0.994	0.772*	0.661–0.903
	Female	16.9	1.000		1.000	
School Grade	1 ASC	15.5	1.145	0.884–1.484	2.607*	1.705–3.985
	2 ASC	14.5	1.055	0.807–1.378	1.966*	1.315–2.940
	3 ASC	17.5	1.324*	1.024–1.711	1.999*	1.393–2.868
	Common Core	15.4	1.138	0.848–1.526	1.578*	1.091–2.283
	1st year Bac	17.8	1.347*	1.005–1.806	1.53*	1.083–2.164
	2nd year Bac	13.8	1.000		1.000	
Weight	Normal	15.5	1.000		1.000	
	Underweight	12.6	0.789	0.596–1.044	0.777	0.578–1.044
	Overweight	17.7	1.178	0.942–1.473	1.179	0.930–1.494
	Obese	16.9	1.11	0.717–1.719	1.089	0.683–1.735
Location	Rural	15.9	0.975	0.853–1.114	0.936	0.802–1.093
	Urban	16.2	1.000		1.000	
Hunger Frequency during the past 30 days	Never	13.0	0.444*	0.362–0.544	0.478*	0.382–0.598
	Rarely	17.3	0.624*	0.477–0.816	0.654*	0.486–0.879
	Sometimes	22.3	0.854	0.668–1.092	0.796*	0.607–1.044
	Most of the time or always	25.1	1.000		1.000	
Level of Parental Involvement	None	12.6	1.000		1.000	
	Level 1	49.3	0.692*	0.555–0.864	0.731*	0.573–0.933
	Level 2	22.5	0.495*	0.388–0.631	0.507*	0.387–0.665
	Lever 3	12.1	0.412*	0.313–0.542	0.466*	0.344–0.631
	Level 4	3.5	0.313*	0.210–0.467	0.380*	0.246–0.587
Most of the time or always felt lonely during the past 12 months	Most of the time or always	29.1	2.894*	2.495–3.357	2.481*	2.091–2.944
	No	12.4	1.000		1.000	
Most of the time or always were so worried about something that they could not sleep at night during the past 12 months	Most of the time or always	30.2	2.908*	2.499–3.383	2.640*	2.220–3.141
	No	13.0	1.000		1.000	
Were bullied during the last 30 days	Yes	23.0	2.393*	2.079–2.755	2.145*	1.829–2.517
	No	11.1	1.000		1.000	

(Continued)

TABLE 3 Continued

Variable	Category	Suicidal ideation (%)	Bivariate association		Multivariate association	
			Unadjusted OR	95% CI	Adjusted OR	95% CI
Currently smokes cigarettes	Yes	35.7	3.389*	2.736–4.199	3.081*	2.386–3.979
	No	14.1	1.000		1.000	
Currently uses marijuana	Yes	32.6	2.831*	2.227–3.600	2.739*	2.058–3.647
	No	14.6	1.000		1.000	
Ever used amphetamines or methamphetamines	Yes	36.6	3.657*	2.896–4.618	3.360*	2.552–4.423
	No	13.6	1.000		1.000	
Used drugs before age 14 years	Yes	35.0	1.299	0.919–1.836	0.827	0.513–1.334
	No	29.3	1.000		1.000	

* $p < 0.05$.

(OR: 2.481; 95% CI: 2.091–2.944), so worried that they couldn't sleep (OR: 2.640; 95% CI: 2.220–3.141), bullied (OR: 2.145; 95% CI: 1.829–2.517), smoke cigarettes (OR: 3.081; 95% CI: 2.386–3.979), use marijuana (OR: 2.739; 95% CI: 2.058–3.647), and ever used amphetamines or methamphetamines (OR: 3.360; 95% CI: 2.552–4.423).

Additionally, suicidal planning was found to be associated with multiple demographic and risky behavior variables ($p < 0.05$) as indicated in Table 4. Bivariate analysis indicated that there is no statistically significant difference between male and female adolescents in terms of suicidal planning; however, multivariate analysis indicated that males are less likely to express suicidal planning (OR: 0.818; 95% CI: 0.696–0.961). Hunger frequency trends and parental involvement had similar results to that of suicidal planning in both bivariate and multivariate analysis. Multivariate analysis revealed multiple mental health and risky behavior parameters that increase the likelihood of suicidal planning ($p < 0.05$): felt lonely most of the time (OR:1.955; 95% CI: 1.632–2.342), so worried that they couldn't sleep (OR: 1.994; 95% CI: 1.657–2.399), bullied (OR: 1.715; 95% CI: 1.454–2.023), smoke cigarettes (OR: 2.920; 95% CI: 2.234–3.817), use marijuana (OR: 2.645; 95% CI: 1.971–3.549), and ever used amphetamines or methamphetamines (OR: 2.751; 95% CI: 2.070–3.656).

Discussion

The study found that 1 in 6 and 1 in 7 school attending adolescents in Morocco reported suicide ideation and planning respectively. That, suicidality is positively associated with age, being a female, lack of parental support, increased hunger frequency, risky behaviors and worse mental health wellbeing. Studying psychosocial factors associated with completed suicide poses a significant challenge, alternatively, factors affecting ideation and planning can be assessed. It is challenging to compare the data to the global international trends due to

sociocultural differences impacting the perception of suicide and thus affecting the willingness to self-report ideation and planning (1). However, the results and trends are comparable to those of other countries in the region with similar sociocultural influences (3, 21, 22).

The results indicate that the prevalence of suicidal ideation and planning among school-attending adolescents in Morocco is comparable to that of countries in the Eastern Mediterranean Region, which ranges from 16–21% and 9–17% respectively. In comparison to the other regions, GSHS data indicated that the prevalence of suicidal ideation and planning in Morocco is lower than that of countries in Africa and the Americans but higher than countries in South-East Asia and Western Pacific (Table 1). The results indicate that studying factors associated with suicide need to be socioculturally relevant to the said region as different factors may impact suicidality differently based on external factors.

Mental health and wellbeing in the Eastern Mediterranean Region are influenced by many parameters that are unique to the region. Belief and religiosity are found to be a source of wellbeing and a protective factor against suicide (23). The region contains an amalgam of religions: Islam, Christianity, and Judaism. Islam accounts for the belief of 90% of the citizens in the region (24). Religion plays a significant role in the lives of individuals in the region. Considering Islam, Christianity, and Judaism prohibit suicide, it may in turn affect the prevalence of suicide. The scarcity of data and research assessing suicide in Muslim-majority countries further challenges understanding suicide and associated factors in the region (4). Additionally, studies have shown the potential presence of a relationship between climate change and mental health (25). As such, the similarities in the climate in the region may play a role in the trends of mental illnesses particularly anxiety and depression (24).

The Eastern Mediterranean Region is rich in culture and historic backgrounds. Culturally, families in the region are more closely knit than other regions (24). Being in a supportive, healthy family-oriented environment is found to be protective

TABLE 4 Chi-squared and regression analysis of demographics and risk factors associated with suicidal planning.

Variable	Category	Suicidal planning	Bivariate association		Multivariate association	
			Unadjusted OR	95% CI	Adjusted OR	95% CI
Age	11 years old or younger	14.8	0.495	0.233–1.052	0.434*	0.190–0.990
	12 years old	12.8	0.707*	0.523–0.957	0.470*	0.288–0.765
	13 years old	14.8	0.781	0.595–1.024	0.569*	0.368–0.881
	14 years old	15.4	0.919	0.708–1.192	0.651*	0.434–0.979
	15 years old	15.0	0.968	0.745–1.257	0.707	0.476–1.049
	16 years old	15.5	1.042	0.808–1.344	0.846	0.584–1.227
	17 years old	14.2	1.135	0.86–1.498	1.095	0.766–1.566
	18 years old or older	12.0	1.000		1.000	
Sex	Male	14.6	1.003	0.871–1.155	0.818*	0.696–0.961
	Female	14.5	1.000		1.000	
School Grade	1 ASC	16.2	1.145	0.884–1.484	3.312*	2.107–5.208
	2 ASC	15.6	1.055	0.807–1.378	2.603*	1.689–4.010
	3 ASC	15.6	1.324*	1.024–1.711	2.162*	1.453–3.217
	Common Core	14.6	1.138	0.848–1.526	1.948*	1.304–2.909
	1st year Bac	10.5	1.347*	1.005–1.806	1.059	0.704–1.595
	2nd year Bac	10.0	1.000		1.000	
Weight	Normal	14.0	1.000		1.000	
	Underweight	14.9	1.071	0.821–1.397	0.997	0.750–1.325
	Overweight	15.0	1.082	0.853–1.373	1.132	0.883–1.450
	Obese	18.5	1.39	0.907–2.128	1.403	0.899–2.191
Location	Rural	15.7	1.204*	1.047–1.384	1.020	0.869–1.198
	Urban	13.4	1.000		1.000	
Hunger Frequency during the past 30 days	Never	12.2	0.444*	0.362–0.544	0.451*	0.360–0.565
	Rarely	14.3	0.624*	0.477–0.816	0.579*	0.426–0.788
	Sometimes	17.8	0.854	0.668–1.092	0.641*	0.484–0.849
	Most of the time or always	24.7	1.000		1.000	
Level of Parental Involvement	None	12.6	1.000		1.000	
	Level 1	48.6	0.701*	0.556–0.882	0.751*	0.581–0.969
	Level 2	23.9	0.545*	0.424–0.701	0.607*	0.459–0.803
	Lever 3	11.7	0.416*	0.312–0.554	0.496*	0.360–0.682
	Level 4	3.3	0.309*	0.202–0.473	0.409*	0.259–0.644
Most of the time or always felt lonely during the past 12 months	Most of the time or always	22.7	2.098*	1.792–2.457	1.955*	1.632–2.342
	No	12.3	1.000		1.000	
Most of the time or always were so worried about something that they could not sleep at night during the past 12 months	Most of the time or always	23.8	2.172*	1.847–2.553	1.994*	1.657–2.399
	No	12.6	1.000		1.000	
Were bullied during the last 30 days	Yes	19.2	1.926*	1.664–2.23	1.715*	1.454–2.023
	No	11.0	1.000		1.000	

(Continued)

TABLE 4 Continued

Variable	Category	Suicidal planning	Bivariate association		Multivariate association	
			Unadjusted OR	95% CI	Adjusted OR	95% CI
Currently smokes cigarettes	Yes	29.9	2.975*	2.374–3.729	2.920*	2.234–3.817
	No	12.5	1.000		1.000	
Currently uses marijuana	Yes	33.8	3.447*	2.713–4.379	2.645*	1.971–3.549
	No	12.9	1.000		1.000	
Ever used amphetamines or methamphetamines	Yes	32.1	3.267*	2.567–4.158	2.751*	2.070–3.656
	No	12.6	1.000		1.000	
Used drugs before age 14 years	Yes	32.8	1.787*	1.224–2.609	1.261	0.740–2.149
	No	21.5	1.000		1.000	

* p < 0.05.

of mental illness (26). Both cultural background and a family environment supports mental wellbeing (24).

The common misconceptions and negative attitudes toward mental illness generate stigma that impacts access to mental healthcare and mental wellbeing. Due to the influence of culture and religion in the Arab world, mental illness is often viewed as the result of a higher power. For instance, Muslims often view mental illness as the "evil eye" or "jinn possession," Christians often view it as the "devil possession" and in certain countries due to cultural influences it is viewed as a "case of contamination" that can be accidentally contracted by "stepping on sorcery or drinking it" as seen in Morocco (27).

The results indicate that the prevalence of suicidal ideation and planning are similar in the region, which could be due to the sociocultural differences as highlighted above. Additionally, the results support the global sex differences in suicidal ideation, which indicates that females are more likely to express suicidal ideation (28).

Additionally, the demographic data associated with suicidal ideation was similar to that of other countries in the region. For instance, an increasing hunger frequency was associated with an increase in suicidal ideation (22). Multiple studies exploring variables that increase the likelihood of suicidal ideation also revealed an increased likelihood associated with increased bullying, cigarette smoking, feeling lonely, feeling worried, drug use, and marijuana use (15, 22, 28). Interestingly however, our study revealed an association between suicidal ideation and increasing age, which was similar to a study conducted in Lebanon using data from 2005 but opposing another study conducted in Lebanon in 2020 (15, 22).

Suicidal planning trends and associations were similar to that of other countries in the region. A study assessing factors associated with suicidal ideation and planning amongst Palestinian adolescents also revealed that feeling lonely, feeling worried, experiencing bullying, smoking cigarettes, using marijuana, and using amphetamines increased the likelihood of

suicidal planning. Similarly, our study revealed similar findings using both bivariate and multivariate analysis. Additionally, our results revealed that drug use before the age of 14 increased the likelihood of suicidal planning. In terms of participants characteristics, our data indicates an association between increasing hunger frequency, living in a rural area and suicidal planning. Both parameters may be associated with socioeconomic status affecting food scarcity. Additionally, it was found that decreasing educational levels was associated with increasing rates of suicidal planning.

The study adds to the limited data available in the region. Based on the results and regional trends, national systemic interventions need to be studied to decrease the prevalence of the growing public health threat. Interventions need to be aimed at tackling hunger frequency, creating supportive school environments, introducing school counselors in order to recognize early signs and intervene early, and educate students about mental health and the consequences of cigarette smoking, marijuana use, and drug use. Additionally, significant efforts are needed to address the stigma associated with mental illness, which impacts individuals' willingness to seek help.

It is challenging to study the factors associated with completed suicide, as such suicidal ideation and planning are used instead to draw inferences. Additionally, it is also challenging to conduct a prospective study to explore factors associated with completed suicide. Alternatively, a cross-sectional design was used. The main limitation of such study design is reverse causality, and thus only allows us to determine associations rather than causation. Additional limitations include under-reporting, sample size not including adolescents not enrolled in schools, and the lack of pertinent demographics such as socioeconomic status, religion, and family dynamics. On the other hand, the study's large sample size ensures the diversity and representativeness of the data, and since the data was a part of the WHO's Global Schools Health Survey it allows for better comparison between regions and

countries. Further research needs to be conducted to consider specific sociocultural differences in order to better understand their impact on suicidality.

Based on the study results, monitoring of adolescent mental health wellbeing in schools should be a priority, awareness campaigns with parents should be initiated and culturally acceptable interventions should be developed and tested to address suicidality. The effort should come from all involved parties (Government, School, Parents and Adolescents) focusing on psychoeducation, taking into account sociocultural factors and also tackling the associated stigma to build community-based interventions.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Moroccan Ministry of Health. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

AT conducted the literature review, statistical analysis, and manuscript writing under the supervision and mentorship of

ZM. Both authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Global prevalence and characteristics of non-suicidal self-injury between 2010 and 2021 among a non-clinical sample of adolescents: A meta-analysis

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Background: Adolescents with immature mind and unstable emotional control are high-risk groups of non-suicidal self-injury (NSSI) behavior. We meta-analyzed the global prevalence of NSSI and prevalence of NSSI characteristics in a non-clinical sample of adolescents between 2010 and 2021.

Methods: A systematic search for relevant articles published from January 1, 2010 to June 30, 2021 was performed within the scholarly database search engines of CBM, CNKI, VIP, Wanfang, PubMed, Web of Science, PsycINFO, and Embase. Eligibility criteria were as follows: provided cross-sectional data on the prevalence of NSSI; the subjects were non-clinical sample adolescents; and a clear definition of NSSI was reported. We used the following definiton of NSSI as our standard: the deliberate, self-inflicted destruction of body tissue, such as cutting, burning, and biting, without attempted suicide. The quality evaluation tool for cross-sectional studies recommended by the JBI was used. The global prevalence of NSSI was calculated based on the random-effects model by Comprehensive Meta-analysis version 3.0. Subgroup analyses were performed to compare the prevalence according to sex, living place, smoking or drinking history, and family structure.

Results: Sixty-two studies involving 264,638 adolescents were included. The aggregate prevalence of NSSI among a non-clinical sample of adolescents was similar between over a lifetime (22.0%, 95% CI 17.9−26.6) and during a 12-month period (23.2%, 95% CI 20.2−26.5). Repetitive NSSI was more common than episodic NSSI (20.3% vs. 8.3%) but the frequency of mild injury (12.6%) was similar to that of moderate injury (11.6%). Multiple-method NSSI occurred slightly more often compared than one-method NSSI (16.0% vs. 11.1%). The top three types of NSSI in adolescents were banging/hitting (12.0%,

95% CI 8.9–15.9), pinching (10.0%, 95% CI 6.7–14.8), and pulling hair (9.8%, 95% CI 8.3–11.5), and the least common type was swallowing drugs/toxic substances/chemicals (1.0%, 95% CI 0.5–2.2). Subgroup analyses showed that being female, smoking, drinking, having siblings, and belonging to a single-parent family may be linked to higher prevalence of NSSI.

Conclusion: This meta-analysis found a high prevalence of NSSI in non-clinical sample of adolescents, but there are some changes in severity, methods, and reasons. Based on the current evidence, adolescents in modern society are more inclined to implement NSSI behavior by a variety of ways, which usually are repetitive, and moderate and severe injuries are gradually increasing. It is also worth noting that adolescents with siblings or in single-parent families are relatively more likely to implement NSSI behavior due to maladjustment to the new family model. Future research needs to continue to elucidate the features and risk factors of NSSI so as to intervene in a targeted way.

Limitation: The limitation of this study is that the heterogeneity among the included studies is not low, and it is mainly related to Chinese and English studies. The results of this study should be used with caution.

Systematic review registration: [www.crd.york.ac.uk/prospero/], identifier [CRD42022283217].

Introduction

Non-suicidal self-injury (NSSI) behavior in adolescents is an ongoing societal health concern and is defined as the deliberate, direct, and socially unacceptable destruction of body tissue, such as skin cutting, skin burning, and hitting oneself, but without an attempt at suicide (1, 2). The possible motivation and potential purpose of NSSI behavior in adolescents might be to remove difficulties in life, release pressure or control emotion (3). NSSI behavior often carries a high risk of personal injury and high risk of repetition, which can increase the occurrence of suicidal behavior and seriously endanger the physical and mental health of adolescents (4, 5). Many lines of evidence indicate that while adolescents are physically mature during puberty, they have yet to reach psychological maturity, have higher levels of impulsivity, and may experience difficulty in regulation of negative emotions and be prone to engage in NSSI behaviors (6). Moreover, NSSI during adolescence can have long-lasting and far-reaching developmental consequences, manifesting as anxiety, depression, and suicidal behaviors later in life as well as increased burden on society and families (7). The prevalence of NSSI in adolescents increased significantly at the beginning of the 21st century, and the incidence remains high (8).

In China, a total of 15,623 adolescents in rural regions were engaged in a nationwide survey by using a multistage sampling method, and approximately 29% of them reported a history of NSSI at least once during the last year (9). In the United States, a 2015 survey by the Centers for Disease Control and Prevention Youth Risk Behavior Surveillance System estimated the prevalence of NSSI behavior among high-school-age adolescents ($n = 64671$) in 11 US states. It concluded that 6.4–30.8% of adolescents had purposefully engaged in NSSI behavior without attempted suicide during the past 12 months (10). A cross-sectional assessment comprising 12,068 adolescents in 11 European countries determined the lifetime prevalence of direct self-injurious behavior (D-SIB) to be 27.6%, corresponding to 19.7% for occasional D-SIB and 7.8% for repetitive D-SIB. Lifetime prevalence varied from 17.1 to 38.6% across countries (11). According to a meta-analysis, the average lifetime prevalence of primary occurrence of NSSI in school-aged adolescents worldwide was 17.2% (range 8.0–26.3%) (12). Another meta-analysis involving 686,672 children and adolescents found a 22.1% (95% CI 16.9–28.4) lifetime prevalence of NSSI and 19.5% (95% CI 13.3–27.6) in a 12-month time period (13). It is not difficult to see that NSSI has become one of the key health problems in the field of adolescent psychology in the past decade. However, the epidemic characteristics and influencing factors of NSSI in different regions of the world are quite different.

Therefore, we conducted a meta-analysis to estimate the global prevalence of NSSI behavior and research its characteristics in adolescents. In this context, we were able to identify epidemiological and social factors associated with NSSI that could be used to deliver timely assistance and intervention in the future.

Methods

This study was conducted by following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (14), with the registration number of CRD42022283217 on PROSPERO.

Search strategy and eligibility criteria

A systematic search within the literature was performed using the electronic databases China Biological Medicine (CBM), China National Knowledge Infrastructure (CNKI), VIP database, Wanfang database, PubMed, Web of Science, PsycINFO, and Embase, from January 1, 2010 to June 30, 2021. In this study, we use the combination of Mesh words and free words for literature search. The following search terms or combination thereof were used (* indicates truncation): ("self-harm" or "self-injury") and ("adolescent" or "youth" or "young" or "teen*" or "student*" or "school*") and ("prevalence"). Reference lists from the retrieved literature were also examined to identify additional studies.

Two authors (X-zS and L-jH) independently confirmed the eligibility of studies by screening title and abstract. Studies published in English or Chinese were considered. Any dissonance between the two authors was communicated and jointly resolved. Eligibility criteria are as follows: provided cross-sectional data on the prevalence of NSSI; the subjects are non-clinical sample adolescents who are those between the ages of 10 and 19; and a clear definition of NSSI was reported. We used the following definiton of NSSI as our standard: the deliberate, self-inflicted destruction of body tissue, such as cutting, burning, and biting, without attempted suicide (1, 2). Any study that did not meet the above inclusion criteria was excluded.

Data extraction

Two authors (L-jH and D-dH) independently and manually extracted data from eligible studies after reading the full-length text. The following data were extracted: name of first author, year of publication, country of origin, study design, instrument for NSSI assessment, participant gender, total sample size, mean age of participants, and prevalence of NSSI. Prevalence of NSSI

was considered our primary outcome. Disagreements about data extraction were resolved by the corresponding author (X-hH). We used the quality evaluation tool for cross-sectional studies recommended by the Joanna Briggs Institute (JBI) (15).

Statistical analysis

All statistical analyses were conducted with Comprehensive Meta-analysis version 3.0. The I^2 statistic was used to assess the between-study heterogeneity, which described the percentage of variance on a basis of real differences in study effects. An I^2 value of 25% was considered low, 50% moderate and 75% substantial. If significant heterogeneity was detected, the random-effects model was applied. The random-effects model assumes various effect sizes between studies, different study designs and study subjects. Thus, the aggregate prevalence of NSSI was calculated based on the random-effects model, and data were reported with the corresponding 95% confidence interval (CI) where appropriate. The statistical significance level was set at $p < 0.05$.

Publication bias was assessed using the funnel plot along with Egger's and Begg's tests. A p value of 0.05 or less was used as the cut off for the presence of statistically significant publication bias. Subgroup analyses were performed to compare the aggregate prevalence of NSSI outcome in each study as a function of sex, living place, smoking, or drinking history, and family structure. Sensitivity analyses were performed by changing the combined effect model to explore potential sources of heterogeneity.

Results

Study selection and characteristics

The detailed process of paper selection is displayed in Figure 1. A total of 1,857 relevant citations were gathered after an extensive literature search was performed in several databases. Duplicates ($n = 159$) were removed, and a screen of titles and abstracts determined that an additional 1,601 were irrelevant. The resulting 97 studies were comprehensively reviewed, and an additional 35 were excluded. Finally, 62 studies including 264,638 subjects were used in this meta-analysis.

Characteristics of the included studies are shown in Table 1.

Quality assessment of included studies

Most of the included studies (44, 71%) were of high quality, complied with all items of the quality evaluation tool for cross-sectional studies recommended by the JBI, but a few included

FIGURE 1
Flow chart of literature search.
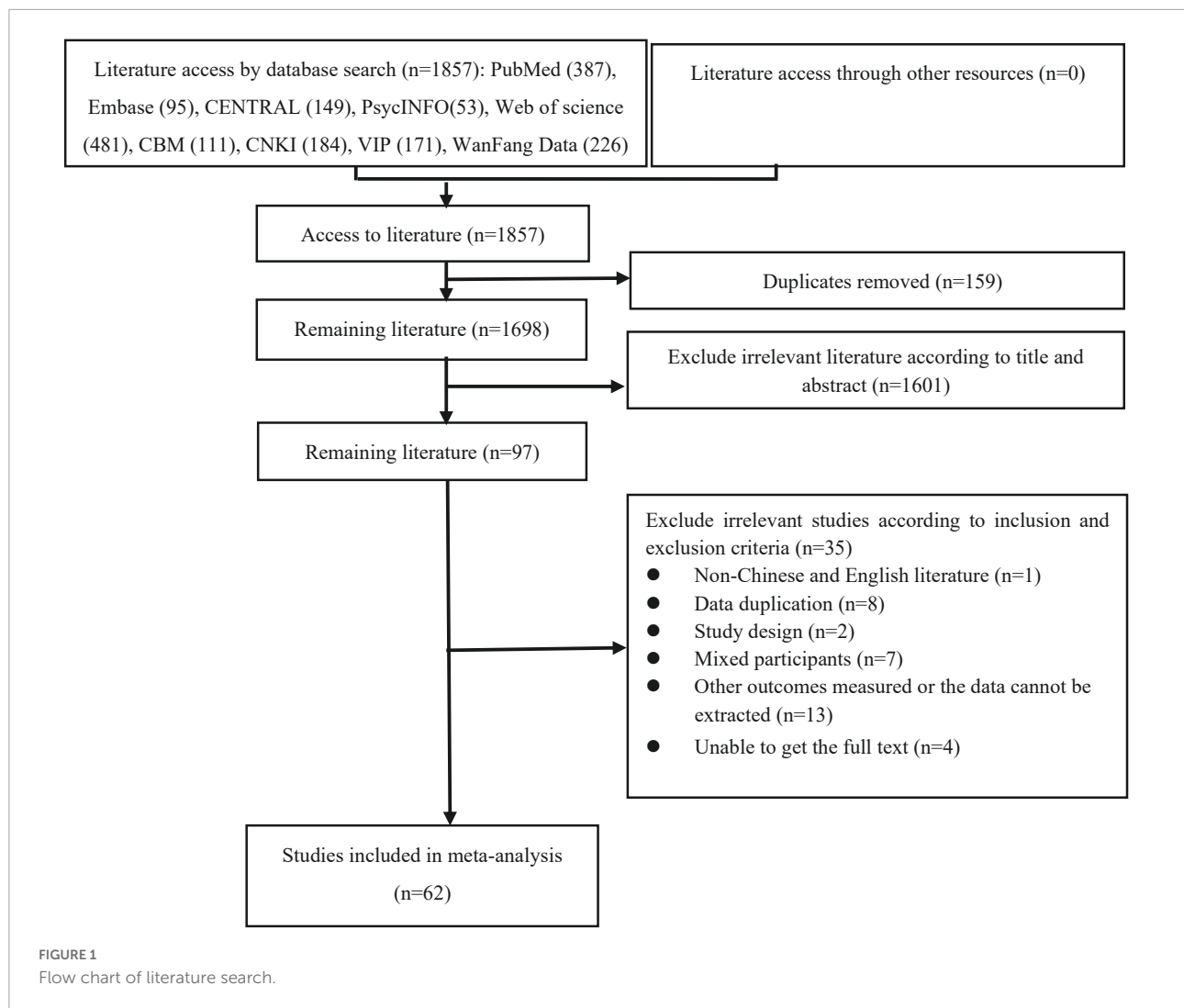
studies (18, 29%) did not clearly give the content required for evaluation (**Table 2**).

Aggregate prevalence of non-suicidal self-injury in adolescents

Lifetime and 12-month prevalence

Of the 62 included studies, some reported lifetime prevalence, some reported 12-month prevalence, and some both. In our study the lifetime aggregate prevalence of NSSI among 64,484 adolescents included in 29 studies was 22.0% (95% CI 17.9–26.6) (**Figure 2**). There was a significant level of heterogeneity detected (I^2 = 99.393, p < 0.001). The 12-month aggregate prevalence of NSSI was only slightly higher when assessed in 39 studies (23.2%, 95% CI 20.2–26.5) involving a total of 212,752 adolescents (**Figure 3**). The

heterogeneity remained significantly high with the additional studies (I^2 = 99.660, p < 0.001).

Aggregate prevalence of different characteristics of non-suicidal self-injury in adolescents

Frequency

Table 3 shows that the aggregate prevalence of episodic NSSI in adolescents was 8.3% (95% CI: 5.4–12.5), while 20.3% (95% CI 13.9–28.6) of adolescents reported repetitive NSSI.

Severities

The aggregate prevalence of minor or mild NSSI in adolescents was 12.6% (95% CI 6.4–23.3), which was similar to that of moderate or severe NSSI (11.6%, 95% CI 10.0–13.3) (**Table 3**).

TABLE 1 Characteristics of the included studies.

Study	Country of origin	Instrument for NSSI assessment	Sample size			Mean age	Prevalence of NSSI, %	
			Male	Female	Total		Past year	Lifetime
Yan et al., 2012 (16)	China	RBQ-A	705	583	1288	14.24	22.67	NA
Giletta et al., 2012 (17)	Italy; Netherlands	6-item measure	NA	NA	1502	15.69	22.84	NA
Di Pierro et al., 2012 (18)	Italy	SIQ-TR	79	188	267	17.03	13.48	18.4
Sornberger et al., 2012 (19)	United States	Single-item measure	3503	3623	7126	14.92	NA	24.47
Tang et al., 2013 (20)	China	FASM	1436	1471	2907	15.4	33.6	NA
Tormoen et al., 2013 (21)	United States	Single-item measure	NA	NA	11440	NA	NA	4.3
Cheung et al., 2013 (22)	China	Single-item measure	1047	1270	2317	16.4	13.98	NA
Zetterqvist et al., 2013 (23)	Sweden	FASM	1515	1545	3060	NA	35.6	41.6
Liang et al., 2014 (24)	China	8-item measure	1089	1031	2140	14	NA	23.1
Rodav et al., 2014 (25)	Israel	OSI-F	NA	NA	275	14.81	20.7	NA
Liang et al., 2014 (26)	China	SHQ	1085	1046	2131	13.92	NA	23.2
Evren et al., 2014 (27)	Turkey	Single-item measure	NA	NA	4957	15.58	14.4	NA
Albores-Gallo et al., 2014 (28)	Mexico	Self-injury questionnaire	244	289	533	13.37	12.6	17.1
Claes et al., 2014 (29)	Belgium	SHI	395	137	532	15.11	NA	26.5
Claes et al., 2015 (30)	Belgium; Netherlands	SHI	436	349	785	15.56	NA	20.1
Hanania et al., 2015 (31)	Jordan	Single-item measure	478	474	952	NA	14.29	22.6
Kiekens, 2015 (32)	Belgium; Netherlands	SHI	511	408	946	15.52	NA	24.31
Gandhi et al., 2015 (33)	Belgium	SIQTR	201	335	568	16.13	NA	16.5
Calvete et al., 2015 (34)	Spain	FASM	901	959	1864	15.32	32.2	NA
Somer et al., 2015 (35)	Turkey	ISAS	745	911	1656	16.8	NA	31.3
Kim and Yu, 2017 (36)	South Korea	DSHI	376	341	717	NA	NA	8.8
Cimen et al., 2017 (37)	Turkey	ISAS	241	314	555	NA	NA	11.4
Liu et al., 2017 (38)	China	Single-item measure	1027	1063	2090	15.5	12.6	8.8
Lin et al., 2017 (39)	China	Twelve NSSI behaviors	1007	1108	2161	15.83	20.1	NA
Ma et al., 2018 (40)	China	Adolescent NSSI behavior questionnaire	4600	5104	9704	NA	38.50	NA
Jiang et al., 2018 (41)	China	Chinese version of YRBSS	1005	805	1910	NA	6.80	NA
Cui et al., 2018 (42)	China	Single-item measure	2033	1704	3737	NA	34.7	NA
Gandhi et al., 2018 (43)	Belgium	Single-item measure	NA	NA	401	16.6	NA	16.5
Liu et al., 2018 (44)	China	Single-item measure	NA	NA	5696	15.0	21.4	28.1
Tang et al., 2018 (9)	China	Chinese-FASM	8043	7580	15623	15.2	29.2	NA
Ren et al., 2018 (45)	China	DSHI	955	1034	1989	15.45	20.8	NA
Jiang et al., 2018 (46)	China	DSHI	579	447	1026	13.76	24.2	NA
Cao et al., 2019 (47)	China	Single-item measure	1075	1029	2104	NA	NA	10.9
Chen et al., 2019 (48)	China	OSI	4150	2979	7129	15.48	NA	33.7
Chen et al., 2019 (49)	China	8-item measure	7250	6192	14162	15.13	15.36	NA
Ma et al., 2019 (50)	China	8-item measure	7999	7539	15538	15.13	28.74	NA
Xu et al., 2019 (51)	China	ANSAQ	10862	10969	21831	15	7.9	NA
Zhang and Zhang, 2019 (52)	China	Adolescents' non-suicidal self-injury scale	708	789	1497	12.01	NA	9.9
Li et al., 2019 (53)	China	8-item measure	10990	11638	22628	15.36	32.1	NA
Gaspar et al., 2019 (54)	Portugal	Single-item measure	1499	1763	3262	14.8	20.3	NA
Hu et al., 2020 (55)	China	OSI	4150	2979	7129	15.48	33.7	NA
Hu et al., 2020 (56)	China	ANSAQ	3995	3130	7125	13.93	51.40	NA
Jiang et al., 2020 (57)	China	ANSAQ	7347	7153	14500	14.83	14.81	NA
Lin et al., 2020 (58)	China	Modified Adolescents' Self-Harm Scale	997	1068	2065	NA	NA	40.34
Mao et al., 2020 (59)	China	Modified Adolescents' Self-Harm Scale	308	333	641	16.37	NA	32.1
Pang and Wang, 2020 (60)	China	Self injury behavior assessment questionnaire	7648	7174	14822	15.27	30.54	NA
Wang et al., 2020 (61)	China	Fourteen NSSI behaviors	412	363	775	15.58	41.3	NA

(Continued)

TABLE 1 Continued

Study	Country of origin	Instrument for NSSI assessment	Sample size			Mean age	Prevalence of NSSI, %	
			Male	Female	Total		Past year	Lifetime
Zhou et al., 2020 (62)	China	OSI	2219	2215	4434	14.38	33.3	NA
Liu et al., 2020 (63)	China	Adolescent NSSI Function Assessment Scale	1245	1460	2705	13.4	NA	47.1
Tang et al., 2020 (64)	China	Chinese-FASM	8043	7580	15623	15.1	28.58	NA
Gu et al., 2020 (65)	China	Seven NSSI behaviors	NA	NA	949	13.35	38.9	NA
Buelens et al., 2020 (66)	Belgium	Single-item measure	NA	NA	2130	15	NA	21.8
Liang et al., 2021 (67)	China	DSHI	670	611	1281	10.60	NA	42.31
Sun et al., 2021 (68)	China	RBQ-A	534	466	1000	NA	NA	27.6
Costa et al., 2021 (69)	Brazil	FASM	254	251	505	14.32	45.3	NA
Perez et al., 2021 (70)	Spain	ISAS	809	924	1733	15.76	NA	24.6
Madjar et al., 2021 (71)	Israel	NSSI-AT	148	158	306	NA	11.4	NA
Jeong and Kim, 2021 (72)	South Korea	Single-item measure	968	879	1843	NA	8.8	NA
Lee et al., 2021 (73)	South Korea	Korean-DSHI	1075	599	1674	16.6	28.3	NA
Tang et al., 2021 (74)	China	Twelve NSSI behaviors	545	504	1060	14.66	40.9	NA
Jiang et al., 2021 (75)	China	Seven NSSI behaviors	356	372	728	14.07	17.4	NA
Abbasian et al., 2021 (76)	Iran	ISAS	NA	NA	604	14.29	NA	38.7

SHQ, self-harm questionnaire; RBQ-A, risky behavior questionnaire for adolescents; YRBSS, youth risk behavior surveillance system; OSI, Ottawa self-injury; ANSAQ, adolescent non-suicidal self-injury assessment questionnaire; DSHI, deliberate self-harm inventory; SIQTR, self-injury questionnaire-treatment related; FASM, functional assessment of self-mutilation; OSI-F, Ottawa self-injury inventory-functions; SHI, self-harm inventory; ISAS, inventory of statements about self-injury; NSSI-AT, non-suicidal self-injury assessment tool; NA, not available.

Method

One-method NSSI affected 11.1% (95% CI 8.8–13.9) of the adolescent population included in our meta-analysis (Table 3), with a slightly higher percentage reporting multiple-method NSSI (16.0%, 95% CI 11.0–22.6).

Type

The top three types of NSSI in adolescents were banging/hitting (12.0%, 95% CI 8.9–15.9), pinching (10.0%, 95% CI 6.7–14.8), and pulling hair (9.8%, 95% CI 8.3–11.5), and the least used type of self-harm was swallowing drugs/toxic substances/chemicals (1.0%, 95% CI 0.5–2.2) (Table 3).

Subgroup analyses of non-suicidal self-injury among adolescents

Sex

When classified by gender, the prevalence of NSSI was significantly higher in females (25.4%, 95% CI 22.4–28.6) than in males (22.0%, 95% CI 19.2–25.0; $p < 0.001$) based on 43 studies (Table 4).

Urban vs. rural

When the subjects in 10 studies were grouped by location, the prevalence of NSSI was found to be higher among adolescents living in urban areas (26.6%, 95% CI 20.6–33.5) than among those living in rural areas (25.8%, 95% CI

20.9–31.4), but this difference was not statistically significant ($p > 0.05$) (Table 4).

Smoking or drinking history

Prevalence of NSSI was significantly higher in adolescents who smoked (24.7%, 95% CI 12.4–43.1 vs. non-smoking: 10.1%, 95% CI 3.2–27.6, $p < 0.01$) and drank alcohol (24.4%, 95% CI 12.2–42.9 vs. non-drinking: 9.3%, 95% CI 3.1–24.8, $p < 0.01$). The results from three studies are shown in Table 4.

Family structure

Finally, NSSI was more prominent among adolescents in families with multiple children (27.0%, 95% CI 24.0–30.3) than among those in single-child families (25.8%, 95% CI 22.5–29.3). Moreover, the prevalence of NSSI was higher among adolescents in single-parent families (30.1%, 95% CI 27.6–32.8) than among those in two-parent families (23.5%, 95% CI 19.0–28.5). Differences were statistically significant in both scenarios ($p < 0.05$).

Sensitivity analysis

In order to explore the stability of meta-analysis results, we repeated the meta-analysis with a fixed-effects model, which gave similar lifetime and 12-month aggregate prevalences of NSSI as the random-effects model. This suggested that our meta-analysis was reliable.
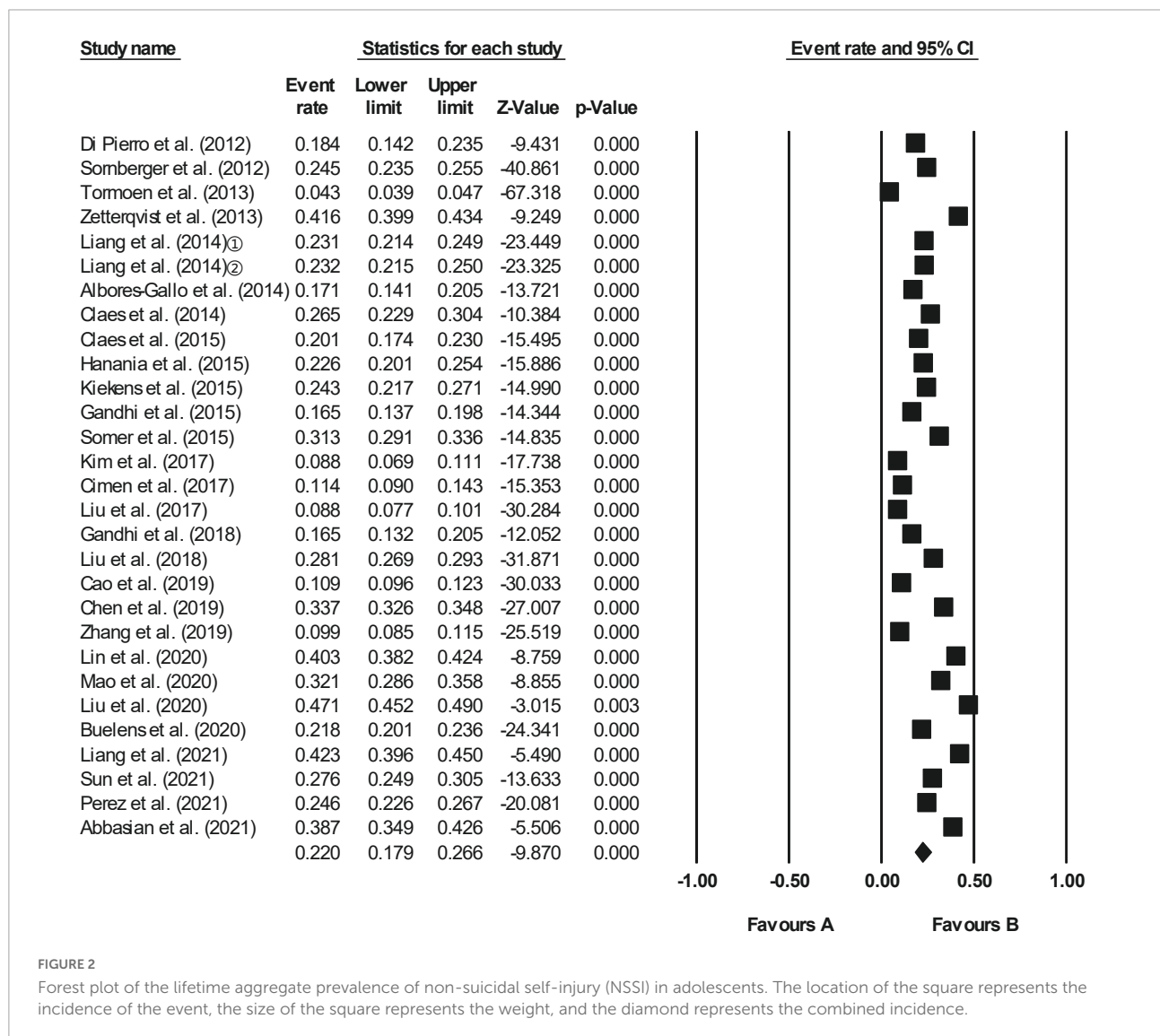
TABLE 2 Quality assessment of included studies.

Study	Q1[a]	Q2[a]	Q3[a]	Q4[a]	Q5[a]	Q6[a]	Q7[a]	Q8[a]	Q9[a]
Yan et al., 2012 (16)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Giletta et al., 2012 (17)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Di Pierro et al., 2012 (18)	Yes	Unclear	No	Yes	Yes	Yes	Yes	Yes	Unclear
Sornberger et al., 2012 (19)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tang et al., 2013 (20)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tormoen et al., 2013 (21)	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
Cheung et al., 2013 (22)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zetterqvist et al., 2013 (23)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Liang et al., 2014 (24)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Rodav et al., 2014 (25)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Unclear
Liang et al., 2014 (26)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Evren et al., 2014 (27)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Albores-Gallo et al., 2014 (28)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear
Claes et al., 2014 (29)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Unclear
Claes et al., 2015 (30)	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hanania et al., 2015 (31)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kiekens et al., 2015 (32)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gandhi et al., 2015 (33)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calvete et al., 2015 (34)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Somer et al., 2015 (35)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kim and Yu, 2017 (36)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cimen et al., 2017 (37)	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Liu et al., 2017 (38)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lin et al., 2017 (39)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ma et al., 2018 (40)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jiang et al., 2018 (41)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cui et al., 2018 (42)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gandhi et al., 2018 (43)	Yes	Yes	Unclear	Yes	No	Yes	Yes	Yes	Unclear
Liu et al., 2018 (44)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tang et al., 2018 (9)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ren et al., 2018 (45)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jiang et al., 2018 (46)	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cao et al., 2019 (47)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chen et al., 2019 (48)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Chen et al., 2019 (49)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ma et al., 2019 (50)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Xu et al., 2019 (51)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Zhang and Zhang, 2019 (52)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Li et al., 2019 (53)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gaspar et al., 2019 (54)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hu et al., 2020 (55)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hu et al., 2020 (56)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jiang et al., 2020 (57)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lin et al., 2020 (58)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mao et al., 2020 (59)	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes
Pang and Wang, 2020 (60)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wang et al., 2020 (61)	Yes	Yes	Unclear	Yes	Yes	Yes	Yes	Yes	Yes
Zhou et al., 2020 (62)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Liu et al., 2020 (63)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(Continued)

TABLE 2 Continued

Study	Q1[a]	Q2[a]	Q3[a]	Q4[a]	Q5[a]	Q6[a]	Q7[a]	Q8[a]	Q9[a]
Tang et al., 2020 (64)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Gu et al., 2020 (65)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Buelens et al., 2020 (66)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Liang et al., 2021 (67)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sun et al., 2021 (68)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Costa et al., 2021 (69)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Perez et al., 2021 (70)	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Madjar et al., 2021 (71)	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes
Jeong and Kim, 2021 (72)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lee et al., 2021 (73)	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Tang et al., 2021 (74)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Jiang et al., 2021 (75)	Unclear	Unclear	Unclear	Yes	Yes	Yes	Yes	Yes	Yes
Abbasian, 2021 (76)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[a]Q1–Q9 based on the Joanna Briggs Institute Risk Assessment (15).

FIGURE 2
Forest plot of the lifetime aggregate prevalence of non-suicidal self-injury (NSSI) in adolescents. The location of the square represents the incidence of the event, the size of the square represents the weight, and the diamond represents the combined incidence.

FIGURE 3

Forest plot of the 12-month aggregate prevalence of non-suicidal self-injury (NSSI) in adolescents.

Publication bias

Asymmetry was detected in the funnel plot of the lifetime and 12-month aggregate prevalence rates (**Figures 4**, **5**). Egger's test showed no significant publication bias in the 29 studies ($t = 1.97$, $p = 0.059$) used to determine the lifetime rates, or in the 39 studies used to calculate the 12-month prevalence. However, the Begg's test found significant publication bias within the studies used to calculate the lifetime aggregate prevalence ($Z = 2.10$, $p = 0.035$), but not in those studies referenced for the 12-month aggregate prevalence ($Z = 1.68$, $p = 0.09$).

Discussion

Although NSSI in adolescents widespread, it is yet often a hidden problem. To the best of our knowledge, this is the first meta-analysis to study the global prevalence and characteristics of NSSI between 2010 and 2021 among a non-clinical sample of adolescents. This meta-analysis found a high prevalence of NSSI in adolescents. Repetitive NSSI was more common than episodic NSSI (20.3% vs. 8.3%) but the frequency of mild injury (12.6%) was similar to that of moderate injury (11.6%). Multiple-method NSSI occurred slightly more often compared than one-method NSSI (16.0% vs. 11.1%). The top three types of NSSI in adolescents were bang-ing/hitting, pinching, and pulling hair, and the least common type was swallowing drugs/toxic substances/chemicals. Subgroup analyses showed that being female, smoking, drinking, having siblings, and belonging to a single-parent family may be linked to higher prevalence of NSSI.

This study found that the aggregate prevalence rates were 22.0% during a lifetime and 23.2% during 12 months. This finding was consistent with the 22.1% lifetime prevalence of NSSI and 19.5% in a 12-month prevalence reported from a

TABLE 3 Prevalence of characteristics of non-suicidal self-injury in adolescents.

Characteristic	Number of studies (n)	NSSI prevalence (%)	95% CI	Heterogeneity test	
				I^2/%	p
Frequency					
Episodic frequency	6	8.3	5.4–12.5	98.606	<0.001
Repetitive frequency	6	20.3	13.9–28.6	99.295	<0.001
Severity					
Minor/mild	5	12.6	6.4–23.3	99.432	<0.001
Moderate/severe	5	11.6	10.0–13.3	84.917	<0.001
Method					
One method	6	11.1	8.8–13.9	88.157	<0.001
Multiple methods	6	16.0	11.0–22.6	97.003	<0.001
Type					
Cutting	19	7.0	5.7–8.6	97.996	<0.001
Biting	12	8.6	6.4–11.4	98.957	<0.001
Burning	17	2.5	1.8–3.4	97.394	<0.001
Carving	7	7.8	5.1–12.0	97.608	<0.001
Pinching	4	10.0	6.7–14.8	96.367	<0.001
Pulling hair	10	9.8	8.3–11.5	97.429	<0.001
Scratching	13	8.6	6.6–10.9	97.755	<0.001
Banging/hitting	18	12.0	8.9–15.9	99.566	<0.001
Interfering with wounds	5	7.8	4.8–12.3	96.291	<0.001
Rubbing skin	3	3.6	2.0–6.6	96.620	<0.001
Sticking needles	3	3.6	1.8–7.0	96.664	<0.001
Swallowing drug/toxic substance/chemicals	3	1.0	0.5–2.2	93.874	<0.001

TABLE 4 Prevalence of non-suicidal self-injury among adolescents based on subgroup analyses.

| Subgroup	Number of studies, n	Number of adolescents, n	NSSI prevalence, %	95% CI, %	Heterogeneity test		Subgroup differences			
					I^2/%	p	OR	95% CI	Z	p
Gender										
Male	43	107,285	22.0	19.2–25.0	99.268	<0.001	0.839	0.768–0.918	−3.835	<0.001
Female	43	102,473	25.4	22.4–28.6	99.202	<0.001				
Living place										
Urban areas	10	37,514	26.6	20.6–33.5	99.428	<0.001	1.048	0.923–1.190	0.727	0.467
Rural areas	10	28,404	25.8	20.9–31.4	98.930	<0.001				
Smoking history										
Yes	3	1,479	24.7	12.4–43.1	93.050	<0.001	2.588	1.470–4.559	3.293	<0.001
No	3	4,072	10.1	3.2–27.6	99.149	<0.001				
Drinking history										
Yes	3	2,721	24.4	12.2–42.9	96.610	<0.001	3.014	1.487–6.108	3.060	0.002
No	3	2,850	9.3	3.1–24.8	98.677	<0.001				
One child										
Yes	16	49,014	25.8	22.5–29.3	98.611	<0.001	0.939	0.889–0.991	−2.269	0.023
No	16	86,402	27.0	24.0–30.3	99.077	<0.001				
Single-parent family										
Yes	4	1,203	30.1	27.6–32.8	1.758	0.383	1.200	1.056–1.363	2.379	0.017
No	4	19,959	23.5	19.0–28.5	97.183	<0.001				
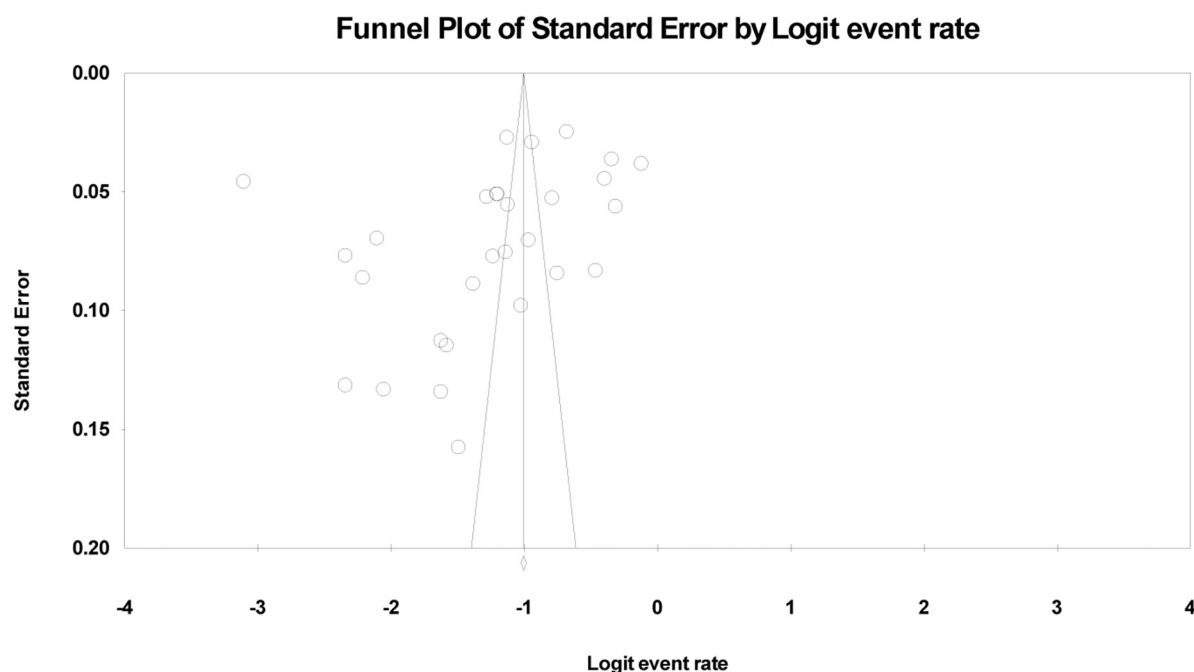
FIGURE 4
Funnel plot of the lifetime aggregate prevalence of non-suicidal self-injury (NSSI) in adolescents.
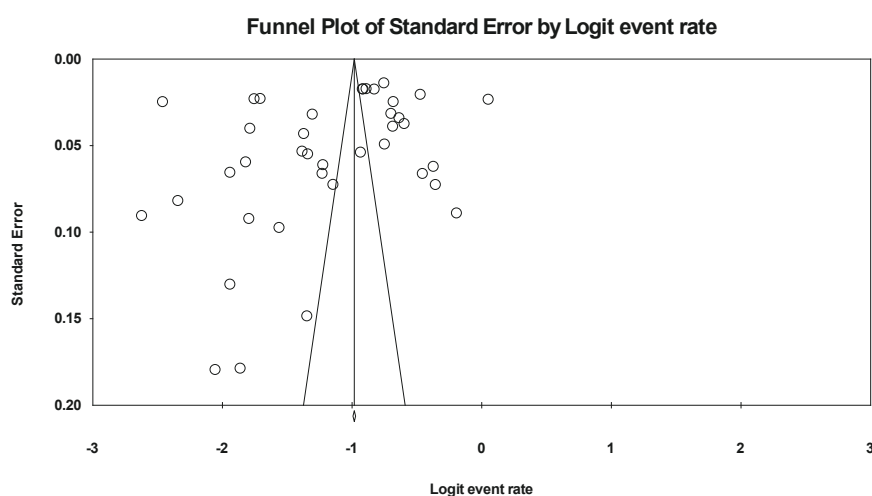

FIGURE 5
Funnel plot of the 12-month aggregate prevalence of non-suicidal self-injury (NSSI) in adolescents.

meta-analysis with 686,672 children and adolescents between 1989 and 2018 (13). Compared with that study, our study did not include children and focused on the prevalence of NSSI among adolescents in the last decade. It can be seen that the 12-month prevalence rate of NSSI was more higher in our study. However, it was lower than a comparative study done in 11 European countries among 12,068 adolescents showing lifetime prevalence varied from 17.1 to 38.6% (11). Still, our

finding was higher than that another meta-analysis reported lifetime prevalence rate of NSSI in a worldwide was 17.2% (12). Despite these slight variations in findings, there is no doubt that the prevalence of NSSI is high worldwide. Adolescence is a sensitive and vulnerable period of time in which a person learns methods of internalizing and externalizing emotions, and a wide range of problematic behaviors can develop as a result of learning unhealthy coping mechanisms (77). Adolescents

who have trouble expressing emotions and feelings may project a depressed mood characterized by impulsive and irritable self-injury and self-mutilation. Epidemiological investigation suggests that senior high school students with NSSI behavior often have seriously negative emotions and lack positive cognitive activities (78). When adolescents are in a stressful environment for a long time, or suddenly encounter a stressful event that exceeds their ability to cope, they may be attacked by negative emotions in the face of difficult situations that can not be easily solved, this in turn may induce impulsive and reckless behaviors. Sometimes, adolescents do express their feelings, parents often take a critical or neglectful attitude, which is more likely to lead to the child toward NSSI behavior (79). Other factors may also increase the likelihood of NSSI. For example, peer pressure may lead teenagers to self-mutilate in order to obtain a sense of identity and achievement. These same actions may also lead a teenager to feel embarrassment or inferiority to people around them. Oftentimes an adolescent may hide self-injury behavior and scars in order to avoid recalling the painful experience of the past (80). Schools should be made aware of the extent to which NSSI behavior is prevalent and problematic. This knowledge could guide the creation of safe environments where adolescents can go and learn how to deal with their emotions in positive ways, which could help prevent NSSI.

Our study found that adolescents were much more likely to injure themselves repeatedly by multiple methods, although the likelihood of mild or moderate injury seemed similar. This may reflect that self-injurious behavior can lead someone to feel that he or she is solving interpersonal problems, which may reduce negative thoughts or feelings, and instead generate positive emotions or feelings. To some extent, the more times an adolescent repeats the self-harm, the more they feel that they can control negative emotions. When these actions do not solve the actual problem, the risk of more severe consequences, such as suicide, are increased (81). The present study also found that the three most common types of NSSI in adolescents were banging/hitting, pinching, and pulling hair, while the least common type of NSSI in adolescents was swallowing drugs/toxic substances/chemicals. It is possible that adolescents rarely opt to swallow drugs/toxic substances/chemicals because of their preference for sensory stimulation: more physically involved attempts at self-harm may stimulate the senses more quickly and speed up the reactionary feeling of control. Although another study in 516 Korean adolescents found the incidence of cutting injury was high (19.3%) (82), the prevalence was only 7.0% in our meta-analysis. This may be related to the difficulty in acquiring dangerous goods in some countries, such as blades and sharp tools, or cutting injury was scary and bloody for most adolescents. Our results help to identify common types of self-injury and prevent possible self-injury.

Given that adolescence is a critical period to initiate self-injury prevention and intervention efforts (83), understanding the prevalence and features of NSSI is of great significance.

Subgroup analyses showed that being female, smoking, drinking, having siblings, and being part of a single-parent family may increase risk of NSSI. According to our results, the prevalence of NSSI in female adolescents was higher than that in male adolescents. This was consistent with the research results in a study that NSSI showed to be associated with female gender (84). Female adolescents may be more susceptible to self-injury because they are more likely to experience higher negative influence and have lower ability to manage emotion, including acceptance of emotions and controlling impulses (78). Another study confirmed that menophania, irregular menstruation, and algomenorrhea were associated with an increased risk of NSSI (44). Smoking and drinking have also been positively associated with the prevalence of NSSI. Positive relationships of smoking, drinking, and self-injury with NSSI have also been reported in some previous studies (85–87). In addition, family structure and family ties may increase risk of NSSI. Our finding that adolescents from single-parent families were more prone to engage in self-injurious behavior was consistent with a study of Poland encompassed 5,685 individuals (88). It is possible that a connected family and solid parent-child ties can protect against self-injury (26). Research on the influence of familial ties on adolescent NSSI has thus far focused on the influence of parent-child relationships, while remarkably little is known about the influence of the relationships between relatives or between siblings. Our study found that adolescents with siblings were more likely to engage in self-injurious behavior than adolescents in single-child families. The bond between siblings is lifelong and represents one of the most important relationships in one's life because children spend more time with their siblings than with their parents (89). The bond between siblings encompasses positive features (e.g., warmth, intimacy, empathy) but also negative features (e.g., conflict, rivalry), and it may have a major impact on each sibling's life and wellbeing (90). Siblings may be a source of emotional support for each other (91). Our findings indicate that adolescents with siblings may face different peer interaction pressure, and may choose NSSI behavior as a signal to seek outside help in order to seek parental attention.

From the results of this study, we could see that in the 21st century, especially in the last decade, the incidence of adolescent NSSI behavior in non-clinical samples remains high, but there are some changes in severity, methods and reasons. Based on the current evidence, adolescents in modern society are more inclined to implement NSSI behavior by a variety of ways, which are repetitive and intentional, and moderate and severe injuries are gradually increasing. In terms of the types of NSSI, in the past, cutting was one of the main ways of self-injury, but the first three types of NSSI in this study were banging/hitting, pinching, and pulling hair. It is also worth noting that adolescents with siblings or single parent families are more prone to NSSI behavior. There may be three reasons as follows:

First, the temptation of virtual world and the influence of network environment on NSSI behavior. With the development of social economy and the popularity of new media on the internet, more and more adolescents are exposed to more complex and varied information about NSSI behavior on the internet. They will compare and discuss their own self-injury experience, and it is easier to try new ways of NSSI behavior (92).

Second, the increase of learning pressure, ineffective coping styles and out-of-control emotional self-management. Compared with the adolescents of the last century, the adolescents of the 21st century live in a more prosperous material environment. But facing a more intense competitive environment, they usually need not only learn the cultural knowledge of an age group, but also learn all kinds of talents or skills (93). When learning pressure is too high and the response is ineffective, their emotions are easy to get out of control, and they may have NSSI behaviors due to venting or avoiding bad emotions.

Third, adolescents' interpersonal relationships are becoming more and more complex. Adolescents are gradually facing relatively complex peer relationships, teacher-student relationships, and family relationships. The instability of interpersonal relationship is easy to lead to cognitive deviation, negative emotions and problematic behaviors (92). Especially in China, with the opening of the comprehensive two-child policy, adolescents who used to be only children have a brother or sister with a large age difference, and the focus of the family has shifted away from themselves. When they feel helpless and have no help, NSSI behavior may become the last way to deal with it, because the visual impact of self-injury and the signal to the outside world are telling others that "I need help," at the same time, it can also force others to respond, such as attracting the attention of parents (90). In addition, with the increasingly inclusive society, the increase of personal freedom and the improvement of marital autonomy, the divorce rate in contemporary society is much higher than that in the last century (94). Therefore, the number of children in single parent families is gradually increasing. With the change of family structure, family atmosphere and parental rearing patterns, adolescents are not easy to adapt to new family relationships and induce bad emotions and behaviors (88).

This study has several advantages. First, the meta-analysis shows minimal publication bias. Second, the aggregate prevalence of NSSI in adolescents was broken down in terms of frequencies, severities, methods, and types. Our findings contribute to raising awareness that NSSI in adolescents is a prevalent and unaddressed issue and should be addressed urgently. On the other hand, we acknowledge the following limitations in our study. First, all the included studies were in Chinese or English, so language bias cannot be ruled out. It is not difficult to find that more than half of the research comes from China. There may be two reasons for this: first, in terms of database selection, we not only

selected four English comprehensive databases, PubMed, Web of Science, EMBASE, and PsycINFO which are representative, but also four representative databases in China were also selected. So there is more than half of research come from China. Second, China is the most populous country in the world. NSSI among adolescents has become one of the most important public health problems in China, with more and more research input and published results, more and more Chinese studies are included in meta-analysis. In this way, the final summary of research results can be more comprehensive. Of course, due to the limitations of the author's language, the lack of in-depth analysis of other related studies in French, German, Spanish, Japanese, Korean is also one of the limitations of this study. Second, the different studies used a wide variety of screening instruments and different cut-off points for NSSI, resulting in high heterogeneity among studies. Also contributing to heterogeneity were differences in study subjects, locations, and sociocultural environments. Lastly, we cannot ignore the risk of bias due to the self-report nature of NSSI instruments, which for socially taboo topics such as NSSI and suicide may not always be fully reliable.

Conclusion

In summary, the global prevalence rate of NSSI in adolescents is high. Psychological, cognitive behavioral, family, and social interventions could be used to lower this number. Further research should be built on our findings and identify risk factors for self-harm in adolescents so that effective methods can be developed. With these actions, we can protect the health and safety of adolescents to the greatest extent possible. Administrators and the leaders of the community and hospital should create programs that teach adolescents how to deal with their emotions.

Data availability statement

The original contributions presented in this study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

QX and XS designed the study and developed the idea in consultation with LH, DH, and XH. XS and LH were responsible for literature screening. LH, DH, and XH extracted data. QX performed the statistical analyses. QX and

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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Feasibility and acceptability of experience sampling among LGBTQ+ young people with self-harmful thoughts and behaviours

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This study was the first to determine whether it was feasible and acceptable to use experience sampling methods (ESM) among LGBTQ+ young people, who had current experiences of self-harm. Sixteen LGBTQ+ young people (16−25 years old) took part in the experience sampling study. This included a baseline assessment, a 7-day ESM assessment (participants were sampled six times a day using a phone app), and the option of an interview at the end of the 7-day ESM assessment. Feasibility data was descriptively analysed, with pilot ESM data presented. Qualitative data was thematically analysed to determine the acceptability (barriers and facilitators) of taking part in this study. Study feasibility was assessed by enrolment rate (55.2%), participant retention across assessment period (100%), ESM app feasibility (87.5%), and good adherence to total number of ESM surveys (67.6%). Individual study adherence ranged between 43 and 95.2%. Study acceptability was assessed by participant interviews. Thematic analysis indicated four superordinate themes; (i) Self-reflection and awareness; (ii) Practicalities of ESM surveys; (iii) Daily timeframes; and (iv) Suggestions for future studies. Pilot ESM data demonstrates that there was fluctuation of depressive and anxiety symptoms within- and between- participants over the course of the study, however, greater sample power is needed for full analysis. This study demonstrated that ESM designs are feasible and acceptable among LGBTQ+ young people with current experiences of self-harm. Pilot data indicated that specific experiences and moods are likely to be important to self-harm. These potentially have a temporal influence on self-harm behaviour or ideation, and therefore should be examined in a fully powered sample.

KEYWORDS

self-harm, experience sampling method (ESM), LGBTQ+, young people, feasibility, acceptability

Introduction

Self-harm (the injury or poisoning of self, irrespective of suicidal intentions) (1) is a significant issue among young people. Globally, self-harm, with suicidal intentions, is the fourth leading cause of death for those 15–19-years (2). Among young people in the United Kingdom, it is estimated that between 13.2 and 19.7% struggle with self-harm (3–5). Among studies which focus solely on LGBTQ+ young people, self-harm prevalence was found to be between 8 and 33% (6, 7), which is higher on average than prevalence among cisgender, heterosexual counterparts (3).

LGBTQ+ young people face uniquely stressful experiences relating to their sexual orientation and/or gender identity (8–10). Experiences such as internalised self-hatred, negative responses from family, and bullying or victimisation are key to self-harm (11, 12). However, less is known about how such experiences may be time-variant (the close interaction between the event and the behaviour). Investigating how stressors may influence self-harm across hours or days, rather than weeks and years, would aid self-harm prevention (13). For example, in their study, Lockwood et al. (14) found that young people often reported that when self-harm occurred, it was within ten minutes of having experienced a self-harm thought (though not all thoughts led to self-harm enaction). This indicates not only that impulsivity was a predictor of self-harm (14) but also that precipitating experiences may have a time-variant influence on self-harm thoughts or behaviour. To explore real-time influences, experience sampling methods (ESM; also known as Ecological Momentary Assessment, EMA; (15–17)) can be used. ESM offers a temporal understanding of the sequence in which events, experiences, moods or cognitions may occur and how they relate to each other (17).

Experience sampling methods has effectively been used to investigate self-harm fluctuation and experiences which have temporal influence across various populations (18–26). While ESM has been used among highly vulnerable populations including those with eating disorders, psychosis, borderline personality disorder, and depression (19, 23–25, 27), often these studies focus on participants who are 18-years old and above. Two previous studies were specifically conducted to determine the feasibility of using ESM with adolescents who engaged with self-harm with suicidal intentions (28, 29). Both studies offered insight that daily assessment of self-harm with suicidal intention was feasible with young people, however one was set within acute psychiatric care (29) and the other following discharge (28). These studies demonstrate that among highly vulnerable young people, ESM is still considered acceptable and feasible to use. However, these were based within clinical services, therefore it there is little information regarding the feasibility of ESM within young people in community settings. Additionally, there is very limited research which considers LGBTQ+ individuals and self-harm.

Fehling (19) assessed 21 sexual orientation minority adults using the LifeData app-system over a period of 2 weeks, to examine the fluctuations of minority stress, Non-Suicidal Self-Injury (NSSI) and mental health difficulties. The study found that greater experiences of minority stress were related to high predictions of distress and engagement with NSSI. Increased rates of NSSI took place at the same timepoints as minority stress events, which indicates a strong temporal relationship between these events and the NSSI behaviour (19). In their studies, Livingston et al. (30, 31) also evaluated the impact of minority stress, in the form of microaggressions, to determine their contribution to psychological distress and substance use within 50 LGBTQ+ adults. These experiences were assessed over two weeks using Basic for Android, which was installed onto Samsung Galaxy phones. This study indicated that high psychological distress and maladaptive coping behaviours (e.g., substance use) were predicted by experiencing microaggression 2–3 h previously. While this pool of literature is small, it evidences that minority stress experiences can have real-time impact on mood, distress, and self-harm. However, Livingston et al. (30, 31) did not explore self-harm, and Fehling (19) only considered NSSI in LGB adults within their sample.

This highlights a clear gap in the ESM literature considering the experiences of LGBTQ+ young people with current experiences of self-harm. This study would be the first to determine whether it is feasible and acceptable to conduct an experience sampling study with LGBTQ+ young people, who have current experiences of self-harm, with and without suicidal intentions. Specific objectives are listed;

- To determine feasibility; recruitment and consent rates, retention, app usability and adherence will be examined.
- To assess acceptability; LGBTQ+ young people's views of the barriers and facilitators to engaging with the ESM study will be explored.
- Study parameters are considered using pilot ESM data, to indicate whether a follow-up study would be worthwhile. Firstly, using the study design, sample size will be determined through a power calculation. Secondly, pilot ESM data will be observed to examine whether there is any fluctuation of ESM items within- and between-participants.

Materials and methods

Participants

Participants were recruited using online social media platforms and MQ's mental health research website; Participate[1]

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1   https://participate.mqmentalhealth.org

between 14th, June 2021 and 24th, August 2021. To take part, participants had to meet five inclusion criteria: (i) identify as any part of the LGBTQ+ umbrella; (ii) currently experience self-harmful thoughts and/or behaviours, with or without suicidal intentions; (iii) be aged between 16 and 25 years old; (iv) be registered with a United Kingdom based GP practice; and (v) have personal access to a smartphone.

Participants received a £10 voucher as compensation for completing the full-study (phase 2 + phase 3) or £5 if they completed either the full ESM period (phase 2-only) or withdrew during the ESM period but took part in the semi-structured interview (phase 3-only).

Measures and procedures

This is a mixed-method experimental study which uses ESM over a 7-day period (six prompts per day between 8:00 and 22:00) with LGBTQ+ young people who have experiences of self-harm, with and without suicidal intention. The design was informed by the LGBTQ+ advisory group, individuals with lived self-harm experience who offered insights and feedback for the study. This group represents a range of sexual orientations and gender identities. Ethical approval was received from the Science, Technology, Engineering and Mathematic Ethical Review Committee on the 8th of June 2021 (ERN_201745). The study was pre-registered on the Open Science Framework following the ESM template developed by Kirtley et al. (32), study pre-registration: DOI 10.17605/OSF.IO/DPWT.

The study includes briefing and debriefing, while data collection took place over three testing phases: (i) baseline assessment (Phase 1); (ii) 7-day ESM assessment (Phase 2); and (iii) post-ESM semi-structured interview (Phase 3). An overview of these phases can be seen in **Figure 1**. Phases one and two were designed to test the feasibility of conducting an ESM study with this population, and therefore follow the traditional structure of ESM studies (24, 29). Phase three explored participants' own perceptions and experiences to determine how acceptable the study was, as well as discuss facilitators or barriers to engagement with ESM.

Phase 1: Baseline assessment

Phase one of the study was to complete an online baseline assessment which was hosted by Qualtrics. The link was sent to participants once their completed, signed consent form had been received and checked. The baseline assessment took between 20 and 30 min to complete. This was to determine whether participants would complete a stand-alone questionnaire followed by the 7-day ESM assessment. For a follow-up study, this would be used as cross-sectional snapshot of participant profiles and considered in relation to their prospective data.

Demographics which confirmed the study inclusion criteria were collected: age, country, sexual orientation, and gender identity, as well as ethnicity and occupation. Following this, participants completed a series of validated measures, which have all previously been used with LGBTQ+ populations with good internal consistency. All participants completed the first 6 measures, before the 7th measure, a binary, branching question was included. If participants were transgender or gender diverse (TGD) they would complete the final two measures. On completion of baseline assessment, the data was checked to ensure that participants met the inclusion criteria before conducting briefing.

Multidimensional scale of perceived social support

A 12-item scale used to measure the perceived social support from family, friends, and significant others (33). A 7-point Likert scale is used, from 1 (very strongly agree) to 7 (very strongly disagree). The measure includes three subscales which each focus on a type of support (family, friends, significant others). Cronbach's alpha of the Multidimensional scale of perceived social support (MSPSS) was excellent ($\alpha = 0.89$) with subscales ranging between 0.93 and 0.96. Mean total and subscale scores range from 1 to 7, with higher scores suggesting greater perceived social support.

Inventory of statements about self-Injury (ISAS)

There are two sections to the ISAS (34, 35); (i) assessment of lifetime frequency of 12 self-harm behaviours; and (ii) assessment of 13 functions of self-harm over 39 questions, which relate to either intra- or interpersonal functions. Each of these questions is rated on a 3-point Likert scale from 0 (not relevant) to 2 (very relevant). Scores for each self-harm function range from 0 to 6. Strong internal consistency was achieved for intrapersonal functions ($\alpha = 0.84$), while interpersonal functions consistency being 0.65.

Suicidal behaviours questionnaire-revised (SRQ-R)

A 4-item scale to determine suicide risk from thoughts, behaviours, frequency, and intention (36). Items use either a 5- or 7-point response scale. Total scores range from 3 to 18, with higher scores suggesting greater suicide risk. Consistency was indicated Cronbach's alpha ($\alpha = 0.44$).

Hospital anxiety and depression scale (HADS)

This 14-item scale is used to indicate anxiety and depressive symptoms (37). Subscales are calculated to indicate presence of depression ($\alpha = 0.58$) and anxiety ($\alpha = 0.78$) separately, using a 4-point Likert scale. Individually, scores from 0 to 7 are considered normal (no symptoms), 8 to 10 suggesting possible symptoms, and scores of 11 or higher indicating likelihood of a disorder.

Adapted internalised homophobia scale

This measure was used to indicate negative self-perception in relation to LGBTQ+ identity, across five questions (31, 38).

FIGURE 1
Overview of data collection phases.
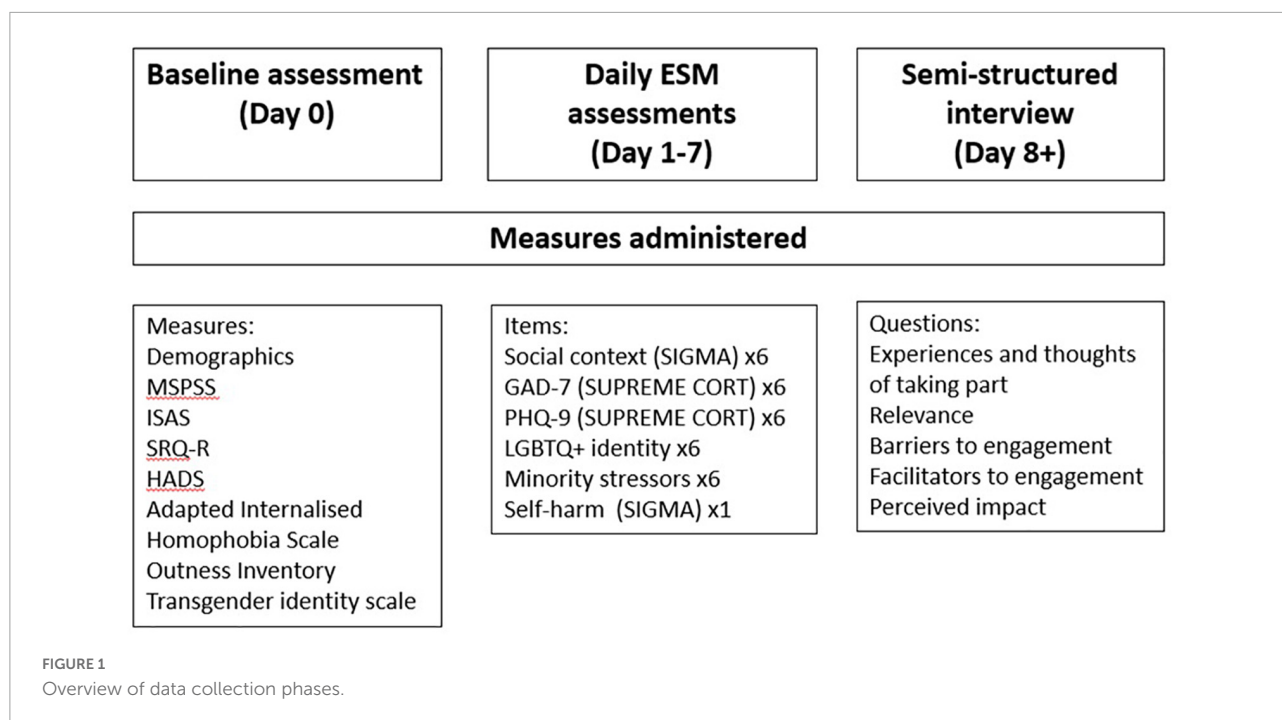
A 5-point Likert scale was used, from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicated more negative associations with LGBTQ+ identity. Cronbach's alpha was 0.78.

Outness inventory

This measure was used to assess the level of which participants were "out" about their LGBTQ+ identity across 13 groups of social relationships, ranging from mother to leaders of religious community to peers (31, 39). All items were assessed using a 7-point Likert scale, from 1 (person definitely does not know about your sexual orientation or gender identity) to 7 (person definitely knows about your sexual orientation or gender identity, and it is openly talked about). Lower scores indicate greater concealment of LGBTQ+ identity. Cronbach's alpha was 0.74.

Transgender identity survey

Twenty-six-items assessed how TGD young people felt about being gender diverse over the last 3 months (40). All items were rated between 1 (strongly disagree) and 7 (strongly agree). The measure consists of four subscales considering pride, passing, alienation, and shame. For the total score, the pride subscale is reverse scored, such that a higher score indicates greater internalised transphobia. For the full measure, Cronbach's alpha was 0.96 with subscales ranging between 0.85 and 0.95.

Congruence and life satisfaction scale (GCLS)

The overall aim of the GCLS is to measure changes in gender congruence, body satisfaction, mental health and life satisfaction for TGD people (41). This measure contains 7 subscales relating to genitalia, chest, other secondary sex characteristics, social gender role recognition, intimacy, psychological functioning, and life satisfaction. These cluster into two subgroups i) gender congruence ($\alpha = 0.90$) and gender-related mental well-being and general life satisfaction ($\alpha = 0.93$). These are rated on a 5-point Likert scale; 1 (always) to 5 (never), with higher scores indicating positive outcomes.

The Zoom ESM briefing was arranged at participants' convenience. It was mandatory for participants to attend this briefing, however, having their camera on was optional. During the briefing, participants were introduced to the study and explained the study procedures. Participants were asked to download the mEMA app which hosted the 7-day ESM assessment. The first author would ensure that they were able to log onto the app using their confidential mEMA code and had access to their ESM surveys. A dummy run of a "prompt" was conducted (push notification on a smartphone). During this dummy run, participants were led through the different types of questions and explained the rating scales. Participants were asked if they had any questions about the study overall or the practical aspects of the app.

Following this, safeguarding procedures, participant rights and compensations were explained. Participants were also told that the first author would be in touch on day 2 of the 7-day ESM assessment to encourage study adherence and troubleshoot any technical issues. Participants were asked to confirm they understood and were happy with all procedures, they were then invited to ask any further questions. The following day, the 7-day ESM assessment would begin.

Phase 2: 7-day experience sampling methods assessment

Phase two of the study was the 7-day ESM assessment. This would run for the next consecutive week following participant briefing. The ESM surveys were administered using the mEMA app from ilumivu[2], software which was designed specifically for ESM research using smartphones. Participants were assigned a confidential code which gave them access to the app, so that no identifying information was shared with the software platform. Survey data was collected and stored on the participants' smartphones; once an internet connection was established this data would sync with the online platform. This software was designed for multi-platform compatibility, which allows for automated notifications for participants using a quasi-random temporal sampling structure (participants were randomly prompted six times between 8:00 and 22:00). The duration and number of survey notifications followed similar designs to previous research (24, 27, 42). Participants were given a 30-min window to respond to each survey notification, this was to ensure that participants gave in-the-moment responses. The mEMA app was piloted using an Android and an iOS device to ensure its compatibility. The app and online platform received security clearance from University of Birmingham IT security.

Experience sampling method items

The ESM items were selected to represent previously identified processes underlying self-harm in LGBTQ+ young people (11, 12). These were grouped thematically; (i) social context and environment (items asking who the participant was with at that time and perceived support); (ii) depression and anxiety; and (iii) perception of LGBTQ+ identity and minority stressors. These items were asked six times a day. The last assessment of each day would also include three items about self-harm and suicidal thoughts, and self-harm behaviour. An overview of all ESM items are presented in **Table 1**.

Experience sampling methods items which had been used in previous research were obtained from www.esmitemrepository.com (43). These items came from two primary sources; SIGMA study (44) and SUPREME CORT (45). All items were presented as consistent visual analogs, using 1–7 Likert scales, this has been suggested to reduce participant error (46). Full information of ESM items and the structure of the ESM survey can be found in **Supplementary material 1**.

Phase 3: Post-experience sampling method interview

On the final day of the 7-day ESM assessment, participants were sent an email thanking them for taking part in the study, reminding them that this was the last day, and

inviting them to Phase 3 of the study. Phase 3 was a semi-structured interview arranged at participants' convenience following the receipt of a completed, signed consent form. Interviews took place over Zoom and were audio-recorded using a Dictaphone. Participants were encouraged to speak openly about their opinions, perceptions, and experiences of the study. The interviews lasted a mean of 19 min (12′ to 41′). Following the interview, participants were thanked, debriefed, and compensated for their time.

Safeguarding procedures

To ensure the safety of participants, several measures were taken. These were explained to participants prior to providing consent for the study and during the study briefing. On enrolment to the study, letters were sent to the participants' GP practice. This would explain that the individual was involved in a mental health study at the University of Birmingham and provide the first authors' contact information. No information was presented that this was a self-harm or LGBTQ+ study to avoid unwanted disclosure for the participant. However, GPs were informed that if the participant was experiencing high distress, their practice would be contacted by letter and phone call.

During the 7-day ESM assessment, if a participant scored suicide ideation highly (scores of 6 or 7) or that they had self-harmed, they would receive a pop-up note that acknowledged their distress and advised contacting their GP service or helplines such as Samaritans. Alongside this, data was monitored once a day to assess for self-harm risk (29). Following previous research, a cut-off score for high-risk responses was established (23, 29). This was scoring highly for suicidal thoughts (scores of 6 or 7) and having self-harmed which would result in a wellbeing call. Data was not checked in real-time; it was established that data checking would occur each morning between 10:00 and 12:00. Any wellbeing calls would take place before 15:00 and were conducted by the first author; this was to ensure that contact with supervisors was conducted during academia hours and GP practices would be open in the event that the call needed to be escalated.

This wellbeing call included encouraging help-seeking to the participant's GP, assessing the imminent risk of a suicide attempt (plans, timeline, access to means), and conducting a safety planning activity with the participant (47). If the participant was at imminent risk of attempting suicide, they would be informed that confidentiality would be broken to inform supervisors, their GP, and potentially emergency services. This would be an immediate phone call to the GP service, and a formal letter. If it was a weekend and the GP service was closed, the safeguarding procedure automatically reverted to contacting

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2   https://mema.ilumivu.com/

TABLE 1 Overview of all experience sampling method (ESM) items.

Preceding research	Key finding: risk factor or experience	ESM topic	Origin of item	Number of items	Times asked per day
(11, 12)	Victimisation. Negative responses to being LGBTQ+. Feeling responsible for others.	Social context and environment	SIGMA (44) Two additional items developed and were face validated by LGBTQ+ Advisory Group.	Branching item = 4 or additional branching question. Second item = 7, or 9 further questions.	6
(11)	Mental health difficulties	Depression (PHQ-9) Anxiety (GAD-7)	SUPEREME CORT study (63)	16	6
(12)	Struggling with processing and understanding one's own LGBTQ+ identity	Perception of LGBTQ+ identity	Items developed and were face validated by LGBTQ+ Advisory Group.	6	6
Minority stressors					
(11, 12)	Victimisation. Negative responses to being LGBTQ+.	Discrimination	Items developed and were face validated by LGBTQ+ Advisory Group.	Two items, both which branch to two additional items if response is yes.	6
(12)	Coping with gender dysphoria.	Gender dysphoria	Items developed and were face validated by LGBTQ+ Advisory Group.	1	6
(12)	Negative responses to being LGBTQ+.	Misgendering	Items developed and were face validated by LGBTQ+ Advisory Group.	1	6
Outcome of interest					
		Self-harm thoughts	SIGMA (44)	1	1
		Suicidal thoughts	SIGMA (44)	1	1
		Self-harm behaviour	SIGMA (44)	1	1

TABLE 2 Full participant sample characteristics.

Participant	Age (years)	Ethnicity	Occupation	Sexuality	Gender
1	19	White British	University student	Bisexual/demisexual	Cisgender woman
2	24	White	Flexible working hours	Gay	Cisgender man
3	25	White	Currently unemployed	Pansexual	Non-binary
4	22	Asian Malaysian	University student	Bisexual	Cisgender woman
5	18	White	Volunteering	Neptunic	Non-binary
6	19	White	Sixth form or college student	Bisexual	Cisgender woman
7	17	White British	Sixth form or college student	Bisexual	Cisgender woman
8	16	White British	Sixth form or college student	Bisexual	Cisgender woman
9	16	White British	Sixth form or college student	Gay	Cisgender man
10	19	White British	Sixth form or college student	Gay	Transgender man
11	20	Asian Vietnamese	University student	Bisexual	Cisgender woman
12	16	White	Sixth form or college student	Queer	Questioning
13	19	White	University student	Asexual	Cisgender woman
14	20	Mixed (White and Asian)	University student	Lesbian	Cisgender woman
15	22	White	Full-time employment	Lesbian	Cisgender woman
16	18	White British	Sixth form or college student	Pansexual	Cisgender woman

emergency services. However, if participants were not at-risk, no further procedures were taken. At this point, participants would be asked if they wished to continue with the study and reminded that it is their right to withdraw if they so wished. All participants were aware of these procedures and agreed to them when signing the consent form.

Analysis

All quantitative participant data was analysed in SPSS28. For baseline measures total score and subscales, averages, and standard deviations were calculated to give an insight into the characteristics of the participant sample.

Study feasibility was assessed in four key ways; recruitment rates, retention rates, app feasibility and study adherence. Recruitment rates considered the number of respondents over the recruitment period and final study enrolment rate. Reasons for non-consent were recorded. Secondly, retention was examined across the baseline assessment and 7-day ESM assessment, this was to determine whether a particular phase of the study was less desirable. If participants withdrew during any aspect of the study, they were asked for reasons and invited to the post-ESM interview to discuss their opinions of the study and elaborate on exercising their choice to withdraw. Thirdly, feasibility of the mEMA app was determined by the number of days in which participants were able to log in and give responses. Finally, total study adherence was examined by the number of responses to surveys and descriptives of response patterns. This was followed by adherence breakdown by ESM topic items (e.g., social context, mental health, identity and minority stressors, and self-harm). Participant adherence was assessed through individual study adherence and ESM topic surveys completion. Analysis consists of descriptive statistics.

Study acceptability was assessed using the data from LGBTQ+ young people's semi-structured interviews. All the interviews were conducted and transcribed verbatim by the first author. Following transcription, all transcripts were imported into NVIVO12 and deductively thematically analysed (48–50) to determine barriers and facilitators of taking part within the study. Line-by-line coding of opinions, perceptions and experiences took place. These were then considered in relation to the research aim, and similarities and differences between codes were collated to develop preliminary subthemes. These were reviewed and discussed between the research team to create the final thematic framework.

Using pilot data, the parameters of the study are considered. This is to inform whether a follow-up study would be worthwhile. Firstly, using the current study design, a sample size calculation was conducted in R. This determines the sample number needed to achieve 80% power to detect an association of medium size ($r = 0.30$) using an alpha of 0.05 (51). This is with the parameters of 42 observations per individual across a 7-day ESM period, and indicates the number of participants needed for multi-level regression models, allowing for analysis of the temporal relationship between ESM items and self-harm. Secondly, total scores for selected ESM items were calculated (anxiety, depression), these were averaged over the day for each participant, offering a daily score of ESM item. The GAD-7 and PHQ-9 had previously been adapted for ESM studies (45). As a note, these ESM items use different scales (1–7) from the originals (0–3) and thus do not offer the validated severity thresholds of anxiety or depression (52, 53). Observation of these ESM items is offered to show within- and between- participant changes in scoring over the 7-day ESM assessment. GAD-7 and PHQ-9 scores are then compared between participants who self-harmed and those who did not.

Results

The final sample consisted of 16 LGBTQ+ young people, with the average age of 19.2 (SD: 2.7). For full participant details, see Table 2. Twelve participants were cisgender and four were TGD. A total of 37.6% identified as bisexual, whilst other sexual orientations were represented by other participants. One participant did distinguish their bisexuality to also include demisexuality, such that they only feel sexual attraction to someone they have an emotional bond with. Another individual identified as neptunic (attraction to female genders and non-binary individuals). Most participants described themselves as white or white British, and nearly half of the sample were sixth form (age range: 16–18) or college students (43.8%).

A summary of the baseline assessments (M; SD) can be found in Table 3. Despite relatively high suicide risk ($M = 11.94$; SD = 2.41), only one safeguarding procedure was triggered during the 7-ESM assessment. Following the participant's wellbeing check and risk assessment, further escalation was not needed. During the 7-ESM assessment, five participants self-harmed. Two participants did not indicate why they had self-harmed, however 2 indicated that self-harm had occurred following difficult interactions with others and for one participant this was related to negative self-thoughts. Across participants all self-harm behaviours included in the ISASi were endorsed, with the most endorsed behaviours being cutting, pinching, and interfering with wound healing. At baseline, participants suggested the intrapersonal functions (e.g., sensation-seeking, affect regulation) ($M = 1.20$, SD = 0.40) were more relevant to their self-harm, than interpersonal functions (e.g., interpersonal influence or boundaries; $M = 0.40$; SD = 0.25).

Feasibility

Recruitment and retention

Across the 2.5-month recruitment period, 29 individuals responded to the study call; 75% of whom were through MQ Participate. From the 29 respondents, 16 provided valid consent forms, therefore the enrolment rate was 55.2%. Seven people did not respond following the initial email contact and follow-up emails. Two chose not to take part as they were too busy, one person was not currently experiencing self-harmful thoughts or behaviours, and one declined as they felt the compensation was not enough for the study. Two people were excluded as they did not meet the inclusion criteria (over 25-years-old, invalid GP details).

Of the final sample, all the participants completed both the baseline assessment and 7-day ESM assessment. Therefore, throughout the experimental phases of this study, the retention rate was 100%. Twelve participants (75%) agreed to take part in the post-ESM interview. Reasons for not taking part in the

TABLE 3 Baseline measures descriptives [mean (*M*); standard deviation (SD)].

	Total score	
	M	**SD**
MSPSS	4.99	0.99
Significant other	5.47	1.35
Family	4.20	1.45
Friends	5.30	1.27
ISASii	0.65	0.23
Intrapersonal functions	1.20	0.40
Interpersonal functions	0.40	0.25
SBQ-R	11.94	2.41
HADS		
Anxiety	13.56	4.23
Depression	9.25	3.15
Adapted Internalised Homophobia scale	2.26	0.86
Outness Inventory	2.77	1.10
Transgender Identity	4.65	1.67
Pride	3.22	1.92
Passing	5.14	1.90
Alienation	4.00	1.72
Shame	4.34	2.03
GCLS		
Cluster 1: Gender congruence	3.04	1.46
Cluster 2: Gender-related mental well-being and general life satisfaction	2.93	0.70

Due to missing data, analyses across the whole GCLS scale was not possible.

interview were not being able to fit the interview around medical appointments, multiple instances of forgetting to attend, and not returning the completed consent form despite reminders.

App feasibility

Over the 7-day ESM assessment period, 14 participants were able to log into the mEMA app at least once a day. Two of the participants missed all surveys for the final day of the study, while one logged in multiple times on the last day but did not complete the full survey each time. Neither participant flagged why they did not respond on the final day within the post-ESM interview. Despite this, participants generally reported that the 7 days was an appropriate test period within the post-ESM interviews.

From observation of the data, for eight participants the first question of social experiences and context would stop following their responses to whether they were with others physically or online. If they responded online, the following branching questions were not presented. This indicated that there was a logic break between the design platform and the app. The remaining participants did not encounter this break. Potentially, this is a barrier to usability based on phone type. Phone type was not recorded in this study.

However, this limitation was mentioned by a participant who owned a Microsoft phone, and previous studies have found technical issues of the mEMA app relating to phone type (29).

Adherence

Adherence to the ESM protocol was operationalised in three ways; (i) total responses to surveys and descriptives of response patterns; (ii) adherence to ESM topic surveys; (iii) participant adherence. Firstly, total number of responses to surveys was examined. For each participant, 42 surveys were sent over the course of the 7-day assessment period, resulting in 672 possible surveys to complete across the whole sample. The total number of responses to these surveys was 454 (67.6%). The highest response rates were on day 2 (77%), while the lowest responses were on days 4 (59.4%) and 7 (57.3%). On average, participants completed 4.05 (SD: 1.06) surveys per day.

Secondly, adherence was examined in relation to ESM topic surveys. This breaks down the ESM survey into specific topic items (social context, mental health, identity and minority stressors, and self-harm). Participants were asked about self-harm thoughts, with and without suicidal intention, and self-harm behaviour seven times. On average participants responded to 70.6% of these surveys (*M*: 4.94; SD: 1.24). All other ESM topic surveys were asked 42 times as they occurred in each survey. Similar adherence rates were seen across social context (63.1%; *M*: 26.3; SD: 6.5), mental health difficulties (65.0%; *M*: 27.3; SD: 7.4), and identity and minority stressor items (65.5%; *M*; 27.5; SD: 7.5).

Thirdly, participant adherence to the ESM protocol was demonstrated if the LGBTQ+ young person completed all six surveys each day. Therefore, participant adherence was assessed by considering study adherence and adherence to ESM item group; see in **Table 4**. Participant adherence ranged from 13 to 40 survey responses. The highest rate of completion was 95.2%, with another four participants being able to respond to over 80% of the total surveys. The lowest overall adherence was by two participants, who responded to less than 43% of the survey prompts.

Acceptability

To determine the acceptability of the ESM study, LGBTQ+ young people were invited to take part in a post-ESM semi-structured interview. This would explore their perceptions of the ESM study, with a focus for the specific challenges and facilitators to taking part in this type of research, and opinions of how they felt the study could be improved. A total of four themes were developed, each containing subthemes. The thematic framework can be seen in **Table 5**. Themes and subthemes identified are detailed below with example quotes.

TABLE 4   Participant adherence by total experience sampling method (ESM) survey adherence and ESM item group adherence; range, percentage, mean, and standard deviations.

P#	Range of survey responses per day	Total survey adherence completed N (%)	Average number of surveys responded to per day M (SD)	Completed self-harm items in surveys N (%)	Completed social context items in surveys N (%)	Completed mental health items in surveys N (%)	Completed identity and minority stressor items in surveys N (%)
P1	5–6	40 (95.2)	5.7 (0.5)	6 (85.7)	34 (81.0)	39 (92.9)	40 (95.2)
P2	2–6	33 (78.6)	4.7 (1.6)	5 (71.4)	33 (78.6)	33 (78.6)	33 (78.6)
P3	0–6	25 (59.5)	3.6 (2.1)	4 (57.1)	25 (59.5)	25 (59.5)	25 (59.5)
P4	2–6	33 (78.6)	4.7 (1.7)	4 (57.1)	29 (69.0)	31 (73.8)	31 (73.8)
P5	2–5	26 (61.9)	3.7 (1.1)	6 (85.7)	26 (61.9)	26 (61.9)	26 (61.9)
P6	4–6	35 (83.3)	5.0 (0.8)	5 (71.4)	33 (78.6)	35 (83.3)	35 (83.3)
P7	2–4	21 (50.0)	3.0 (0.6)	3 (42.9)	21 (50.0)	21 (50.0)	21 (50.0)
P8	5–6	36 (85.7)	5.1 (0.4)	7 (100.0)	34 (81.0)	34 (81.0)	34 (81.0)
P9	1–5	18 (42.9)	2.6 (1.3)	4 (57.1)	18 (42.9)	18 (42.9)	18 (42.9)
P10	2–5	24 (57.1)	3.4 (1.1)	6 (85.7)	23 (54.8)	23 (54.8)	23 (54.8)
P11	0–3	13 (31.0)	1.9 (1.1)	3 (42.9)	13 (31.0)	13 (31.0)	13 (31.0)
P12	2–5	25 (59.5)	3.6 (1.0)	6 (85.7)	25 (59.5)	25 (59.5)	25 (59.5)
P13	3–6	34 (81.0)	4.9 (0.9)	6 (85.7)	34 (81.0)	34 (81.0)	34 (81.0)
P14	2–5	23 (54.8)	3.3 (1.1)	4 (57.1)	22 (52.4)	21 (50.0)	21 (50.0)
P15	4–6	38 (90.5)	5.4 (1.0)	6 (85.7)	30 (71.4)	36 (85.7)	37 (88.1)
P16	3–6	30 (71.4)	4.3 (1.4)	4 (57.1)	20 (47.6)	23 (54.8)	25 (59.5)

Self-reflection and awareness

A key facilitator to engagement was the ability for participants to track their mood over time. This resulted in participants feeling that they had an increased awareness of their experiences, mood, thoughts, and feelings about self-harm. This allowed participants to reflect on their triggers and influences on their mood. Many participants found that this was helpful for them. Participants also suggested that aspects of ESM could be used in therapeutic or clinical services.

Improved understanding of mood

Most participants found that that the ESM study helped them to track and reflect on their mood. This was beneficial to their own wellbeing, as well as, helping them to engage with the study; *"It might have affected my mood for the better really because being able to check in and reflect is, was helpful for me." (P10, gay, transgender man)*. This enhanced understanding dominated most of the interviews. Some participants even made efforts to change their behaviours when noticing that they were scoring highly for depression or anxiety.

> *"And I think, I don't know, it was kind of like someone just checking in and being like "hello! You okay?" and being able to be like "actually no I'm not" like you know it was very useful to motivate me to be like right let's change my mood, let's improve how I'm feeling because that reflection wasn't you know, I feel like shit a bit. [laugh]" (P2, gay, cisgender man).*

From this improved understanding of their mood, a number of participants became aware of how experiences which related to their LGBTQ+ identity could influence their mood and thoughts; *"Actually helped me understand a lot about myself, and how, how actually that could be effecting my mental health. Because I realised for some of the questions that I've been answering, they reflected on, that it actually, there was some correlation to it." (P3, pansexual, non-binary)*.

The ability to self-reflect widely encouraged participants to engage with the ESM study. By completing surveys, they were able to obtain a better reflection of their wellbeing and make their own evaluations of what influenced their mood and self-harm.

"But with awareness kind of comes some intense lows and intense highs"

As self-awareness and reflection grew, participants also commented how they were more aware of their self-harmful thoughts and behaviours. For most this caused no impact. Participants did not feel that they experienced more frequent or intensive self-harm than usual despite being asked daily; *"Erm, no I don't think so. It didn't make them worse or better [thoughts], in a way it was the same." (P6, bisexual, cisgender woman)*. Some found that they were able to use their engagement with the study as a barrier to self-harm behaviour. One participant mentioned how they were able to reflect on

TABLE 5   Thematic framework of barriers and facilitators of taking part in the experience sampling method (ESM) study.

Theme	Descriptors	Subtheme	Descriptor
Self-reflection and awareness	Participants tracking their own mood, reflecting on this and increased awareness of their personal influencers. This helped them to engage with the study.	**Improved understanding of mood** (facilitator)	Majority of participants found that the ESM study helped them to track and reflect on their mood. Specifically, this aided awareness of influences to their self-perceptions of LGBTQ+ identity.
		"But with awareness kind of comes some intense lows and intense highs" (facilitator/barrier)	As awareness grew, participants were more aware of their self-harm. Mainly participants didn't feel there was a change in the frequency of these thoughts, and some actually used the study as a barrier to self-harm. However, one participant found that this triggered more self-harmful thoughts.
		Future uses (suggestion)	Potential therapeutic uses for mood tracking and integration with clinical services.
Practicalities of the ESM surveys	Participants opinions on the survey and app were mainly positive. However some experienced notification errors.	**Quick, easy, and minimal impact** (facilitator)	Participants did not feel as those taking part in the ESM study had a large impact to their day because it was so quick.
		Notification system error (barrier)	Some participants faced notification errors. Either notifications failed to present, or the notification would not be dismissed once the survey had been completed.
Daily timeframe	Participants thoughts on the ESM assessment timeframes (8:00-22:00).	**Missing morning notifications** (barrier)	Several participants missed morning notification due to sleeping patterns.
		"negative thoughts more come at night" (barrier)	Participants felt that 10pm was too early to capture their self-harm behaviour
		Personalised timeframe (suggestion)	Participants wanted to adjust the timeframes to better suit their lifestyles. It was suggested this would be beneficial during work or education hours.
Suggestions for a future study	Participants reflected on the relevance of questions and how to improve the study.	**Streamlining ESM items** (suggestion)	Participants offered two suggestions to improve ESM surveys. These changes were related to the ESM items. These suggestions were separating cisgender and gender diverse items, and including additional self-harm items.
		System changes and additional context (suggestion)	Participants suggested a system which would allow for their experiences to be captured if they missed several surveys. They also wanted an option to write context for themselves or others to understand why their mood, thoughts or behaviours had changed.

whether acting on their self-harmful thoughts was necessary, while another specified that she actively did not self-harm due to being in the study.

> *"I feel like it made me more aware of them [thoughts], especially when it came to erm like self-harm [behaviour]. When I would be looking back on it, I'd be like well "I have thought about it but have I actually. . .? But I didn't do it and now looking at it did I need to?" (P3, pansexual, non-binary).*

However, with greater self-awareness of self-harm, a few participants did mention that they could, in certain circumstances, see that responding to questions about self-harm daily could be difficult. One participant discussed that if they were having a bad week (frequent self-harm ideation) they would have been less likely to engage with the study, while another disclosed they had more impulses to self-harm during the study. However, their greater

self-awareness also acted as a barrier to engaging with this self-harm.

> *"So I started to overanalyse my, essentially my emotions and everything [. . .] Yeah well it was triggering in that I felt like I had a bit of an impulse to do like, you know, bad things [self-harm]. But I say I managed to control it, because I was more well aware of how I was feeling and I knew what to do." (P4, bisexual, cisgender woman).*

Future uses

Several participants mentioned that they found the ESM study so useful to track mood and their self-harm that they felt aspects of experience sampling could be used within therapeutic or clinical services. The benefit of this would be that instead of being asked about their thoughts and feelings over the last 2 weeks, clinicians would be able to see within- and between- day changes. One participant, who was a medical student, discussed how the questions regarding mood and self-harm could be useful within in-patient settings or in the community to gain real-time reflections of risk.

> *"I think that would be really useful, definitely in an in-patient setting and maybe even like if someone you feel is in a community setting and they're really at risk, then getting them to answer these questions once a day, or 3 times or even 6 times a day, just to sort of check in and see what their risk is instead of waiting until someone is at crisis, and then saying "oh well we can't help you now because you're too ill" or whatever." (P1, bisexual/demisexual, cisgender woman).*

Practicalities of the experience sampling method surveys

The second theme presents the participants' opinions of the overall survey and app itself. For most participants, aspects related to the ESM surveys facilitated their engagement with the study. This was primarily the speed and ease of completing ESM surveys. Due to these facilitators, participants felt that completing ESM surveys had very little impact to their daily lives. However, there was one element which acted as barrier for some participants: the notification system.

Quick, easy, and minimal impact

All participants mentioned that the ease of responding to the ESM surveys was a facilitator to their engagement with the study. A key aspect was that the surveys were short and therefore quick to complete, which had little impact to the participants' activities; *". . . because it's just such a small snapshot and it takes so little time, you sort of do it and then you forget about it until you've got the next one to do, because it's so quick that it doesn't*

impact what you're doing. . ." (P1, bisexual/demisexual, cisgender woman).

Experience sampling method surveys were distributed through the mEMA app and accessed through personal phones; participants felt this made completing surveys easy. One participant reflected on how using an app rather than email, meant that there was less burden on the participant to remember to engage with the study; *". . .using a phone app is definitely a good way to collect the data rather than just having something be like "please remember to fill in this form and email it to me X times per day", that's, it's a good method. . ." (P9, gay, cisgender man).*

Participants did not feel that completing the ESM surveys was invasive, and the surveys had little impact on their wellbeing; *"It was [pause] I don't know, fine to do? [laugh] That sounds really weird like, but it wasn't stressful or felt overly invasive or anything." (P15, lesbian, cisgender woman).* Due to the minimal impact of the study, it was encouraging that many participants mentioned how they would be happy to engage in other ESM studies.

Notification system error

A small number of participants experienced errors with the mEMA app's notification system. For some this was that the app failed to present survey notifications. This meant that the participant had to actively go onto the app, find their survey schedule for the day and make their own alert system; *". . .so it wouldn't actually send me the notifications. So when I woke up I would literally have to check what the times were and set an alarm for each of them." (P12, queer, questioning).*

However, for others if they had completed the survey, the two additional notification reminders would continue. This was mentioned as annoying; *"The thing is because it keeps notifying me even when I've done it, like buzz. And I'm like I've already done! Buzz, I've already done it! [laugh] To the app!" (P10, gay, transgender man).* Another participant found that the notification not automatically being dismissed meant that he wasn't sure whether the current notification was new or a previous survey. This led to him missing survey notifications as he ignored further notifications.

> *". . .the technical problem I told you about where it wouldn't automatically clear the notification after the window has expired. I remember, especially because it didn't clear automatically, I had to manually do that so I only ever got the erm, self-harm end of the day survey I think twice. . ." (P9, gay, cisgender man).*

These notification errors, combined with the observational data which indicated a survey logic break for some participants (no branching questions), highlight a key barrier within this study. Aspects of the mEMA app appear to be unsuitable for study use.

Daily timeframe

The third theme concerns the primary barrier to engagement. This was the daily timeframe of 8:00–22:00 during which all ESM surveys were sent. This was related to most of the participants taking part during their summer holidays, as often they did not have specific daily schedules and therefore, they had variable sleeping patterns. Many felt that the surveys would start too early in the morning and end too early in the evening. It was suggested that participants had a personalised timeframe in future studies.

Missing morning notifications

Several participants highlighted within their interviews that they struggled to complete the surveys in the morning. This was related to participants waking up later on days when they did not have any scheduled plans such as work; *"I mean it was alright on the days I was in work because I get up early then but on the days I don't I missed them, because like I woke up at like 2. [laugh]" (P12, queer, questioning).*

> *"…I mean it was a bit hard to get all 6 erm, all 6 of the questionnaires in each day. Especially since my sleep schedule is absolute carnage, so I'll often sleep in until about 11 and see I've missed a erm, [pause] I've missed my morning surveys…" (P9, gay, cisgender man).*

This acted as a barrier as 1-3 of the surveys could be presented before the participants were awake. Therefore, the number of responses was greatly reduced simply by the young person missing their notifications by being asleep.

"Negative thoughts more come at night"

A further barrier of the timeframe was that participants felt that 22:00 was too early to capture their self-harm behaviour; *"…with me I go to bed fairly late so by the time it asked that [self-harm] if something happened it wouldn't have reflected anything." (P6, bisexual, cisgender woman).* This indicates self-harm may not be captured by the final survey of the day which was distributed randomly between 20:00 and 22:00 each day.

> *"…so a lot of these intrusive thoughts aren't really into my head at that moment. It tends to come at night, so I feel if you had asked me during the nighttime, although I know that's not a normal procedure to ask during the night, but I felt like it would have triggered more of a response from me [filling in surveys]." (P4, bisexual, cisgender woman).*

Therefore, this study may not have captured all self-harm, as participants may have gone on to engage with these behaviours but not recorded this in the next day's survey. This builds into the specifications of how participants categorise their day, either midnight to midnight or their waking to sleeping period.

Personalised timeframe

To combat timeframe barriers, participants suggested having a personalised timeframe; *"…I think if there was more of a flexibility […] if you could choose which hours you'd be more likely to fill stuff in from." (P9, gay, cisgender man).* This would be adjusted around participants' lifestyles; *"…the 8am all the way through maybe having it so many someone could put in their own timings, so say they have their own wake up and sleep. Say if they work night shifts then being able to adjust it for their own erm cycle." (P3, pansexual, non-binary).*

One participant suggested that instead of just having a start and end time for each day, being able to block out specific time periods would be helpful when he was in college; *"That sort of thing, like having a timescale when it can asked but outside of that timescale don't ask because I'm busy." (P10, gay, transgender man).* Given the population of this ESM survey, this is an interesting suggestion for future studies to work around school, college, or university hours.

Suggestions for a future study

The final theme presents the participants' reflections on the relevance of ESM questions and their perceptions of how to improve the survey for future studies. These suggestions were related to tailoring the ESM survey for gender identity, a further line of questioning regarding self-harm, and a procedure in place for participants who miss survey notifications or wish to offer further context for their own mood and self-harm.

Streamlining experience sampling method items

Some participants discussed changes to the ESM items. These changes focused on; (i) separating cisgender and gender diverse ESM questions; and (ii) including in-depth self-harm questions. Firstly a number of cisgender participants discussed how ESM items relating to misgendering and gender dysphoria were less relevant to them; *"I'd say the only thing that wasn't useful was asking about gender dysphoria. […] slightly tailor the questions to the individual. So if someone doesn't have gender dysphoria don't include those questions…" (P1, bisexual/demisexual, cisgender woman).* Some participants felt that removing these questions would save them time as they responded to each set of these questions the same. It was suggested that if at baseline assessment, someone stated that they are cisgender, they would not be presented with these questions.

However, a small number of cisgender participants found that these questions might be useful to capture any fluctuations in how they felt about their gender identity; *"…I feel like when gender dysphoria yeah sometimes I would answer like second to least one yeah, because like I'm not really struggling with it but I'd be like oh I'd have thoughts about it…" (P7, bisexual, cisgender woman).* It was suggested that tailoring ESM surveys to recognise gender identity more closely would be useful. However, dismissing these items by someone identifying as cisgender would miss some nuances of gender identity.

Secondly, several participants suggested changes to ESM items concerning self-harm. Given the precautions around self-harm items and the consideration of how frequently these were presented, participants mentioned that having more in-depth self-harm items would have benefits. One suggestion was to consider impulsivity, as this was associated with self-harm among some participants; "*....it might have been quite helpful to ask about compulsive behaviours, if there were any compulsive behaviours or any impulsive decisions or something like that...*" *(P6, bisexual, cisgender woman).* This was recognised by participants as influential for moving from ideation to behaviour.

Another suggestion was distinguishing between someone actively self-harming and passively being injured. This was considered as a form of self-harm but potentially less directive or intentional. One of the participants who had endorsed self-harm within the 7-day ESM assessment mentioned that they were more likely to passively hurt themselves than actively self-harm.

> "*...there was an option for have you deliberately hurt yourself. But there wasn't an option for have you deliberately not got out of the way of harm. Which is like, not protecting yourself but not quite hurting yourself sort of thing, which I feel like might apply to people more. Because I know like if I'm frustrated or upset with myself, I'm less likely to go out of the way to protect myself from something bad happening.*" *(P10, gay, transgender man).*

Finally, one participant suggested that an ESM item considering the severity of self-harm should be included. This was suggested to distinguish between self-harm behaviours which might trigger the safeguarding procedure, rather than considering self-harm behaviour in conjunction with suicidal intention scores. This participant reasoned that by including this topic, researchers would be notified if someone had severely injured themselves, despite having low suicidal ideation.

> "*So when it comes to questions like that like it needs to be more a severity thing because when it comes to it, I mean, like for instance snapping a band that is a form of self-harm. Well cut for me, cutting my leg. [...] Because I mean sometimes we get stuck in our own head that we don't actually realise how badly we numb ourselves out and then cut and then it's like oh that's a bit deeper than I wanted it.*" *(P3, pansexual, non-binary).*

System changes and additional context

The final suggestion was including a system which would allow participants to report their experiences, mood, thoughts and feelings if they missed several surveys in one day. This would act as a reference for a chunk of time so that they had some data for the day; "*...like maybe if you miss a couple [surveys] it would be good to be like "hey this one [survey] is kind*

of going to be open until you do it" to kind of compensate for the ones you've missed maybe." *(P2, gay, cisgender man).* While this would not offer the same specific real-time data, it may aid engagement with the study. However, this could also cause participants to be less motivated to respond to each survey as they knew there was a back-up system in place.

Similarly, some participants discussed having a system in which they could provide context for their overall day. They indicated that this would be helpful for their own self-reflection to understand what had happened to cause low mood or self-harmful thoughts and behaviours that day, which could also be useful for research. This system could also potentially capture experiences which were influential outside of the ESM items asked.

> "*Being able to put a little comment box at the end, oh I had a really bad argument. Just for myself looking back or anyone who wanted to look at it. It's got some context for why I suddenly went like dipped really badly...*" *(P10, gay, transgender man).*

Pilot data

To establish the sample size needed for a follow-up study, a power calculation was run (51). This indicated that between 190 and 210 participants would be required to obtain a strong sample power to determine effect sizes of 0.3, alpha of 0.05. This is based on an assessment period of 7 days, in which participants are sampled six times a day, with the ability to conduct multilevel regression modeling between all ESM items.

Given the high levels of anxiety and depression at baseline, the relevant ESM items (GAD-7 and PHQ-9) are presented as examples of within- and between- person fluctuations over the 7-day ESM assessment (**Supplementary material 2**). Higher scores PHQ-9 (range: 9–63) and GAD-7 (range: 7–49) were associated with greater severity of depressive and anxiety symptoms. From observation of the total scores, anxiety and depression rates varied throughout the week. For example, within-participant three depressive and anxiety symptoms were rated very high on day 1 (PHQ-9 $M = 48.17$; GAD-7 $M = 41.00$) whereas on day 5 these were much lower (PHQ-9 $M = 17.20$; GAD-7 $M = 10.20$). Between participants, on day 1 PHQ-9 ranged from an average of 15.33 to 48.17, while later in the week (day 6) these were slightly lower (13.50–47.50), despite two participants self-harming that day.

Within **Supplementary material 2**, participants who self-harmed are highlighted on the days they acted on these behaviours. Considering the GAD-7 and PHQ-9 across participants who self-harmed within the study ($n = 5$) compared to those who did not ($n = 11$); depressive scores (PHQ-9) were consistently higher among participants who self-harmed (**Figure 2**). Whereas, anxiety (GAD-7) was typically higher

among those who did not self-harm (**Figure 3**). This indicates that there are different relationships between underlying stressors and self-harm. Within a fully powered, follow-up study such associations could be considered to determine the temporal influence of stressors onto self-harm.

Discussion

This study is the first to examine ESMs within LGBTQ+ young people who have current experiences of self-harm, with and without suicidal intentions. The overall findings support the feasibility and acceptability of ESM among this population. Several factors were mentioned which could improve the acceptability of the study for future research. From the pilot data, a larger sample size is needed for full complex analysis to establish temporal relationships between precipitating stressors and self-harm. This would be able to extend on the ESM pilot data, which demonstrated item scores varied within this study between- and within- participants, and offer evidence as to whether there were temporal influences of such precipitating stressors to self-harm in this population.

In relation to previous research, the enrolment rate for the study was comparable to other small feasibility studies (54, 55). Each of these studies included 14 participants (54, 55). However, compared to feasibility studies which considered high-risk adolescents and self-harm, enrolment is much lower ($n = 34$, (28); $n = 53$, (29)). Potentially these higher enrolment rates are related to the period of recruitment, as neither paper mentioned how long recruitment was open for these studies (28, 29), while this recruitment was limited to 2.5 months. The retention rate of participants, however, was consistent with previous ESM research in samples who have self-harm experiences (22, 26, 27). Indeed, retention of all participants was a particular strength of this study, on the higher end of retention rates comparably (56). Overall, adherence to survey completion (68%) was similar to other ESM studies considering adolescents and young people who experience self-harm [69%, (28); 63% (29). A barrier reported by participants were the daily timeframes (8:00–22:00), as often they were not awake for the first few assessments and felt that finishing assessments before 22:00 missed some potential behaviours. Future consideration should be given to personalised wake and sleep times, which could more accurately reflect a young person's daily activities. A further barrier to study adherence were errors relating to the notification system. This was only experienced by a few participants, however, when considering in relation to the logic break this indicates that alternative platforms may be more efficient for ESM studies.

The long-term goal of this line of research inquiry is to understand how daily experiences prospectively influence self-harmful thoughts and behaviours among LGBTQ+ young people. This could then be used to inform future interventions or prevention strategies. ESM has been adapted to provide in-the-moment interventions to support other health behaviours (57, 58), through processes such as self-monitoring. One key theme of the ESM qualitative interviews highlighted the utility of ESM to enhance awareness and reflecting on their mood and self-harm. This was discussed as a therapeutic tool for themselves, acting as a barrier to their self-harm. Previous evidence has indicated the effectiveness of using ESM as an intervention (59). In their study, ESM provided personalised feedback, and was found to be as effective as a therapeutic tool among depressed individuals (59). Thus, it is possible ESM may have therapeutic application for those who self-harm as well. This would provide an individualised, easy to access, and relatively cheap way to reduce self-harm within LGBTQ+ young people.

Despite LGBTQ+ young people who self-harm being considered a high-risk population (7, 60, 61), there was only one event in which the safeguarding procedure was flagged. This event did not need to be escalated when speaking with the participant during their wellbeing check. The procedure followed a similar strategy to Glenn et al. (29), whereby participants would be contacted by the researcher within 24 h for a wellbeing check. This information is useful, firstly, to demonstrate that ESM with a high-risk population is possible. Secondly, it is ethical to conduct such research, as from the qualitative interviews' participants found the ESM design highly helpful to monitor their self-harm and mood. Rather than feeling as though the survey assessments triggered their self-harm. Thirdly, to determine that this safeguarding procedure was acceptable to LGBTQ+ young people. All participants were told before taking part in the study that this safeguarding procedure would be in place to ensure participant safety; only one person did not give valid GP details and was therefore excluded. Considering this and previous research, it appears that ESM designs are appropriate to use with high-risk young people who experience self-harm (27–29, 62, 26).

Strengths and limitations

This study demonstrates ESM is feasible, safe and acceptable with LGBTQ+ young people who experience self-harm. These findings are supported by the reflections of barriers and facilitators for study engagement. These demonstrate how to improve the study for participants and can be considered with development strategies in mind (e.g., research costs, ethical submissions and approvals).

The key limitation of this study is the recruitment period. Due to COVID-19, the start of this study was delayed. This followed in-depth team discussions and codesign with the LGBTQ+ Advisory Group. This meant there was only
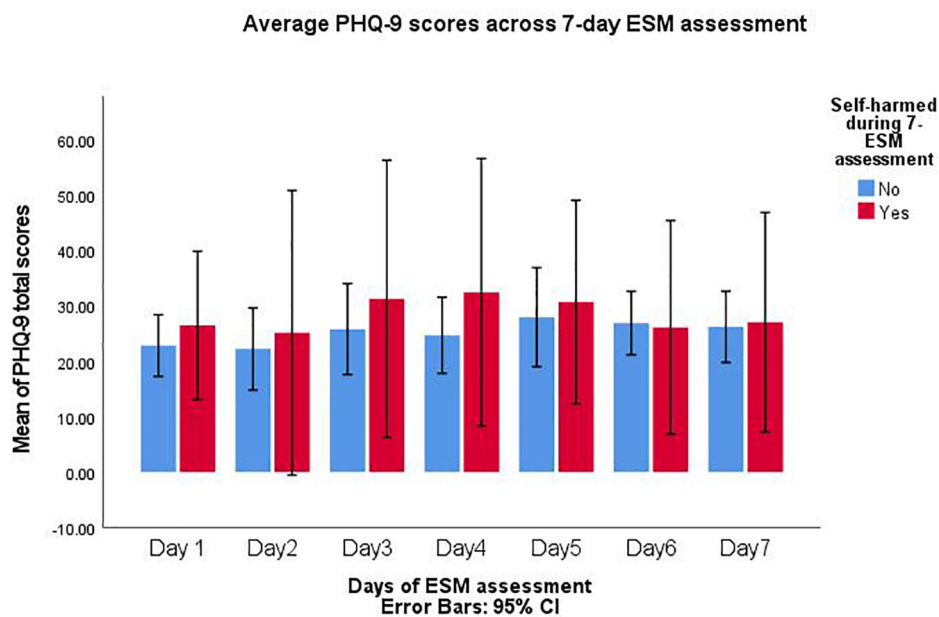
FIGURE 2
PHQ-9 scores compared between participant who self-harmed and those who did not during 7-day experience sampling method (ESM) assessment.
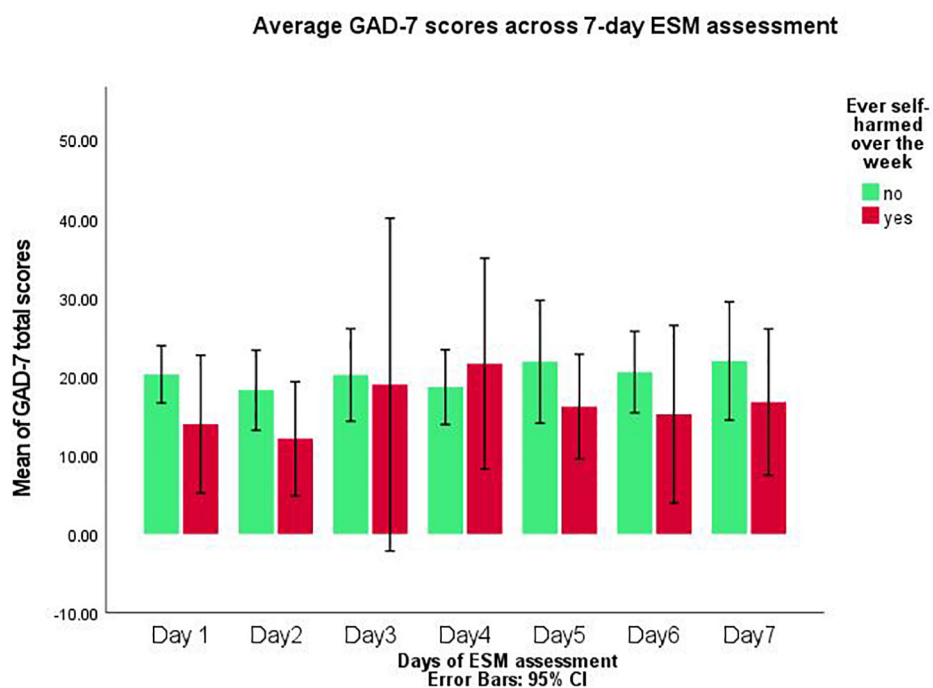

FIGURE 3
GAD-7 scores compared between participant who self-harmed and those who did not during 7-day experience sampling method (ESM) assessment.

2.5 months for recruitment to be conducted before the mEMA software license expired, resulting in a small sample. Furthermore, given that participants were only assessed 6 times a day over 7 days, expected missing data was not strongly accounted for. This needs to be considered for a follow-up study, as a minimum number of survey responses is needed to

achieve statistical power and capture an effect. Therefore, if this study design was followed, a need for a much larger sample size (190–210 participants) is required.

Conclusion

This study has indicated that it is feasible and acceptable to conduct ESM studies with LGBTQ+ young people with current self-harm experiences. There is worth in conducting a follow-up study with a greater number of participants, which would be able to determine the temporal relationships between precipitating stressors and self-harm. From this, we would be able to identify key moods, experiences or thoughts which might be targeted during self-harm interventions.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author/s.

Ethics statement

The studies involving human participants were reviewed and approved by Science, Technology, Engineering and Mathematic Ethical Review Committee. Ethical approval: ERN_201745. Written informed consent from the participants' legal guardian/next of kin was not required to participate in this study in accordance with the national legislation and the institutional requirements.

Author contributions

AW, JA, ET, and MM conceptualised the study. AW devised the study protocol, completed an Open Science protocol, and was responsible for data collection, analysis and the initial write up. JA, ET, and MM reviewed the drafts of the manuscript. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.916164/full#supplementary-material

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Caregivers' experiences and perceptions of suicidality among their children and youth with fetal alcohol spectrum disorder

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Individuals with Fetal Alcohol Spectrum Disorder (FASD) experience a range of biopsychosocial vulnerabilities that can increase the possibility of adverse life outcomes, including a heightened risk of suicidality. In this study, we explored the lived experiences of caregivers of children and youth with FASD and suicidality, including their perceptions of their child and youth's suicidal experiences. Between March and June 2021, six comprehensive, semi-structured interviews were conducted with five caregivers of children and youth with FASD (Mage = 14.5 years, range 11–22) who were currently experiencing suicidality or had a history of suicidality. Data were analyzed using interpretative phenomenological analysis and then developed into a composite vignette informed and organized by the social-ecological suicide prevention model (SESPM). The composite vignette revealed the narratives of families living with and caring for children and youth with FASD who experience suicidality in relation to the complex and intersectional individual, relational, community, and societal level contextual and protective factors. Findings from this study highlight the critical need for comprehensive FASD-informed suicide prevention and intervention approaches to promote the mental health and wellbeing of children and youth with FASD and their caregivers.

Introduction

Fetal alcohol spectrum disorder (FASD) is a neurodevelopmental disorder caused by prenatal exposure to alcohol and is estimated to impact at least 4–7% of the North American population (1–4). Individuals with FASD experience multifaceted brain- and body-based difficulties, ranging from physical health challenges to impairments in cognitive, behavioral, social-emotional, and adaptive functioning (5). Related to these

challenges, and in the absence of adequate support, individuals with FASD may also experience complex life adversity such as school disruption, difficulties obtaining and maintaining employment, financial and housing instability, trouble with the law, and mental health and substance use concerns and disorders (6, 7). Further compounding these biopsychosocial vulnerabilities, experiences of trauma and victimization are exceptionally common for individuals with FASD (8, 9). Concerningly, many of the complex challenges experienced by individuals with FASD (e.g., trauma, mental health and substance use issues) overlap with risk factors for suicidality, and there is growing evidence of elevated risk for suicidal ideation and behavior in this population (10).

Suicidality and FASD

Several decades ago, researchers reported that individuals with FASD experience remarkably high rates of suicidality (11). Depending on the stage of suicidality (i.e., ideation, attempt, or death), time frame (i.e., lifetime or current), and context or setting investigated (e.g., child welfare, forensic mental health, psychiatric clinic, etc.), up to 19% of children (12), 39% of adolescents (11), and 55% of adults (13) with FASD have been reported to experience some form of suicidality (14). Preliminary work has also been conducted exploring the contextual factors that may be related to suicidality in this population. Co-occurring mental health and substance use needs, neurocognitive and behavioral challenges, problems with independence, housing, employment, and financial stability, and interpersonal stressors, including trauma, are often experienced by individuals with FASD who report suicidality (10, 15). Importantly, most previous research on suicidality in FASD has occurred in clinical settings with suicidality often being a tangential focus (15). Very few studies have incorporated the views of caregivers or explored the deeper lived experiences of suicidality among individuals with FASD and their families.

Caregivers' lived experiences with suicidality

Caring for an individual experiencing suicidality takes a heavy toll on the whole family system and can negatively impact both the physical and psychological wellbeing of the caregivers (16). In non-FASD populations, suicidality of a family member can significantly influence caregiver mental health, family functioning, and overall wellbeing (17, 18), and can contribute to caregiver burden, pressure, powerlessness, secrecy, shame, and guilt (16, 19). Caregivers of individuals experiencing suicidality have described living in a hypervigilant state, required to ensure the safety of their family member, and experiencing

additional stress and fear related to what they may come home to (16). Parents of children who engage in self-harm often develop feelings of helplessness and doubts about their abilities to cope as a parent.

Families raising children with disabilities experience higher levels of adversity including adverse family experiences (20). In general, caregivers of individuals with FASD report exceptionally high levels of concerns and stress (21–24) as well as numerous barriers to adequate services and supports (25). Parents of children and youth with FASD are often aware of and attuned to changes in mood and depressive symptoms which can be extremely taxing and demanding. In a recent study, parental monitoring was identified as playing a critical role in lowering the risk of suicide at times when depression increased for youth (26), and parental monitoring and checking in regularly with children and youth has been shown to increase parental knowledge generally about the wellbeing of their child (26). Research on caregiver experiences of children and youth with FASD suggests that they often face challenges in self-care and the many challenges in caring for children with FASD has an effect on family relationships and contributes to social isolation (27). However, many families of individuals with FASD also show remarkable adaptation and resilience and are able to articulate strengths and values of their families (24, 28, 29).

Given the high rates of suicidality reported among individuals with FASD, and the integral role of caregivers in the prevention of suicidality in other populations (19), further research is needed to better understand the perspectives and experiences of individuals with FASD and their caregivers around suicidality. Given that both social support and depression are important clinical markers of suicidality, these factors are important in prevention and intervention initiatives (26, 30).

Social-ecological framework of suicide

To account for the complexities of suicide research, practice, and policy, Cramer and Kapusta (31) developed the social-ecological suicide prevention model (SESPM). The SESPM is a multi-level conceptual framework based on the Centers for Disease Control and Prevention's social-ecological framework for violence prevention (32) and aligning with Bronfenbrenner's ecological systems theory (33). The SESPM incorporates four layers of risk and protective factors including (from macro to micro) the societal, community, relational, and individual influences on suicidality. Societal factors are larger scale issues such as social and cultural norms, policies, and other guiding rules or laws, whereas community level factors are those delineated to a certain region such as neighborhood centers, schools, workplaces, and health care providers. Relational factors are defined by direct person-to-person interaction such as social support, peers, and family, and individual factors relate

to personal characteristics such as demographics, attitudes, and health conditions (31). The SESPM is not a suicide theory itself, rather, it provides an organizational framework for understanding and better integrating suicide research, prevention, and intervention (31) and can be applied across theories of suicide.

Given the multi-faceted and complex needs, strengths, and lived experiences of individuals with FASD and their families, the SESPM was chosen as the guiding conceptual framework for the current study. Within the SESPM, Cramer and Kapusta (31) encourage a nuanced examination of risk and protective factors that may vary across specific populations, where certain factors may be more or less relevant for different groups of people. Particularly considering the recognized importance of adopting integrated approaches for supporting individuals with FASD and their families (34, 35), the SESPM offers a useful perspective through which suicidality among individuals with FASD can be more comprehensively understood. Therefore, in this study we utilized the SESPM as a guiding framework to explore the lived experiences of caregivers whose children and youth with FASD experience suicidality, including their perceptions of their child and youth's suicidal experiences.

Methods

Participants

This study was part of a larger project examining suicidality among individuals with prenatal alcohol exposure (PAE) and FASD. Participants in the current study were caregivers recruited through social media (e.g., Facebook, Twitter), local FASD service networks, and key contacts (e.g., clinical and research contacts, key FASD stakeholders, representatives of the Canada FASD Research Network's Family Advisory Committee—a representative group of caregivers across the country who are well-connected to other caregivers) who shared recruitment materials on the research team's behalf. All participants were individuals who previously completed an online survey conducted in an earlier phase of the larger project (36). At the time of the earlier survey, respondents ($n = 23$) were invited to participate in follow-up, in-depth qualitative interviews, and five caregivers (22% response rate) agreed. These participants, representing a range of cultural backgrounds, included four adoptive caregivers and one trustee (who was a former mentor who assumed trusteeship when the youth turned 18 years of age). One adoptive caregiver was interviewed twice about two different adopted youth in her care with FASD who both experienced suicidality. According to caregivers, their children and youth with FASD had a mean age of 14.5 years (range 11–22) and were currently experiencing suicidality or had a history of suicidality.

Qualitative interviews

Between March and June 2021, six comprehensive, semi-structured interviews were conducted. These interviews were designed to better understand caregivers' lived experiences of suicidality among their children and youth with FASD, and to contextualize the spectrum of suicidal thoughts and behaviors among young people with FASD. Based on previous research conducted with families of children with FASD and informed by biopsychosocial conceptualizations of suicidality among individuals with FASD, 17 open-ended questions were developed specifically for this study, with follow-up prompts if required. The interview was organized into different sections which included: general introductory questions and rapport building, which included check in questions about how things have been going for the child and the family lately; suicidal thoughts and behaviors; non-suicidal self-injury behaviors; help-seeking behaviors and experiences following suicidality; their child's social experiences and friendships; feelings of hopelessness and depression; feelings of belonging, connectedness, and acceptance; and broader impacts on the family unit. Interviewers also questioned participants about things that have had a positive impact on their child's emotional wellbeing to identify protective factors and ways in which strengths, resilience, and health may be fostered for individuals with FASD. Please see Table 1 for an example of interview questions in each section.

Interviews were conducted by two members of the research team, a postdoctoral research fellow and Registered Psychologist (KT) and a graduate student (SH), with oversight from the project's co-principal investigators (DB, KH, and CM). Interviews took place over a secure video conferencing software and lasted between 2 and 3 h. Given the sensitive and emotional nature of the topic, interviewers checked in regarding the family's wellbeing, current supports and services, and current safety plan to manage their child's suicidal thoughts and behaviors on an ongoing basis. Ethical approval for this study was granted by the Conjoint Faculties Research Ethics Board (CFREB) at the University of Calgary (REB20-0428). Informed consent was obtained both *via* a digital consent form and by verbal consent prior to the interview.

Data analysis

Data analysis in this study was conducted following the principles and practices of interpretative phenomenological analysis (IPA) (37, 38) which aims to get "as close as possible" to the lived experience of participants regarding a particular phenomenon. Using IPA within the current study allowed us to glean insight into the perspectives and experiences of caregivers raising children and youth with FASD who are suicidal or have experienced suicidality. For example, we as researchers gained insight into the emotions surrounding caregivers'

TABLE 1 Example interview guide questions.

Interview guide sections and topics	Example questions
General introductory questions and rapport building	*Tell me about your child. What are they like? What are they great at?*
	How has your family been coping in light of the COVID-19 pandemic?
Suicidal thoughts and behaviors	*Can you explain what aspects of your child's life have a positive impact on their mental health and emotional wellbeing that make it worth living?*
	Has your child ever mentioned thoughts of harming themselves (i.e., an idea-like voice inside their head about ending one's own life or intentionally harming themselves with the intent to die)? Can you describe what your child mentioned?
Non-suicidal self-injury behaviors	*Would you say these suicidal behaviors are different than non-suicidal self-injury behaviors? How do you feel they are different? Or the same?*
Help-seeking behaviors and experiences following suicidality	*What happened after your child expressed suicidal thoughts and/or engaged in suicidal behaviors?*
	Did you seek someone else for help? What did this involve?
Child's social experiences and friendships	*How would you describe your child's social experiences and friendships? Do you think their social experiences impact their suicidal thoughts or behaviors in any way? If so, in what way?*
Feelings of hopelessness and depression	*Has your child expressed feelings of hopelessness or depression? Do you think these feelings impact their suicidal thoughts or behaviors in any way? If so, in what way?*
Feelings of belonging, connectedness, and acceptance	*Has your child expressed feelings of belonging, connectedness, or acceptance? Do you think these feelings impact their suicidal thoughts or behaviors in any way? If so, in what ways?*
Broader impacts on the family unit	*How have your child's suicidal thoughts and behaviors impacted the people around them? For example, have they impacted your own life? The lives of other family members? The larger community?*

experiences, their understanding and meaning-making process regarding the challenges of navigating their youth's suicidality, and our understanding of our participants' meaning-making process (38).

All interviews in this study were digitally recorded and transcribed verbatim. Data analysis was conducted primarily by two authors (KH and MB) who first reviewed all six transcripts several times independently to acquaint themselves with the content of the interviews. Initial notes and comments were made throughout the transcripts (e.g., notations in the margins

of the document, highlighting of key passages, and content, etc.). After making initial notes and remarks on the transcripts, the same authors then re-read the interviews multiple times to transform initial thoughts and ideas into more specific preliminary themes and phrases. Data were further reduced by establishing connections between preliminary themes and organizing them thematically. Themes were given descriptive labels that communicated the nature of the theme, using direct quotations from the interviews. Throughout the data analysis process, KH and MB met several times to discuss their thoughts on the interviews, their generated preliminary themes, and to work collaboratively to categorize and refine their initial themes into more fully realized and finalized themes. These on-going discussions provided space for sharing our individual development and construction of the key findings based on each researcher's understanding of the data (e.g., as informed by our expertise in FASD and suicidality, respectively). These meetings allowed for differing understandings or constructions of the key findings to be discussed and debated, leading to an eventual shared understanding and agreement on the final themes generated.

In line with the philosophical underpinnings of IPA, our analysis was conducted first on a case-by-case basis to understand each individual's experience before comparing experiences across our sample or considering them in relation to our conceptual framework (38). Once final themes were determined, we further considered our themes in line with our conceptual framework. All authors iteratively discussed the final themes and our final organization and write-up. As described above, once our final themes were generated using IPA and agreed upon as a group, these themes were then deductively mapped onto Cramer and Kapusta's (31) SESPM. Organized around the four levels of the SESPM, our results were synthesized into a composite vignette that depicted and illustrated the multi-level factors related to suicidality among children and youth with FASD at the individual, relational, community, and societal levels.

Drawing on the work of scholars in other fields who have used vignettes as a method to present research findings (39, 40), we used a composite vignette to depict a mix of experiences that are fused together into a single all-encompassing narrative (39, 41), organized around the SESPM framework. Given the depth and sensitivity of details shared with the research team during the data collection process, the research team recognized that there was a potential risk for our participants to be identified if individual level quotes were presented that were attributed to a particular participant, even with de-identified information and the use of a pseudonym. It was of the utmost importance to the research team to present our findings in a way that authentically expressed the experiences of our participants and their children and youth, while also protecting their anonymity. The research team strongly felt that to present our findings in an alternative way, such as themes with corresponding

quotations, would require the diluting of meaning of the complex stories that our participants shared and would in fact take away the voices of our participants who had shared the sensitive details about their experiences with us, making clear the urgency for these conversations. Therefore, to protect the anonymity and confidentiality of our participants, and to share our findings in an authentic and impactful way that provides a voice for our participants without adding to their vulnerability, a composite vignette was written to meld together stories, experiences, and voices across all six interviews into one synthesized narrative.

As described by Schinke et al. (40), composite vignettes enable researchers to bring together various elements of participants' stories that weave together a more powerful and comprehensive shared account of the phenomena at hand. When constructing the vignette, a narrative outline was first created using the final themes generated and following the structure of the SESPM. KH reviewed the data under each theme, extracting key words, phrases, quotes, and stories that best represented each theme in relation to the four levels of the SESPM. Data extracts were organized, re-organized, and pieced together to establish a compelling story (40) with consideration of the challenges, strengths, and protective factors of children and youth with FASD and their families. In the final composite vignette, direct quotations from the data generated as part of each theme were kept and used to preserve the participants' voices and lived experiences. All authors reviewed and revised the final vignette presented here. We note for the reader that the composite vignette is a particularly sensitive piece of writing, given its melding of many vulnerable and traumatic experiences for individuals with FASD and their families.

Results

The composite vignette described below reveals the narratives of families living with and caring for children and youth with FASD who have experienced suicidality, in relation to individual, relational, community, and societal level contextual and protective factors. The vignette is personal and intense, at times conveying the heaviness of caring for a young person who has been actively suicidal. Family voices express the trauma and grief that they have experienced. The vignette directly reflects family voices and social location as shared with the researchers and the myriad of experiences of families in terms of both strengths and vulnerabilities. The risk of suicide is real in these families, but this is balanced by all that families do for their children, to make them feel safe, to access supports, and to protect them at all costs. The families involved in this research were exceptional in their efforts to support and care for their children and youth during the times they experienced suicidal thoughts and behaviors.

In level one, we explore the complex individual-level factors that caregivers perceived to be related to suicidality among children and youth with FASD. These included socio-demographic characteristics, co-occurring health conditions, substance use, early life trauma, and familial conflict. Participants also spoke of the individual protective factors, such as the pursuit of personal interests, physical activity, and time in nature which help mitigate risk. In level two, we identify the relational factors that may be associated with suicidality among children and youth with FASD, including feelings of belonging (or lack of belonging), social disconnection and bullying, and the influence of peer groups. Participants also discussed the impacts of suicidality on the caregiver and the whole family unit, including specific stressors, family dynamics, and the coping strategies. Level three encompasses the community level influences of suicidality, centering regions or settings, such as neighborhoods, schools, workplaces, and interactions with health care systems. In level three, we identified a particular emphasis on the consequences of late or non-existent access to mental health supports and services for children and youth with FASD and their families. Participants also addressed the helpful interactions they have had with service providers and more informal support networks which have improved their wellbeing as well as the health and safety of the child or youth. Finally, in level four we identify the societal level factors related to suicidality which emphasize larger scale issues including stigma, geographic region (e.g., urban vs. rural settings), and the impacts of the COVID-19 pandemic on family experiences related to suicidality.

Level one: Individual level factors

My child's suicidality emerged at a really young age. I think the thoughts really started when they were about 5 years old. They have expressed being depressed since they were about 7 years old and that feeling has never really left them. At 7 is also when they told us that they were a boy, and we kind of took things slowly. And then at 13 when they started puberty and their menses, it really hit that they're a boy.

Their life has been really, really hard. They came from a very traumatic background before they came into our lives. They have a number of siblings, all of them who are on the spectrum. Some diagnosed with FASD, some undiagnosed, but there's no doubt in my mind. Their mother passed away when they were a child, and their father has been in and out of their life. Their father has bailed on them more times than I'd like to count. They have diagnoses of separation anxiety, oppositional defiant disorder, borderline personality disorder, attention deficit hyperactivity disorder, bipolar disorder, intermittent explosive disorder, and learning disabilities, all on top of the FASD. They have also struggled with alcohol and drug use, especially during their early teenage years. They were sexually assaulted when they were a

child by an extended family member from their birth family. Their siblings would call on them and ask for money, or tell them to get back into contact with their birth father, and so that always ended up being really traumatizing and triggering. They didn't have that kind of loving support that they deserved and should have had, and so it was during those times that they ended up using alcohol and became addicted to crystal meth. So I think all of these complex life experiences led to their suicidal thoughts and behaviors.

The suicide talk for them at this point occurs daily. They will often say things like "Why am I here, nobody loves me, I just need to die". Honestly, a lot of "I'm just gonna go kill myself, I'm just gonna run away, I'm just gonna die out in a field somewhere." Sometimes the suicidal thoughts come from anger at themself or anger at us. They'll say things like "I hate myself, I can't stop my brain from doing these things, I hate you, I don't want to be part of this family, I wish I was never here." It's really emotional, just so intensely emotional. They're such a big ball of love, but they also have a lot of really big emotions. The thoughts and talk have been really scary and really concerning for us lately, especially because of their history of cutting and because of their previous suicide attempt. We are hypervigilant at all times. It's hard because we live on a farm and we have guns out here. They're locked away like they're supposed to be, we follow the rules, but being out on a farm… When these thoughts come up we make sure they stay with us, like you are not leaving my side, you're sleeping in my bed! Because I need to know what their every move is, for at least until I know that they are safe. I have all of my sharp things locked up and out of sight too, so I also make it really hard for them to get access to anything which they can use to harm themselves.

We work really hard to refocus them and distract from the thoughts when we see the volatile emotional swings. We worry that they are getting closer to the thoughts that would actually… lead to the end of their life, but we try to focus on the fact that it's very much in the moment. Right now I don't think they have the process to think of how it will actually work to kill themself. They can't connect that their act would not cause any serious harm… So I don't know if they would follow through now, but I am concerned about what will happen when it all starts to catch up to them as they get older.

For now, we really just try to focus on their strengths and to try to get them out doing things that they enjoy. I think they really dive into their art, and they like gaming, so we try to help with that so that they don't get stuck in the thoughts. They really like exploring new things as well, and getting outside. The physical movement, like running and climbing and bike riding is really good for them. The biggest positive and help is if they get outside. If they are stuck in the house too long their mental health state just deteriorates.

Level two: Relational level factors

For my child it is all relationship based. The relationships with peers and friends, romantic partners, and family members have such a big impact. The most recent challenge has definitely been related to school. Because of overcrowding in the town where they went to school, they were taken out of school and put in the high school. That was really hard at the time because they were not really 13 or 14 mentally, their social or emotional age was maybe 9 or 10. They have experienced so much bullying at school during their life and I think a lot of that is related to their personal characteristics—their identity, their appearance, and also their developmental capabilities. They've had teachers, principals, students, even community members bully them. The bullying at school lately though has really been a problem. One day they came home from school and told us that a bully at school was making transphobic and homophobic attacks and using pandemic rules to isolate them from their friends. The rule at school was that only two kids per cohort were allowed to sit in the lunch group at a table, so this bully would manipulate the rules and use these rules to isolate them from the rest of the peer group.

In elementary school they were also teased remorselessly at school. They were quite a bit bigger when they were younger, and kids used to tease them for being fat. One time two boys put sticky notes on their back saying "I'm fat and I'm stupid" and they walked around school like that. Other kids used to ridicule them and then be like "Come play soccer!" Then the kids would kick balls at them. I would tell them that the kids were being mean, but they would say "They're my friends." And I would have to say, "No sweetheart, they're not, they're being mean to you." So, for a long time it really was teaching them and reminding them what a friend looks like and what somebody who is not a friend looks like. I am so thankful that they have managed to find a small group of friends that are really good to them now.

Their peer group is seriously the greatest thing that could have ever happened to them. For a long time, they didn't really have friends, and didn't know how to have friends or make friends, so this strong peer group that they have developed has really been amazing. I am particularly grateful for their closest friend from this peer group who intervened when they were worried about my child. A few months ago, my child said to this friend that they didn't want to be here anymore and they kind of started saying goodbye to their friend. This friend went straight to their mom and showed their mom the texts from my child, and within a minute this mother called me and told me what was going on. So probably within 5 min of that text message of my child saying goodbye to their friend, my husband and I were downstairs intervening. We didn't take their phone away, because clearly that was the tool that saved their life and I'm not going to punish them for saying they need help. So

really this peer group has been so important for them in a lot of different ways.

But, while I am so grateful for this peer group right now, it's honestly my next big fear and that's what I'm trying to prepare them for. I have talked to them about their differences... that differences are okay, but their peers may grow out of these friendships and that's okay. I've also tried to prepare them for the next phase in life that is happening... Because like I said, these friends are great and I love them dearly, but be prepared that they're going to want boyfriends and girlfriends and partners, and maybe they want to go do something else. And they'll always care about you, but they may not always be there and that's okay. I feel like they are maybe starting to understand this dynamic though because they were kind of in a relationship with a girl from an FASD support group for teens. The romantic relationship piece is a whole new terrain for us at this point as our child gets older. I think one thing that would really drive them over the edge is if their relationship with their girlfriend was to end. I worry that when they have fights or disagreements with their girlfriend that it is contributing to the daily "suicide talk".

So certainly, there is a lot going on in our lives. For us as a personal family, I think we are really on edge. When they are having a good day, it's good. But when they are even a little bit off it's really hard, and it's especially hard for us to sleep. It's like we are on watch all the time if they sneak out of their room. It's on watch for everything. If my husband takes a knife out to cut a bagel, it's like immediately washing it and putting it back in the safe. We're definitely on high alert. Beyond our immediate family unit, it has also led to challenges with our extended family. Other family members are just really nervous to be around them.

My husband also travels quite a bit for work and so when my husband is home, he has a hard time dealing with them sometimes because of the FASD and how encompassing it is. My child often feels that their father doesn't love them because of their FASD. It's not that he can't wrap his head around the FASD, and certainly he loves them, but it's ... complicated. They can be very difficult and there's tension. My husband really is not dealing with it well at this moment in time. He gets angry with them. Sometimes they will yell and scream at us and sometimes that is directed at my husband in particular. I'm very up front with it. I will say to my child, "You're being disrespectful, you're being unkind, you're being selfish." I use all of those negative things I shouldn't say and it makes them feel bad, right? Which I know and I feel bad about, and we talk about it a lot. My husband and I are doing more FASD training stuff. It's like I *know* this stuff, why can't I just stop myself and leave them alone and let them yell and scream when they need to and just not say anything? But, you know, they trigger me too sometimes. So as for me, I am always stressed. I have some health issues because of all of these stressors. I have post-traumatic stress disorder from it. I just do my best to get through every day. There's nothing else I can do, I just do my best every day and get up and just keep going.

Despite the stressors, one thing we really try hard to do is to always go over to them, always give them hugs and kisses, and tell them how much we love them. It can be hard sometimes, but we always want them to know how much and how deeply we care about them. They do have an older sister, our biological daughter, who is almost 30 now, but hanging out with her can be really good. They are super attached to her. So that's been really good for them to hang out with her. If we can try and get them distracted, our eldest daughter is usually really good if she's around. She can usually do something to get them distracted. I have no idea what, but she just has a gift with them that the rest of us don't.

Level three: Community level factors

Overall, we've had very negative experiences seeking help which has been so unfortunate because we actually moved just so that my child could get support. We used to live up in the north and my child saw that a number of the other younger children were cutting. That was how they first got the idea in their head when they saw others doing that, and after that they cut for 2 ½ years. It was a big thing in that community.

When it comes to medical professionals, that has been a real challenge. I'll do whatever it takes to keep my child safe, but I have a lot of trepidation about the medical system. I have a lot of fear and a lot of distrust of the medical system, so I have to say it would be an honest last resort to take them to a hospital. I would really try everything in my power to keep them safe before it got to that point. We're having a hard time getting them in to see a psychiatrist right now, but I definitely want to get them help. I just want to get them general therapy help for sure. They would do really well with therapy one-on-one and having to actually *go* to therapy. We were trying virtual therapy earlier this year but this Zoom therapy just does not work for them. So we had to stop that because every time it was a fight and they would just yell "no, no, no, I'm not doing that!". I can only push so much before I shove them off a cliff and they won't talk to me about anything, so I'm really trying to balance respecting their boundaries vs. pushing them still a bit.

We do also have a respite worker, but the respite worker is terrified of them. Even if we could get the respite support going, access has also been a problem. It's been very short, like 8 h a month. That's not enough for FASD. When the worker comes, it almost triggers them more because it's so little. They need a constant routine and from 1 week to the next is huge in their brain because of their memory challenges. So when there is no consistency, that throws a wrench into it. It makes it worse and then it triggers them which can make them very angry and then we go down a whole rabbit hole... Support is really something that we have been thinking about a lot lately because we've been

thinking about the big picture, not just the everyday day-to-day. I hope that eventually we will get something consistent and helpful for them because their situation and their challenges are lifelong, and we need to set them up for the lifelong, not just the day-to-day.

Along the way there have at least been a few professionals who have been helpful. My child had a few amazing teachers along the way who were very, very good. They also had a really good advocate at the school who was a coach. But really, I think we need more people who actually know about FASD and know how to help. There is such a lack of support for FASD and it is so encompassing. It's not just one issue—it's their mind, it's their body, it's everything—and trying to find somebody that can address the encompassing nature of FASD is impossible.

The one thing lately that has really been helpful is that I'm starting to get better connected, or at least trying to get connected, again with some more support groups. I do have a group of moms that I connect with sometimes too—there are six of us and we all have children with FASD. Each child has different levels of functioning, but all of the youth are relatively close in age, so I draw on their support. They're also all professionals of different levels in their own right. I'm also really good at making friends with other parents in general because I've just learned that it's the only way I can keep my child safe. I'm a very loud and outspoken advocate for my child. For example, because of all of the bullying at school, I made the school have a safety plan in place before I would send them back to school and I was not very pleasant about it. I was pretty harsh with the school because they are very aware of their disability, they are very aware of their struggles, and I just felt like they were not participating in keeping them safe. I have really tried to build this village around them to make sure that they are safe, supported, and understood.

Level four: Societal level factors

The pandemic has definitely exacerbated things for our family. These emotional outbursts, the daily suicide talk… Since the pandemic, it's definitely increased. "You want me dead, you don't want me alive, I want to be dead", those types of things. But I think all kids are feeling that kind of languish right now, you know? That feeling like you're trapped and all you can do is walk the same circle, over and over again. One of our go-to activities as a family before the pandemic was swimming. We would swim at least twice a week and that is their one sense that just helps them get released. A bathtub is not the same as a swimming pool. So not having access to a swimming pool was very detrimental to their mental health. The lockdown definitely made things worse, but I'm also kind of grateful that it happened because it opened up the conversation for us. It's kind of a double-edged sword. I'm grateful and I'm hateful, it's kind of both. But that's the joy

of living in this reality I guess! It's like that Disney Pixar movie, *Inside out*.

You can have multiple feelings at the same time, you can be happy and sad and mad and hateful all in the same moment and that's what I was feeling.

Beyond the pandemic, the other thing that I worry a lot about is how the world will continue to respond to and treat our child. Our child is also a member of a racialized group, so we talk a lot about what it is like having a dark dad and a white mom and the risks those carry in the world. We're not ones to go and lock ourselves on a door or anything, but we're activists. We carry an activist heart. We're always striving to improve the community and it's important to dispel a lot of misinformation that people have about BIPOC. I'm really trying to break down stereotypes and stigmas and advocate for my child, both when it comes to fighting stereotypes… and also the stigma that exists toward people with FASD. It's not their fault. I'm really trying not to put blame on my child for their actions, because it's brain damage, and I just wish people had a better understanding of FASD.

Discussion

In this study, we explored caregivers' lived experience related to FASD and suicidality. Participants spoke to the complex and intersecting individual, relational, community, and societal level factors associated with suicidality among their children and youth with FASD. Until recently, research on suicidality among individuals with FASD has been limited (10, 12, 14, 15, 42–44), and few researchers have explicitly sought to examine suicidality among individuals with FASD as the main purpose of their study (13, 14, 45, 46). The results of this study offer crucial insight into the range and contexts of suicidality in FASD, as well as the potential impacts of suicidality and associated support needs of individuals with FASD and their families.

Key findings regarding suicidality among children and youth with FASD

One of the key purposes of this study was to explore caregiver perceptions about factors associated with suicidality among their children and youth with FASD. As described by our participants, these factors spanned all four levels of the SESPM and included complex trauma, stress response, co-occurring mental health and substance use challenges, experiences of stigmatization and racism, bullying, social isolation and marginalization, and lack of societal awareness, understanding, or compassion regarding FASD. Specifically, caregivers described how the interplay of these factors were all relevant and significant factors that resulted in a culmination of challenges for their children and youth that led to suicidality (31). Caregivers spoke to the layered complexity of these

experiences considering the COVID-19 pandemic and how the pandemic as a societal level concern further heightened their children's mental health concerns suicidality. The complex and unique experiences and vulnerabilities of individuals with FASD have been well-documented (6, 7, 9) and the findings of this study provide further evidence of the significant challenges individuals with FASD and their families experience in their daily lives. Caregivers spoke to the brain and body-based challenges of their children and youth (e.g., impulsivity, emotional reactivity, memory challenges), as well as how these challenges are often exacerbated based on their child's interactions in various social situations or circumstances (e.g., in school or among peers, with health care or mental health providers) which further heightened risk of suicidal thoughts and behaviors.

Our findings related to contextual factors associated with suicidality in FASD align with previously identified factors, including co-occurring mental health conditions and other neurocognitive and behavioral challenges (10, 13, 44, 45, 47). With consideration of the SESPM conceptual framework, it is particularly notable that these factors overlap and intersect with *all* of the factors that Cramer and Kapusta (31) have identified as being most strongly associated with suicide risk across the multiple levels: mental health diagnoses or symptoms such as depression and bipolar disorder; personality disorders such as borderline personality disorder; substance use/abuse; alcohol use/abuse; prior suicide attempt; current suicidal thinking; access to or the presence of lethal means; hopelessness; and feelings of burdensomeness. The overwhelming prevalence of these risk factors among individuals with FASD highlights a critical need to further develop and enhance targeted protective factors to further support individuals with FASD, including strengthened social support, psychological coping skills, hopefulness and positive future orientation, and identifying additional reasons for living (31).

Several findings in this study are especially notable given recent emerging evidence related to suicidality in non-FASD populations. For example, caregivers identified that their children's individual level mental health challenges, gender identity, and developmental capabilities were related to their youth's suicidality, particularly as these factors intersected with relational level experiences of bullying and victimization from peers and others in the community because of their perceived differences. Recent research with LGBTQ2S+ youth who died by suicide revealed that many were found to be bullied before their death. In reviewing the death records of youth who died by suicide, LBGTQ2S+ youth were almost five times more likely to have bullying documented in their death records compared to the records of non-LGBTQ2S+ youth (48). Younger children in this same study were also identified as being at greater risk, with bullying being reported for two-thirds of youth aged 10–13 years before their death (48).

These findings are highly concerning in conjunction with recent evidence about the mental health related impacts of the COVID-19 pandemic on children and youth's mental health, including among LGBTQ2S+ youth. Rico et al. (49) revealed that children and youth's mental health was highly impacted during the pandemic as a result of social isolation, with nearly half of the youth sampled reporting feeling persistent sadness or hopelessness during the pandemic, and almost half of LGBTQ2S+ youth reporting contemplating suicide during the pandemic. Very little is currently known about the experiences of individuals with FASD who are transgender (50), but the findings of this study considered with recent literature on youth in general speak to the potentially heightened risk for youth with FASD who are highly marginalized in addition to the layered complexity and adversity that they already experience in their daily lives. Caregivers in this study also identified cognitive distortions by individuals with FASD that align with a desire to escape from their sense of burdensomeness arising from thwarted belongingness, which will require a special targeted education and support (51). Further research exploring the individual level factors for suicidality among individuals with FASD, including sex, gender, and other sociodemographic factors, including the social determinants of health, is warranted.

Another concerning finding was the young age at which suicidality first emerged among children and youth with FASD, which is consistent with other research on developmental disabilities and suicidality (10, 36, 52). Caregivers in the current study reported that their child had experienced suicidality as young as 5 years of age. Although rates of suicidality may be highest among adolescents, in one study, researchers reported that 12% of school-aged children with PAE in Canada experienced past or present suicidality (10).

Caregivers reported that their children and youth with FASD engaged in daily or almost daily "suicide talk." Given the reported cognitive challenges associated with FASD (53, 54), it is possible that some children and youth with FASD may not fully appreciate or comprehend the meaning of their statements about wanting to die or not wanting to be alive. Furthermore, some children or youth with FASD may lack the skills to cope with distressing emotions or adverse events, resulting in volatility, impulsivity, or reactivity to "in the moment" situations, which may lead them to engage in "suicide talk" to express their desire to escape these hard emotions. As caregivers described, "suicide talk" often emerged as a result of a particular antecedent, often a relational issue, and moved quickly to outward expressions of suicidal thoughts (36). Impulsivity is a widely-reported challenge in FASD (55) and has been identified as a factor associated with an increased risk for suicidality in non-FASD populations (56, 57), warranting further investigation among individuals with FASD in the context of suicidality. Notably, caregivers in this study described different strategies and in-the-moment tactics that may be helpful to distract or dissuade someone from suicidal thoughts

or expression. Distraction and redirection appear to be critical tools for caregivers of children and youth with FASD and this phenomenon warrants further research to understand how suicidality, impulsivity, and distraction/redirection may interact differently in the FASD population.

It is also evident from the voices of caregivers that relational factors, including family and interpersonal stressors and other experiences of trauma, were highly relevant in the context of their youth's suicidality, again aligning with previous research findings (13, 36, 45). Bullying was identified as one of the most significant relational level factors for youth in this study. Although individuals with FASD are often reported to be highly social and inclined toward human connection (29), they may also struggle with desirable social skills, understanding social expectations, making friends, and picking up on cues associated with bullying (27, 58, 59). Nonetheless, although caregivers in this study reported that their children and youth experienced social isolation and marginalization at times, some youth with FASD also had strong and reliable peer groups of genuine friends. Social support is a critically important protective factor for suicidality in youth with and without FASD (31) and facilitating meaningful social connections and relationships should be of the utmost importance for service providers and others supporting individuals with FASD.

Key findings regarding caregivers' lived experience of FASD and suicidality

Beyond the insights caregivers provided about the contextual factors pertaining to suicidality among their children and youth, this study also allowed for insight into the experiences of caregivers who are also grappling in their own ways with their youth's suicidality. Specifically, the results of this study provide the first glimpses of the distressing and disturbing experiences of caregivers and align with previous research emphasizing the ways in which suicide-related stressors can interfere with caregivers' relations and quality of life (60). The disproportionate rates of suicidal ideation, attempts, and completion among those with PAE and FASD (13, 14) elevate risk in their caregivers above and beyond the normal population risk. Caregivers of individuals with FASD already experience disproportionately high levels of caregiver stress (21, 22, 61) and the results of this study provide further contextualization of the heightened stressors caregivers of children and youth with FASD may experience if their children are also experiencing suicidality. As caregivers in this study described, their child's suicidality contributed to familial and relationship challenges within the immediate and extended family unit, caregivers' own post-traumatic stress disorder and adverse childhood experiences, and constant states of hypervigilance to keep their children safe, as has been shown in the non-FASD literature (16).

Unfortunately, for many caregivers, accessing FASD-informed supports and services was severely lacking, which aligns with previous findings in the FASD field that caregivers often face numerous barriers to adequate service provision (25).

Despite these profound difficulties, it is also important to acknowledge and emphasize the strengths, resilience, and coping strategies reported by caregivers in this study. For example, having positive outlets such as physical activity or art, and accessing strong social connections, offer important examples of how protective factors can be identified and built upon, no matter how small, to support individuals with FASD and their caregivers. Caregivers described the immense care, love, and respect that they have for their children and did not convey a sense that their children are in any way a burden to them. In fact, all caregivers described the joy their children brought to their lives and spoke to their strengths and abilities. Suicide theory, assessment, and prevention requires nuanced consideration of both the risk and protective factors and therefore it is imperative to identify both the challenges and strengths of individuals and families when considering suicidality among individuals with FASD (31). There is a clear need for more intentional studies that focus on protective factors, resiliency, and positive coping strategies among children and youth with FASD regarding suicidality.

Implications for mental health professionals

Mental health professionals and clinicians supporting individuals with FASD have an essential role in both prevention and intervention to reduce the risk of suicidality. It is critical to advocate for school system strategies to eliminate bullying and provide supportive counseling for individuals with FASD on how best to navigate peer relationships. Mental health professionals need to have a basic working knowledge of the mental health problems associated with PAE and FASD and require training on how to intervene with individuals with FASD. Further training with relevance to minimizing suicidality should target the need for consistent guidance, stigma reduction, need for early intervention, and need for support services. Additional support can be gained when professionals play an active role to advance caregivers' understanding of the common risk factors for suicide, the interpretation of suicidal statements, and important steps to take to seek help and intervene (62) if and when their child does express suicidality. Such steps involve expanding the support and health care network around the individual across physical, psychological, spiritual, and emotional domains (63). Caregivers should also be trained in becoming aware of the emotional pain their loved ones with suicidality experience, how to promote positive attitudes, and how best to care for and support their loved ones when suicidal

(64). Transitions in care such as a placement move are a crucial point in suicidality that require the support of caregivers (63). The lack of knowledge about FASD and suicidality among mental health professionals builds a compelling case regarding the need for clinical and caregiver support in assessing, managing, and responding to the expression of suicidal intention (65). By adopting a biopsychosocial approach that considers the complex social-ecological factors explored in this study, clinicians can employ advances in managing mental health challenges often experienced by youth with FASD and target specific interventions for suicidality.

As executive function, motor speed function, and global neuropsychological function are associated with suicidal ideation in patients with mental health issues, future research should target the role of caregivers in moderating the effect of PAE related cognitive difficulties in predisposing and perpetuating suicide risk (66). Clinicians should also be alert in recognizing the red flags of FASD in their practice at various service access points and as individuals navigate the health system (65). As caregivers in this study described, current service systems are not well-equipped to support youth with FASD and even if they gained access to care for suicidality, the care was often not appropriately tailored to meet the unique and complex needs of the individual and their family. While mental health professionals can play an instrumental role in supporting individuals with FASD and suicidality, the need also exists for FASD informed mental health professionals to support caregivers who live day-to-day and often intervene daily to the suicidal thoughts and behaviors of their children and youth to have access to supports should crises arise.

Limitations, strengths, and considerations

Although this study offers some important insights that expand our understanding of suicidality among individuals with FASD and their families, it is not without limitations. The first limitation of this study is the reporting by caregivers on behalf of their youths' experiences. Our understandings and interpretations presented here are therefore limited to the suicidal thoughts and behaviors that could be detected by caregivers, so it is possible that caregivers may not have always recognized risk or known about other instances of suicidal thoughts and behaviors. The views of caregivers presented here may also be shaped and altered by the distressing experiences some described. Furthermore, movements such as *nothing about us without us* (Charlton, 1998) emphasize the voices of the individuals directly impacted and so it is important to note that the views of caregivers presented here may not align with the youths' views of their own experiences. Although caregiver perspectives are an essential part of the complex picture of suicidality among individuals with FASD, future research is

needed that centers on the voices of those individuals with FASD with lived experience. A second limitation of our study was the structure of the interview guide that focused predominantly on caregivers reporting about the experiences of their children and youth and not as directly on the way in which caregivers navigate their children's suicidality. Although questions about the caregivers' lived experiences were not explicitly asked, the nuance and the depth of the data collected during the interviews allowed for detailed interpretations of caregivers' lived experiences.

However, a key strength of our study is the use of, and grounding in, the multi-level conceptual framework (31). Use of this comprehensive conceptual model provided an organizational framework for generating knowledge about the risk and protective factors for individuals with FASD and their families across the four social-ecological levels. The use of the SESPM as a guiding flexible framework allowed us to understand and integrate the complex picture of risk and protective factors for suicidality among individuals with FASD and their families, articulating the complexity of life experienced by individuals with FASD.

Finally, during the interviews, and particularly at the end of the interviews when we asked caregivers to share any final thoughts, caregivers spoke a lot about FASD being an understudied and often invisible disability group. Caregivers expressed their immense gratitude that the unique experience of FASD and suicidality was being considered and investigated, which speaks to the novelty and significance of this work and the direct impact this research may have for families experiencing these challenges every day.

Conclusion

The intent of this research was to provide insight into the experiences of families caring for young people with FASD experiencing suicidality. The creation of a composite vignette offered a unique approach to reflect the voices of caregivers and highlights the intensity of their lived experience. Coupled with previous evidence of the remarkably high rates of suicidality among individuals with FASD, our findings related to the multi-level complexity of suicidality and its impacts on caregivers and families underscores the need for mental health and other professionals to be trained in FASD. It is recognized that family and community can serve as critical protective factors to mitigate the risk of suicidality, being mindful that supports for individuals and families must always be in place to address complex biopsychosocial needs. Caring for children with FASD who experience suicidality places a heavy burden on caregivers who often seek help from systems with little knowledge about FASD and mental health. Advocacy is urgently required to ensure that mental health systems have the knowledge and capacity to support caregivers of children

and youth with FASD who need assistance in navigating the complexity of suicidality.

Data availability statement

The datasets presented in this article are not readily available because participants of this study did not agree for their data to be shared publicly. Requests to access further information about the study should be directed to KH, kelly.harding@canfasd.ca.

Ethics statement

This study involving human participants was reviewed and approved by the Conjoint Faculties Research Ethics Board (CFREB) at the University of Calgary (REB20-0428). Informed consent was obtained both via a digital consent form and by verbal consent prior to the interview.

Author contributions

KH, KF, and MB worked together to write the first draft of this manuscript. KT and SH conducted the qualitative interviews reported on in this manuscript. KH and MB conducted the data analysis for this manuscript with input and feedback from KF, CM, and DB. All authors contributed writing to sections of the manuscript and to the conception of this manuscript. All authors read, revised, and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Characteristics and outcomes of referrals to CAMHS for children who are thinking about or attempted suicide: A retrospective cohort study in two Scottish CAMHS

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Suicide among children and young people (CYP) is a leading cause of death. In the UK children identified as suicidal are referred to Child and Adolescent Mental Health Services (CAMHS) for assessment and treatment. However, the number of children referred for suicidality, and their care journey is unknown. This retrospective cohort study conducted in two distinct CAMHS teams, in Scotland, UK, aimed to quantify the numbers of children referred for suicidality, describing this population and the outcomes of these referrals. All CAMHS referrals ($n = 1159$) over a 6-month period (Jan-June 2019) were screened to identify those referred primarily for suicidality. Data extracted included: age, gender, source of referral, reason for referral including underlying issues, whether offered an assessment, and referral outcome. Area based deprivation scores were attached to each referral. Associations between the referred CYP's characteristics (including source of referral and underlying issues) and referral outcomes were explored using Chi Square, Fishers Exact test, and one-way ANOVA. Referrals for 284 children were identified as being for suicidality across the two sites (Site A $n = 104$; Site B $n = 180$). These represented 25% of all referrals to these CAMHS over a six-month period. One third of these concerned children under 12. The underlying issues, referrals sources, and demographic indicators were similar in both sites. In site A 31% were offered an assessment, whilst in Site B which had a dedicated team for suicidal CYP, 82% were offered an assessment. Similarly, more children in Site B were offered treatment (47.8%), than Site A (7.7%). Referrals from A&E were prioritized in both areas, and those who had attempted suicide offered an assessment more often. Older children were more likely to be offered treatment, although they were more likely to present with a history of self-harming behavior and/or previous suicide attempt. There are high numbers of children being referred to CAMHS for suicidality, and many are young children (<12). There is variation within and between services in terms of assessment, referral outcomes and care

pathways for these children. Having a dedicated team to respond to referrals for suicidality appears to support access to assessment and treatment.

Introduction

Suicide is a leading cause of death of children and young people globally (1). National statistics in the United Kingdom reveal the numbers of suicides amongst those under 25 has been continually rising since 2017, with a marked 22% rise in the year 2018 (2). Childline (a UK wide telephone counseling service for children) report that 67 children a day called their helpline in 2018/19 for help with suicidal feelings, and there was an 87% increase (from 2015/16) in calls from children under 11 seeking help with suicidal thoughts and behaviors (3). The problem is a global issue (1, 4), as well as within the UK. Notably, Scotland is reported to have the highest rate of suicides amongst children in the UK[1] (6).

Alongside these worrying statistics and commentaries, we are told that child and adolescent mental health services (CAMHS) are "not fit for purpose" (7). There have been reports describing them as the "Cinderella service", underfunded in relation to physical health services (8, 9).

Demand for CAMHS services continues to grow; the umbrella of what is considered the remit of child and adolescent mental health services steadily widening (10). As a result, CAMHS services are currently under immense pressure, with demand for their services exceeding capacity (11–14). Pre Covid, one in five referrals to CAMHS in Scotland were rejected (15), and in England one in four were rejected (16). Since the pandemic, numbers of referrals have continued to rise and waiting times for many children and young people are over of a year (12, 15, 17). The number of these referrals that were made for children who are suicidal is unknown.

Various reports and reviews have considered the problem of CAMHS demand (14, 15, 18–20), although delivery of services and investment varies across as well as within the different countries that comprise the United Kingdom.

CAMHS in Scotland continues to operate a tier system of care in which CAMHS remain positioned as a specialist service, funded by the NHS. However, there has also been an increase in mental health support services in schools, and a continued shift in focus toward prevention and early interventions (14, 21). Recent reports suggest a re-design of mental health services will follow, making them more accessible with community-based

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1 Scotland has the highest rate of deaths by suicide across all age groups (2, 5).

"one-stop" service provision (14, 21). This has yet to be realized and attempts to better manage referrals to CAMHS have had little impact to date.

There is a paucity of reliable data from CAMHS generally and in Scotland the lack of available information was identified as barrier to service re-design (22). Public Health Scotland (PHS) [previously the Information Services Division (ISD)] collects CAMHS data from each health board (national workforce and performance data) which is limited to referral numbers and waiting times. Recent routine reports on waiting times indicate health boards are working to improve the accuracy of the data they provide to ISD (11). Information is still not routinely collected on the reason for referral. Therefore, the number of children who have been referred to CAMHS for reasons of suicidality and subsequently placed on a waiting list is undetermined.

In 2017, as a direct recommendation made in the (23) "National Mental Health Strategy" ISD and SAMH (Scottish Association for Mental Health) were commissioned to conduct an audit of rejected referrals to CAMHS (15). ISD collected quantitative information from seven participating health boards (7/14) about CAMHS referrals they had received and processed over 1 month (February 2018), whilst SAMH conducted an on-line survey, focus groups and telephone interviews with young people, parents and carers, GPs, and teachers. They found that 20% of all referrals to CAMHS were rejected. As part of the audit data set ISD requested information from the participating health boards about the reason a young person had been referred. They found there to be inconsistencies between the information provided by the boards, compared with the reasons given by children and families as to why a referral had been made. The data from the health boards showed 0.4% of referrals to have been made because of suicidal ideation, and 1.4% following self-harm, while suicidal ideation was one of the most cited reasons for referrals being made by the patients and families, revealing potential discrepancy in the figures provided. The investigators also queried the reliability of the data they were provided (15). While this audit provides valuable insight into the referral process overall and the extent of the problem in relation to rejected referrals from CAMHS, it does not adequately address the issue of quantifying the numbers of children who are suicidal or provide insight into the pathways of care they experience thereafter.

Also following the recommendation made in the "National Mental Health Strategy," (23), in response to increased number of referrals to CAMHS (22% from 2013/14 – 2017/18) and increased waiting times on access to CAMHS, the Scottish Government commissioned a national audit of CAMHS services (22). This audit focused on the funding and efficacy of CAMHS. It used mixed methods, including routinely collected data (from ISD) alongside interviews and focus groups with patients and their parents / carers, senior staff, front-line staff, NHS managers and government representatives. Child and adolescent mental health services were not found to be easily accessible to children and young people, with different services and protocols in place in different areas. The Accounts Commission found there were large inconsistencies and variations in the funding, organization, and delivery of CAMHS services across the country. They reported it was not possible to accurately quantify local health board spending on CAMHS services, and that existing data on CAMHS outcomes was deficient. They described CAMHS as being under increasing pressure, with higher numbers of referrals and increasing waiting times. Despite the audit activity taken place in recent years, much remains unknown about the numbers of children who are referred to CAMHS for suicidality and how they are being managed.

This paper reports the findings of a retrospective cohort study documenting the numbers of children referred to CAMHS for suicidality, and the outcomes of these referrals in two Scottish CAMHS teams. It aimed to:

1) Quantify the numbers of children referred to two different CAMHS services in Scotland over a 6-month period for reasons of suicidality and document the outcome of these referrals.
2) Provide descriptive demographic information about the identified sample population: age, gender, family composition, etc.
3) Explore whether there is any potential relationship between reason for referral, referral source and demographic indicators with referral outcomes.

Materials and methods

Context / setting

The two selected CAMHS teams are in geographically different areas (Health Board regions) of Scotland, and are referred to throughout as site A, and B. They were selected as they offered understanding of contrasting environments, remote rural, and a mixture of accessible-rural / urban areas. They also reflect different CAMHS structures: within the CAMHS team in site A there are psychological services, learning disability and autistic spectrum disorder services,

a looked after and accommodated nurse service, a core CAMHS nursing service, a Tier 4 CAMHS outreach team, and consultant psychiatrists; in site B there are core CAMHS nursing teams, an intensive support team, a looked after and accommodated team, a specific service for children who have experienced child sexual abuse, a suicide and self-harm team and consultant psychiatrists. Psychological services and autistic spectrum disorder and learning disability teams sit out with CAMHS within Site B. The intense nature of on-site review of all referrals data and study resources precluded investigation of more sites.

Data source

Information regarding the number of children who are referred to CAMHS primarily for reasons of suicidality is not routinely available. This information can only be identified from the initial referral letter and / or completed referral form sent to the CAMHS service. These referral forms and letters were identified as the data source for this study as they provided a means to identify the sample population. In site A all referrals were stored in paper-based files, while in site B, PDF copies of these referral letters and forms were held electronically.

Data were collected from referrals made over a 6-month period: January –June 2019. In Site A, a total of 397 referrals were screened. This was the total number of referrals received by CAMHS at Site A (January and June 2019). This comprised: referrals that were accepted and put on the waiting list ($n = 161$); rejected referrals ($n = 209$); and direct tier four referrals (usually accessed by presentation at A&E) ($n = 27$). These categories reflect how referrals were organized within CAMHS at Site A. The total number of referrals screened in Site B was 762. This was the total number of referrals made to CAMHS across Site B (Jan–June 2019), that were directed to the following services: Suicide and Self-harm team ($n = 131$), East ($n = 226$), West ($n = 294$), specific services for children who are looked after and accommodated, and for children who have experienced child sexual abuse ($n = 111$).

Referrals were eligible to be included in the study if they stated within them that the primary reason for the referral being made was that the child had been thinking about or had attempted suicide. The anonymised data set was then entered into an SPSS file, to enable predefined descriptive and inferential statistical analysis to be conducted.

Variables

The data extracted reflected the study objectives. Variables were pre-specified (Supplementary Table 1: Retrospective

cohort study variables). Reasons for referral, referral outcomes and anonymised demographic data were extracted to provide descriptive statistics for the sample population as well as explore the potential relationship between demographic indicators and referral outcomes. For example, the Scottish Index of Multiple Deprivation (SIMD) 2016 version was used to calculate a deprivation score for each child referred for reasons of suicidality. The SIMD tool ranks geographical data zones (based on postcodes) by their level of deprivation. Decile rankings are achieved by combining data from 7 domains of deprivation measured: income, employment, health, education, access, crime, and housing.

Data extraction

The data were extracted in person by LG, from within the CAMHS sites, according to the study protocol. Extracting data to count frequencies from a qualitative source is not straightforward. Some degree of interpretation inevitably occurs. In this instance the presence of certain words / phrases in the referral document were read as indicative of suicidality. For example, "suicidal thoughts" or "been thinking about suicide" etc. However, the richness of the qualitative data is undeniably lost during this process, and coding uncertainty occurred as referral information was sometimes unclear or scant. Furthermore, variables such as referral outcome were not clearly defined within the individual records and narrative data was used to ascertain what happened to the referral (e.g., whether the individual was offered a face-to-face assessment, added to a waiting list etc.). It is important to note that categories were defined by the research team, based upon the information available, and were not necessarily categories employed by the CAMHS teams. Pooling data into categories meant that simple terms like "closed" were used to describe a collection of possible occurrences that could be counted as such. For example, "closed" was used to indicate the case was closed because the person did not attend appointment they were offered, attended one and did not engage thereafter, was not offered further treatment, or attended for treatment and this has ended. The back story as to why the case was closed was lost through the process of anonymizing and categorizing the data. Categories that define a range of situations are outlined in Supplementary Table 1: Retrospective cohort study variables. Missing data was recorded as such.

A coding diary was kept throughout the process, which allowed decisions to be tracked and to ensure consistency. Categories were discussed, agreed, and collapsed as necessary through discussion between LG, ED, and MM. Categories such as "other" were collapsed during the analysis process in consultation with CB, as numbers in these groups would have been so low, they may have compromised individual confidentiality.

TABLE 1 Reason for referral (Site A & B).

	Site A		Site B	
	Number	**Percent**	**Number**	**Percent**
Ideation	40	38.5	73	40.6
Attempt	8	7.7	12	6.7
Ideation & Previous suicidal behavior and / or self-harm.	46	44.2	58	32.2
Attempt & Previous suicidal behavior and / or self-harm.	10	9.6	37	20.6
Total	104	100	180	100

Analysis

Descriptive statistics were produced summarizing the characteristics of the children referred and their referral outcomes. Continuous variables were summarized as mean and standard deviation, or median and inter quartile range (IQR) as appropriate. Categorical variables were summarized as frequencies. Chi Squared analysis and Fishers exact tests were used to explore relationships between categorical variables. Fisher's exact test was employed when small cells sizes meant that Chi Square tests were not appropriate. One-way ANOVAs were used to examine if continuous variables such as age at referral were associated with referral outcome.

Results

Base line and demographic data

The total number of children identified as being referred to CAMHS because of concerns about suicidality in Site A was $n = 104$, which was 26% of all referrals reviewed ($n = 397$). Table 1 shows reason for referral was broken down as follows:

The total number of children identified as having been referred to CAMHS because they were experiencing suicidality in Site B during this time was $n = 180$, which was 24% of all referrals screened[2]. A breakdown of the reason for referral as identified for those referred primarily for suicidality is provided in Table 1.

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2 The actual number of children referred to CAMHS in Site B overall, would also include those referred for ASD assessments, the learning disabilities team, and psychological services and would be much higher. These referrals were not included or screened, on the advice of the data managers as these are not considered core CAMHS services, and the primary reason for their referral would not have been suicide.

Gender and age

Of the children referred for suicidality to Site A; 42 (40.3%) were boys, 62 (59.7%) were girls. Their age at the point of referral ranged from 5–17. The mean age was 13.5, with a standard deviation of 2.52; Thirty percent of children were aged 12 and below. There was 1 missing data unit for age–therefore these statistics depicted in Figure 1A represent 103 referrals.

In Site B, 76 (42.2 %) of children identified were male, 104 (57.8%) were female. Age ranged from 5 to 17 years, with a mean age of 13.28, and a standard deviation of 2.96. Thirty-five percent of children were aged 12 and under. This is presented in Figure 1B.

Family composition

As illustrated in Figure 2A most children referred for suicidality in Site A were found to live at home with at least one of their parents (77%), with the majority being single parent families. However, family composition was not described in 10% of the referrals. Similarly, Figure 2B shows most children in Site B lived with at least one of their parents (76.2%). However, in contrast to Site A, most children had both parents at home. Less than 5% of referrals lacked any information about family composition in Site B.

SIMD (Scottish Index of Multiple Deprivation) data

A deprivation score for each child identified as being referred for reasons for suicidality was calculated based on the Scottish Index of Multiple Deprivation (SIMD) 2016 (the 2020 coding was released following data collection). Postcode data was missing for 17.3% of referrals for suicidality in Site A. The spread of postcode decile for the remaining 86 individuals is illustrated in Figure 3A below. This is contextualized within SIMD data for the region in the discussion which follows.

The SIMD data from the postcodes of the children referred to Site B illustrated in Figure 3B showed there was a high proportion living in the second most deprived areas (based on SIMD ranking) and fewer referrals were for children living in the more affluent areas.

Occupation of referrer

Overall, as is shown in Figure 4A, 65% of referrals for children presenting with suicidality in site A were made by medical professionals, with 51% of these being GP referrals. The second largest source of referral were teachers (29.8%). Similarly, as can be seen in Figure 4B below, most referrals to Site B for

children who were suicidal came from medical professionals (78%) but with higher numbers of referrals from "other doctor or healthcare professionals" and "A&E" than in Site A. Site B had fewer referrals from teachers (22%) than Site A, but a higher number of referrals from other (Other includes school nurse, social worker, other support organization and parents) sources (16%).

Assessment

When a child is referred to CAMHs in Site A, they may or may not be offered a face-to-face assessment by a CAMHS worker, before their referral is rejected, redirected, or added to the waiting list etc. Assessment refers to a face-to-face appointment with a CAMHS clinician, it does not account for background work e.g., information gathering etc. to support the screening process. These assessment appointments generally involve some form or risk assessment, safety planning and exploration of family circumstances and any underlying issues. The format varies between clinicians and sites. Figures 5A,B shows that most (69%) children referred to CAMHS for suicidality in Site A were not offered a face-to-face assessment, though the practitioner screening the referrals may in some instances have provided a telephone consultation with the person making the referral. While in Site B, most children (82%) identified as having been referred for suicidality were offered a face-to-face assessment.

Referral outcome

The variable referral outcome documents the decision that was made immediately following referral and / or assessment in relation to whether the person was offered a service with CAMHS or not. Figure 6A shows that in Site A, < 10% of children were offered treatment straight away, and although 34.6% were added to the waiting list, most referrals were not accepted (57.6%). In contrast, Figure 6B shows most children (66.1%) in Site B were offered treatment. One fifth (20.5%) of referrals were either added to a waiting list or referred to another CAMHS service such as primary care psychology, and 13.3% were signposted or re-directed.

Underlying issues

Underlying issues were identified within the initial referral information or the first contact with the CAHMS service. Each child may have had more than one issue reported. Figure 7A shows that in Site A parental separation, other mental health issues or neurological condition, bullying, and ASD were the most common issues. In Site B the issues most reported for
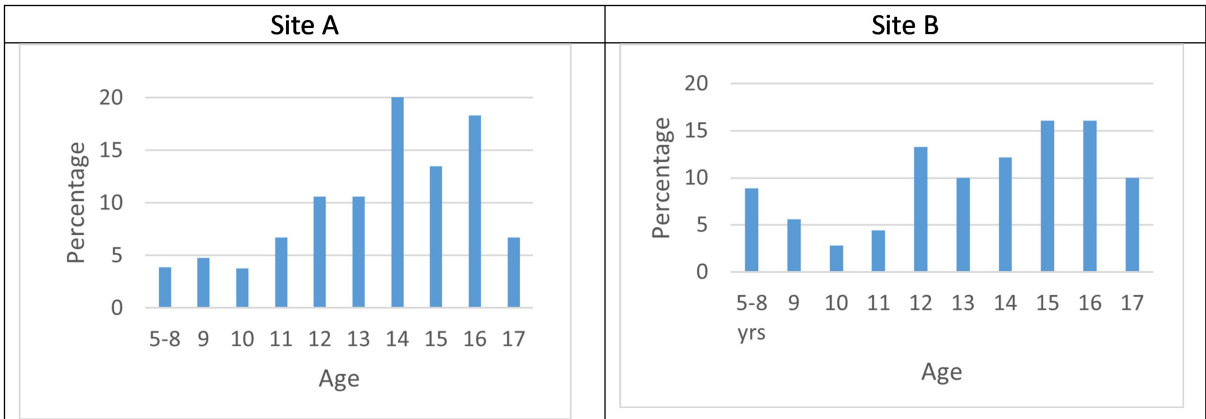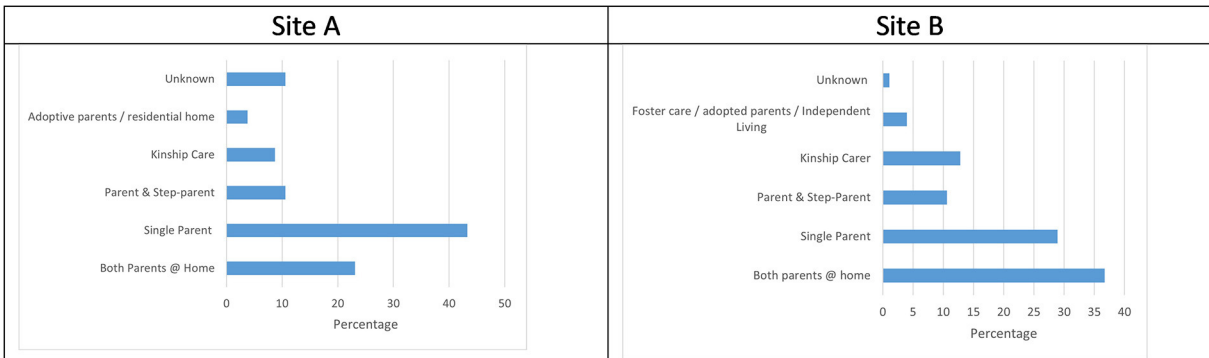
FIGURE 1
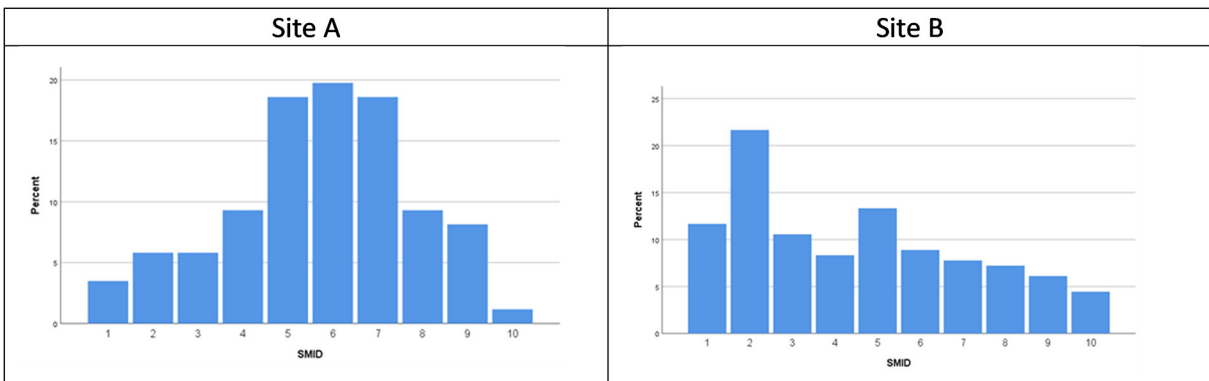**(A,B)** Age at referral.

FIGURE 2
(A,B) Family composition.

FIGURE 3
(A,B) Scottish Index of Multiple Deprivation (SIMD 16) data.
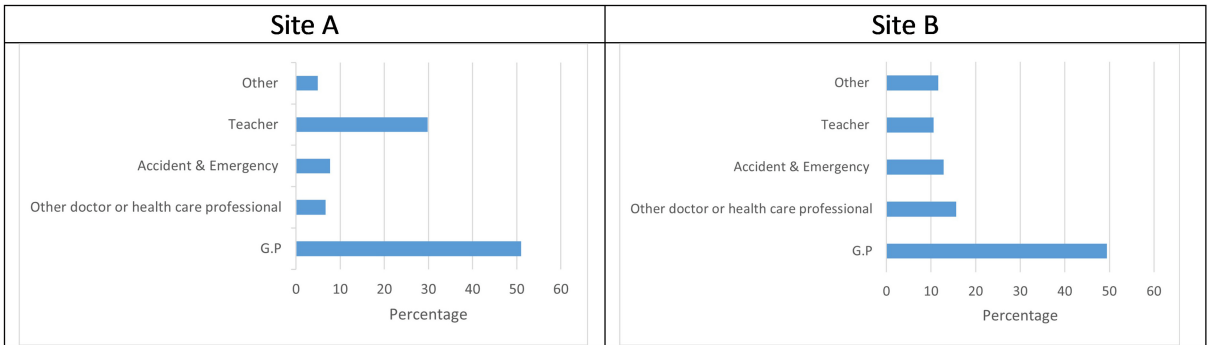
FIGURE 4
(A,B) Occupation of referrer.
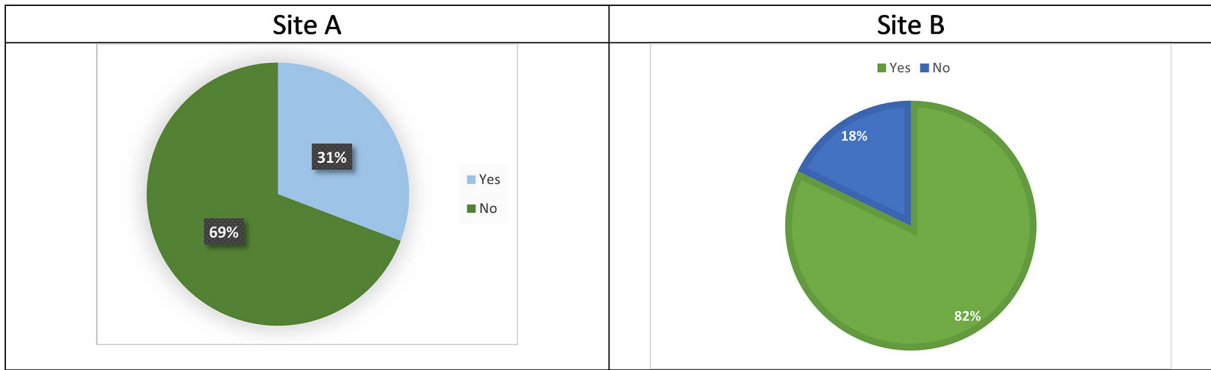

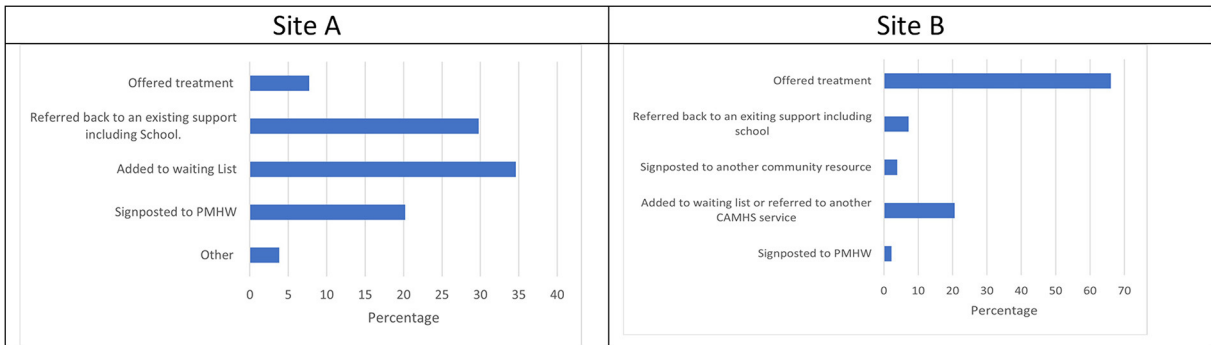
FIGURE 5
(A,B) Offered an assessment.

FIGURE 6
(A,B) Referral outcome.

children were parental separation (41.1%) and bullying (33.9%), followed by abuse (18.3%) and bereavement (16.1%), shown in Figure 7B.

Exploration of associations between demographic indicators and outcomes

Reason for referral and assessment

Fisher's exact tests were conducted to explore if there was any relationship between reason for referral and assessment. Although the numbers of children who had attempted suicide both with and without previous suicidal behavior was much lower than the number of children referred for suicidal ideation, they were more likely to be offered an assessment. A Fishers Exact Test (FET) confirmed there was a potential relationship between these variables in site A ($p = 0.003$ FET). Similarly, in Site B, a FET found there may be a relationship between reason for referral and assessment ($p = 0.010$ FET), as there were slightly higher numbers of children offered an assessment following a suicide attempt (with and without previous behavior). However, overall, most children in Site B were offered an assessment (see Figure 5).

Reason for referral and referral outcome

Unfortunately, it was not possible to reliably determine whether there was any association between the reason that a child had been referred, and the outcome of the referral for either site. This was because the large number of different reasons for referral meant that data was too sparse for statistical analysis. Categories had been collapsed as far as was conceptually feasible.

Referral source and assessment

A Fisher's Exact test ($p < 0.001$, FET) indicated there may be a relationship between the source of the referral and whether the child was offered an assessment. Over 85% of referrals from A&E were assessed although the overall number of those referrals was < 10. While over 85% of G.P referrals were not assessed, albeit the greatest number of referrals received were from GPs.

Most children from whatever route of referral in Site B, were offered an assessment. However, there were some differences. For example, all children and young people in Site B referred by A&E were assessed, whereas < 70% of referrals from teachers were assessed ($p = 0.022$ FET).

Referral source and referral outcome

Exploring the relationship between the referral source and referral outcome (n Site A with FET showed a potential relationship ($p = 0.028$). In Site B data was too sparse for such statistical analysis.

Age and referral outcome

A one-way ANOVA indicated a statistically significant difference between age and referral outcome (F $_{(4,98)}$ = 3.536, $P = 0.010$). The table of means [Table 2 (Site A)] shows that younger children were more likely to be referred to an existing support or onto a primary mental health worker.

A one-way ANOVA also showed that there was a statistically significant difference between the age of children and their referral outcomes (F $_{(12,167)}$ = 2.964, $p < 0.001$) in Site B. From the table of means [Table 2 (Site B)] it appears children offered treatment are older than for other referral outcomes.

Age and reason for referral

Comparison of mean ages within reason for referral for Site A showed that the average age of children having attempted suicide and having attempted suicide with a history of suicidal behavior was slightly higher than for the ideation categories. A one-way ANOVA showed a statistically significant relationship between reason for referral and age (F $_{(3,99)}$ = 4.283, $p = 0.007$). In Site B one-way ANOVA, also showed that the relationship between the age of a child for each reason for referral category was statistically significant (F $_{(3,176)}$ = 2.990, $p = 0.032$).

Summary of main findings

Approximately 25% of all referrals to CAMHS in both regions were for children presenting with suicidality (26% ($n = 104$) in Site A and 24% ($n = 180$) in Site B). The assessment and outcome of these referrals varied between the health boards. In Site A, 31% of children referred were offered an assessment appointment, compared with 82% of children in Site B.

Referral outcomes in Site A indicated that 8% of those assessed were offered treatment, 35% were added to the waiting list, 20% were signposted to primary mental health workers, and 37% of children were referred to other agencies, school or back to the referring agency for support. In Site B 48% of children referred for suicidality were provided and engaged in treatment, 18% of young people were offered treatment but did not engage or attend their appointment, 13% were added to the waiting list, 2% were signposted to primary mental health workers, 7% referred on to a different CAMHS service (e.g., psychology), 11% were referred to other agencies, school or back to the referring agency for support.

Through the process of data collection, it was possible to map the journeys of care made by children in the two sites following their referral to CAMHS. This is depicted in Figures 8–11, which follows.

The reason for referral, that is whether they had been thinking about suicide, attempted suicide, or had a history of suicidal behavior, may have had a bearing on whether children were offered an assessment in Site A and Site B. Children who
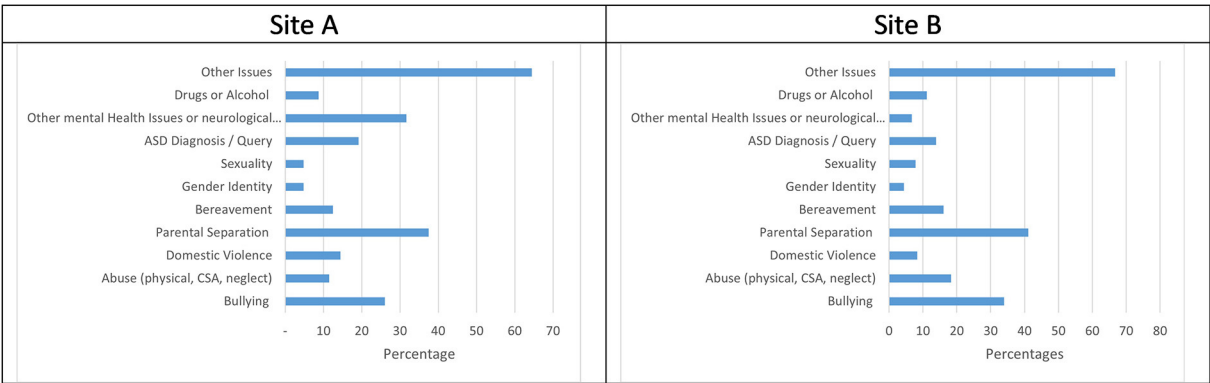
FIGURE 7
(A,B) Underlying issues.

TABLE 2 Age & referral outcome (Site A & B).

	Site A			Site B		
Outcome of referral	Mean age	N	Std. deviation	Mean age	N	Std. deviation
Signposted to PMHW	12.70	20	2.716	11.50	4	4.796
Added to waiting List	13.92	36	1.962	11.78	37	3.128
Other	14.86	7	1.676	11.86	7	4.100
Referred to an existing support including school	12.75	32	2.896	11.69	13	3.376
Offered treatment	15.50	8	1.512	14.06	119	2.423
Total	13.50	103	2.524	13.28	180	2.958

had been referred following a suicide attempt being were offered an assessment more often than those referred for ideation. In both areas, children were also more likely to be offered an assessment if they had been referred directly from A&E than from any other referral source, although in Site B most children were offered an assessment regardless of referral source or reason for referral.

In both health board areas, there appeared to be a relationship between the age of the child and the reason for referral, although the nature of this relationship differed. In Site A the age of the children that attempted suicide seemed to be higher than those presenting with suicidal ideation. While in Site B the data suggested that older children were more likely to have a history of previous suicidal behavior than those being referred following a first attempt or suicidal ideation. In both services, the age of referral also seemed to have a similar relationship with the referral outcome–older children were more likely to be offered treatment. Demographic information from both areas indicated that the underlying issues identified in referrals, family composition and age range of these sample populations were generally similar.

Overall, this study shows that one quarter of all referrals to CAMHS in both sites were for children who had either attempted or been thinking about suicide, and that one third of these were for children under 12. The findings indicate that older children in both areas were more likely to be offered treatment. The underlying issues identified by referrers were similar in both health boards and included a broad range of complex familial and social factors, suggesting that suicidal children are not a homogenous group.

There was a considerable difference in the numbers of children who were offered assessments and treatment between the Sites reflecting the structural differences between teams. In Site A only 31% were offered an assessment, while in Site B, who had a specific suicide and self-harm team, were able to provide face to face assessments for 82% of children referred. Similarly, more children in Site B were offered treatment (48%), than in Site A (8%).

Our analysis suggests that having a specialist team to respond to referrals for suicidality may better equip CAMHS to assess children who have been referred due to suicidality and offer some form of intervention.

FIGURE 8
Referral pathway for children referred to CAMHS from A&E (Site A).
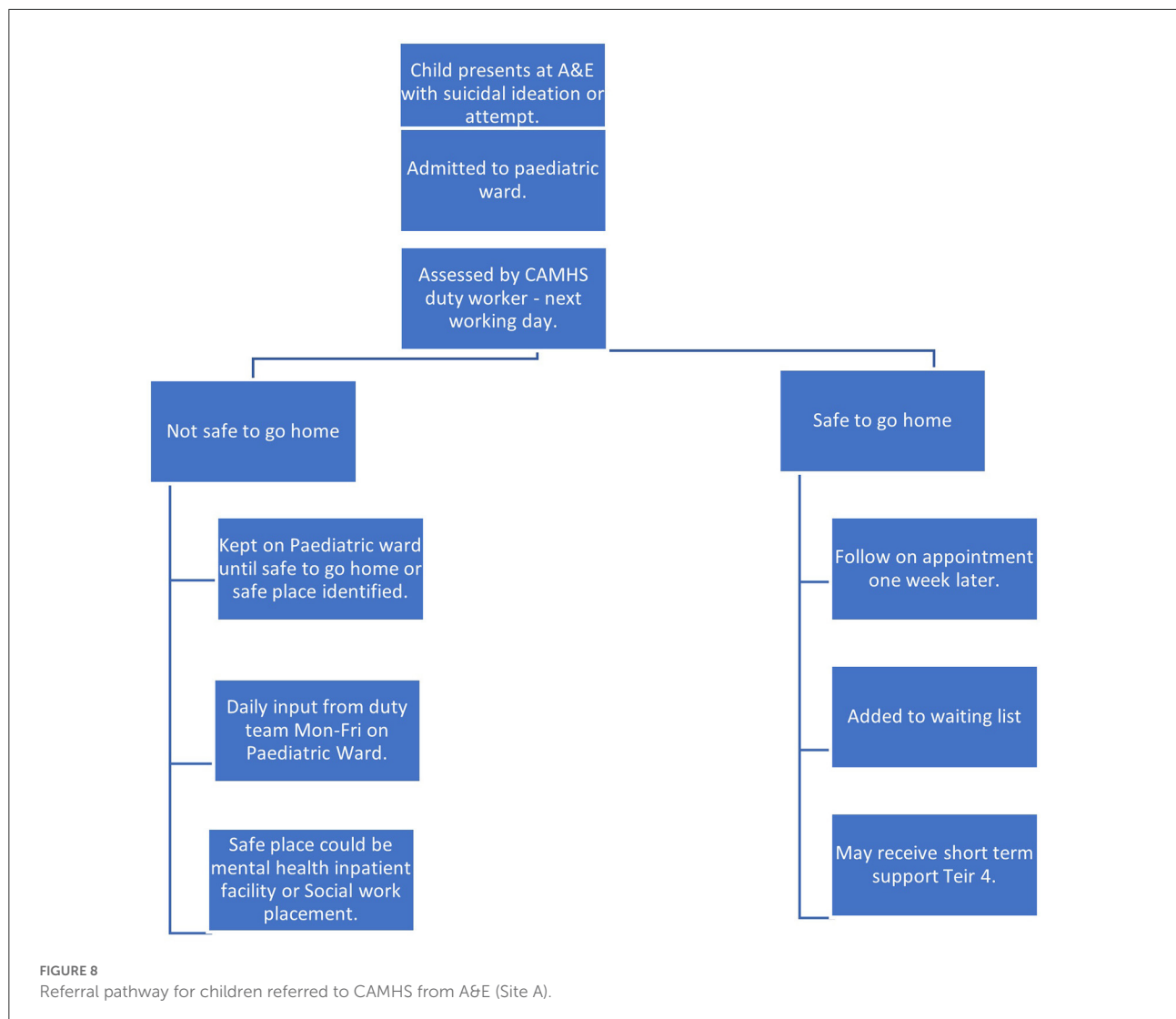
Discussion

The two sites are situated in different parts of Scotland. Not only are the CAMH services operationally distinct from one another, but so too are the local cultural contexts. For example, the population of the geographical region of Site A in June 2019, was 235, 540 whilst in Site B it was 371,910. The number of children aged 0–15 years, in Site A and B was 39,335, and 64,473 respectively. While these numbers reflected a similar percentage of the locality's overall populations (16.7 and 17.3%), Site A has 39% less children aged 0-15 than Site B (24). This difference in child populations is reflected in the number of children referred to the CAMHS services, with Site A receiving 42% less referrals for children and young people who were suicidal during the data collection period.

The size of the population aged 16-18 is unknown as National Records Scotland data are grouped by ages 0-15 and

FIGURE 9
Referral pathway for children referred from other sources (Site A).
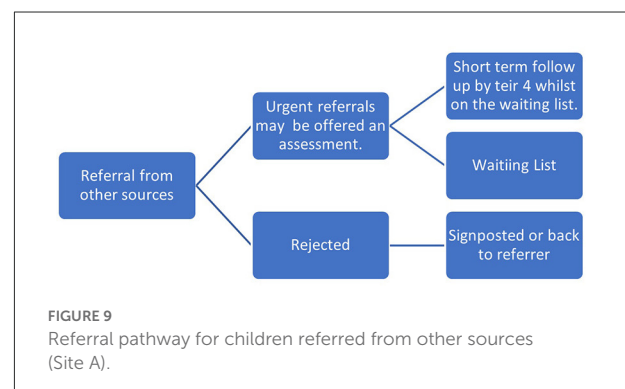
16–24 yrs (24). However, it is worth noting that although Site A only accept referrals for young people aged 16–18 yrs if they are still attending school, in Site B they work with all children
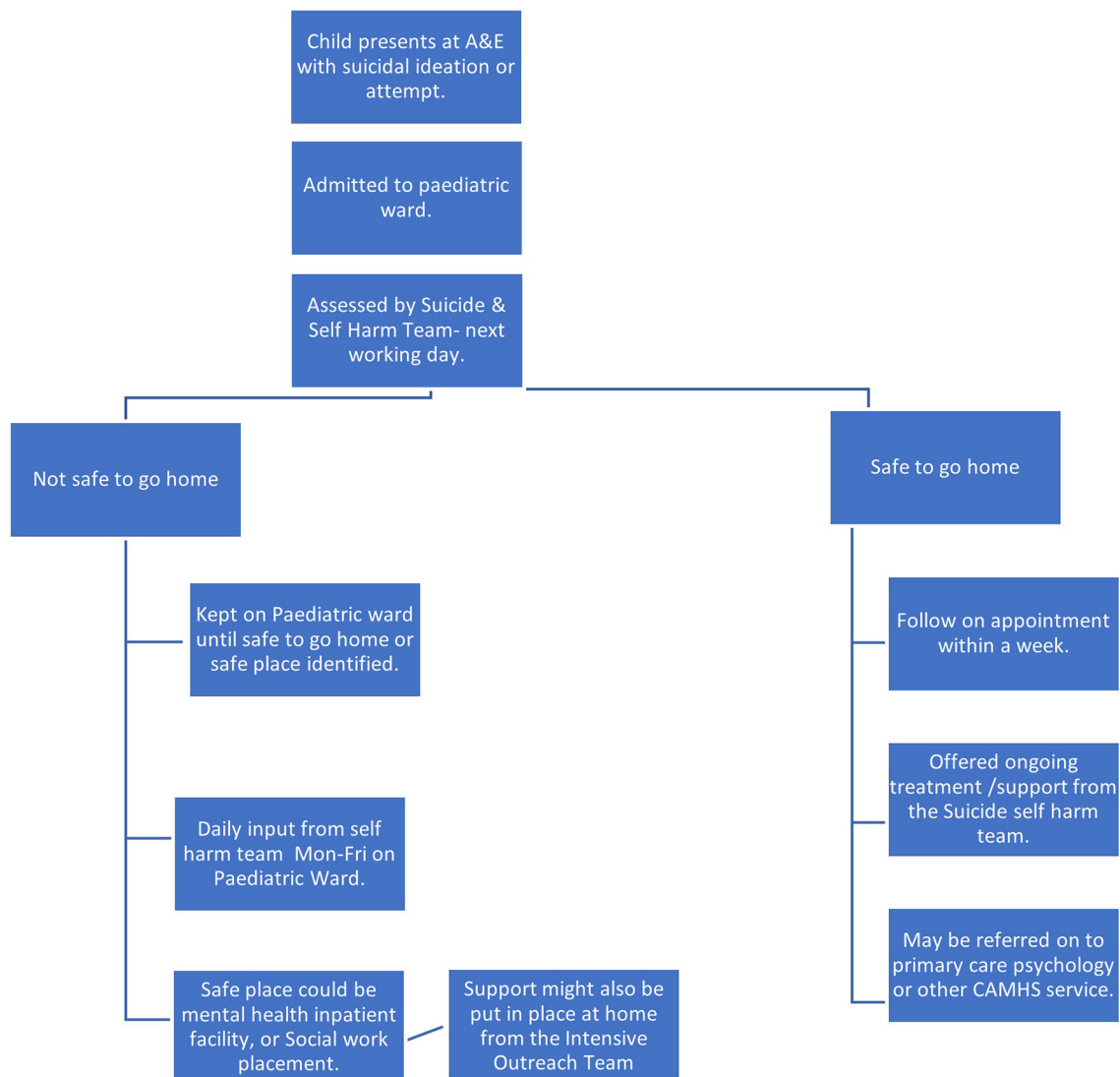
FIGURE 10
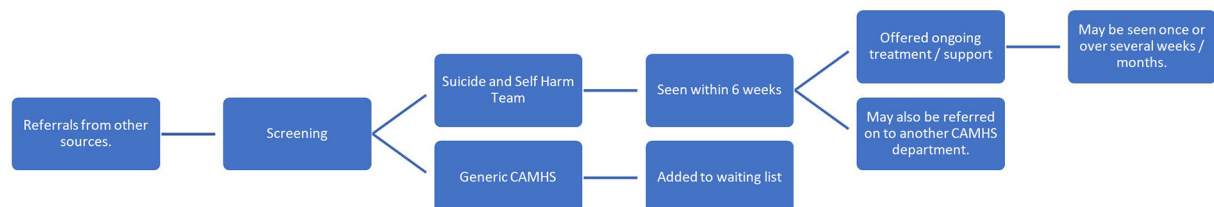Referral pathway for children referred to CAMHS from A&E (Site B).

FIGURE 11
Referral pathway for children referred from other sources (Site B).

up to 18 yrs. The percentage of referrals each CAMHS received for children aged 16-18 who were suicidal was 25 and 26% respectively. This shows that the difference in CAMHS remit for

Site A had little impact on where services referred young people of this age. Or it could be there was a higher proportion of young people aged 16–18 years who were presenting to health services

as suicidal in Site A (as we would expect there would also be a number referred to adult services), or there are higher numbers of children remained in school beyond 16 yrs.

The stark difference in the numbers of children offered face to face assessments between these regions, highlights the benefits in Site B having a discrete suicide and self-harm team. However, due to pressure on resources this team have since moved to a new model of care, which could adversely affect their ability to respond as quickly to these children in future.

The differences in numbers of assessments offered also reflects the geographical challenges faced by CAMHS workers in providing accessible face to face appointments for children living in remote and rural locations in Site A. Although there have been and are ongoing attempts to address this, through the provision of video linked "near me" appointments, and provision of primary mental health workers located within specific regions, these have presented challenges in themselves, and arguably it remains a gap in service provision.

If we consider referrals that were not added to the waiting list or provided treatment as "rejected"[3], then 57.2% of children referred to CAMHS in Site A for suicidality were rejected, compared with 20.6% in Site B. These numbers highlight again the difference between outcomes for children referred to different services. The national CAMHS audit reports that 1 in 5 (20%) of referrals to CAMHS across Scotland are rejected (25). This study shows that while the number of rejected referrals for suicidal children in Site B is in keeping with this figure, in Site A they are more than double the reported national average. Neither service reject less referrals for reasons of suicide than the reported national average, which is contrary to a belief held by parents that CAMHS only see young people who are suicidal, as was reported in the audit of rejected referrals (15).

The study SIMD data demonstrates a difference in the proportion of referrals for children from areas of multiple deprivation between Site A and B, with more children in Site B being referred from areas of higher multiple deprivation. However, this may be reflective of the levels in deprivation across these sites more generally: more areas of Site B are among the 20% of most deprived areas in Scotland than in Site A (19% of data zones in Site B are considered in the lowest decile for deprivation, in Site A this figure is 8%). While there are pockets of areas of deprivation in Site A, poverty of access is a much more prominent issue, with almost half of localities reported as being in the lowest quintile for access (47%) (26, 27).

The 2018 audit of rejected referrals to CAMHS in Scotland (11) found there were a higher a number of rejected referrals for children from areas of multiple deprivation than more affluent areas. However, they were unable to situate this within the context of SIMD data for all CAMHS referrals, as this data is not routinely gathered or available. They suggest that higher

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3 Rejected is the term used by the team conducting the national CAMHS audit (25), although redirected is often a preferred term.

numbers of referrals for children to CAMHS from deprived areas would be expected given what is known about the links between poverty and poorer mental health. There could be a disparity in access to mental health services for children based on social class (28). There are clearly established links between suicide and deprivation (29–31). Although postcode data may not provide the whole picture in relation to the adversity experienced by a child it is important their access to mental health support services are considered within a context of social stratification if we are to understand the specific barriers and challenges such as means of transport to attend appointments, that they face.

In both regions there were slightly higher numbers of referrals for females than males. However, the number of males referred averaged 41% across both regions (40.3% in Site A, and 42.2% in Site B), and there were much higher rates of self-harming behavior among boys generally [rates of self-harm have been found to be three times higher for girls than for boys (32)]. Given that completed suicide is known to be higher among young men and males generally, it could be a positive that boys are seeking help with suicidal feelings at a young age (1, 5, 33–36). However, this finding also highlights the importance of children receiving timely help and the opportunity that it is presented to provide an intervention at the point of referral. The age of children referred to both services ranged from 5–17yrs. Suicidality is generally perceived as an adult problem. While there is growing recognition that suicidality is an issue for many adolescents and young adults it is not commonly associated with younger children (37, 38). This study found that approximately 33% of all children who were referred due to suicidality were aged 12 or younger (30% in Site A; 35% in Site B).

It is debated whether children under the age of 12 fully comprehend suicide (39). Some evidence suggests they do present with suicidal ideation, make attempts to end their life, and complete suicide (38, 40). However, there remains a paucity of research regarding very young children and suicide (41). But given the increasing numbers of deaths by suicide among this population (33, 35), it may be harmful to ignore or dismiss young children presenting with suicidality because of a belief that they are too young to fully understand what suicide really means (42).

The underlying issues identified within the referrals in both health board areas have recognizable similarities. For example, 37.5% of children in Site A, and 41.1 % in Site B noted parental separation. Domestic abuse was reported in 8.3% of referrals in Site B, and 14% in Site A. Child abuse (physical, emotional, sexual or neglect) was mentioned in 12% of referrals in Site A, while the overall rate of child abuse within the referrals in Site B was 18 %, with child sexual abuse specifically mentioned in 10% of identified referrals. This could be because CAMHS in Site B have a dedicated service to support trauma recovery in children who have experienced sexual abuse, encouraging referrers to explicitly mention this.

Parental separation featured in approximately 40% (38% in Site A; 41% in Site B) of all referrals for children who were suicidal, highlighting this is a difficult issue for children not just at the point of separation but also after. It may be this is the case for all referrals to CAMHS and not just those identified for suicidality. An accurate number of children having experienced parental separation across Scotland is not available, however information from the 2011 census tells us that 31% of families with dependent children were lone parent households, 15% were cohabiting, and 54% were married. Of the cohabiting families 29% were stepfamilies, and 8% of married families were stepfamilies (43). This suggests that parental separation across the population of children in Scotland is perhaps not that different from the prevalence of parental separation in children referred to CAMHS for suicidality. Additionally, as is reported elsewhere (6, 37), suicidality in children generally stems from a combination of more than one issue and is not solely attributable to parental separation.

Approximately 20% of all children referred in this study for suicidality either had an autistic spectrum disorder (ASD) diagnosis, or ASD was queried within the referral. We know from the research literature generally that the links between ASD and suicide have been established (37, 44). Specialist support around suicidality should be made available for children with autism and their families.

Drugs and / or alcohol were only mentioned in 9% of referrals in Site A, and 11.1% in Site B. This supports the findings of other research in this area that suggest that unlike in adult populations there is not a clear association between suicidality and drugs / alcohol in children (6, 45, 46).

The data sets from Site A and B were different in that other mental health or neurological conditions (Low mood, anxiety, eating disorders, psychosis etc.) were only mentioned in 6.7% of referrals for children presenting with suicidality in Site B compared to 32% in Site A. This could be due to differences in the choice of language used by referrers to describe symptoms and feelings e.g., anxiety and low mood, and warrants further exploration in future studies. It could also be because the existence of the dedicated suicide and self-harm team in Site B means that rightly or wrongly referrers did not feel the need to pathologize mood and anxiety as much as they are more confident that the expression of suicidality alone meets the threshold for CAMHS. Additionally, referrals where the primary reason for referral was related to ASD were not screened in Site B as these were directed to another team. Importantly though these figures show that a sizeable proportion of the referrals in Site A suggest there is a co-occurring presenting mental health issue that may require assessment / treatment / support.

The underlying issues identified in these referrals supports what is already known about risk factors and suicide in children and young people (46). These are issued faced by many young people growing up. However, as was identified in the UK National Confidential Enquiry report, 2017 (6), young people

who are suicidal often face multiple challenges, and it may be unhelpful to attempt to compartmentalize support around particular issues for individuals who are actively suicidal.

The problem, as it is presented in government reports (14, 15, 47), and was found in this study, suggests that CAMHS do not have the capacity to meet the needs of the numbers of children being referred. In Site A, most children who are referred for suicidality are not assessed or offered treatment. While in Site B, they have a dedicated team for children and young people who self-harm or are suicidal, and consequently assess 87% of all children referred for suicidality (48) argues that demand increases in line with service provision; therefore creation of specialist services to extend capacity results in increasing referrals as awareness of the service extends. However, this study did not find this to be the case. Referrals for children who presented as suicidal were approximately one quarter of all CAMHS referrals in both regions, although one had a specialist suicide and self-harm team.

Strengths and limitations

This study is the first to present data on the numbers of children referred to CAHMS presenting as suicidal and the outcomes of their referrals. Identifying referrals for children who were suicidal from individual records was both a complex and arduous task, given the inconsistencies in recording practices and variation in referral information provided. There is an unavoidable element of interpretation, and construction as the qualitative referral information and record of first contact is deciphered and coded. This may have been approached differently by another researcher, what is presented here is a transparent report of the findings employing our pre-defined protocol.

Although, the sample size was small and any relationships between referral outcomes and demographic indicators difficult to ascertain, what is presented offers previously unknown insight into this important issue. This study was concerned with ascertaining the numbers of referrals for children to CAMHS for reasons of suicidality, and the broad outcomes of these referrals. The data extracted was limited to predefined variables relating to this purpose, however, it may have been helpful to also capture the nature and types of treatments offered. Additionally, although data collection was limited by the availability and accuracy of the data held by CAMHS, this highlights issues in recording practices and referral information requested.

Conclusions

This study shows despite differences in geography and context, suicidality in children is a factor in approximately a quarter of all referrals to these two CAMHS, and there are vast

differences in how these referrals are processed and responded to. There is little difference in the issues being identified by referrers, the age range of children, and the behaviors they present and yet there were very different outcomes, and pathways of care.

Given that 33% of referrals were for children under 12 years of age this highlights the often-missed opportunity for early intervention with very young suicidal children when they are not seen or offered support from CAMHS.

The data presented here is novel and will provide a vital source of information to decision makers and service providers in their consideration of service structures and allocation of resources. With growing numbers of referrals to CAMHS, and excessively long waiting times in many areas, it is vital that those identified as being at risk of suicide be provided with clear and consistent pathways of care.

Routine systems for collecting CAMHS data should include suicidality if we are to better understand the extent of this problem, and responses to referrals for suicidality from CAMHS. Further research is also needed to establish how this care journey is experienced by suicidal children and young people, and whether when they do receive treatment from CAMHS it meets their needs.

Data availability statement

The datasets presented in this study can be found in online repositories. The names of the repository/repositories and accession number(s) can be found below: dataSTORRE https://datastorre.stir.ac.uk.

Author contributions

LG conceived the idea for the study, extracted and input the data, and performed the analysis. LG, MM, and ED developed the study protocol and input to ethics and other approvals for access to the data. CB verified the analytical methods and results. MM and ED encouraged and supervised all stages of this work. All authors discussed the results and contributed to the final manuscript.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.914479/full#supplementary-material

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Nomenclature

For the purposes of clarity, the authors have used the following definitions:

- Suicidal behavior: Any form of self-harming behavior motivated by suicidal intent. It may have a fatal or non-fatal outcome.

- Suicidal ideation: Having thoughts about suicide, which may include planning suicide, sending, or writing suicide notes.
- Suicidality: A term of reference that includes both suicidal behavior and ideation.
- Self-harm: Any behavior that causes self-injury, with and without suicidal intent. Most people who self-injure do not intend die and differentiate between self-harming and suicidal behaviors.

Check for updates

Genetic risk, parental history, and suicide attempts in a diverse sample of US adolescents

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Background: Adolescent suicide is a major health problem in the US marked by a recent increase in risk of suicidal behavior among Black/African American youth. While genetic factors partly account for familial transmission of suicidal behavior, it is not clear whether polygenic risk scores of suicide attempt can contribute to suicide risk classification.

Objectives: To evaluate the contribution of a polygenic risk score for suicide attempt (PRS-SA) in explaining variance in suicide attempt by early adolescence.

Methods: We studied $N = 5,214$ non-related youth of African and European genetic ancestry from the Adolescent Brain Cognitive Development (ABCD) Study (ages 8.9–13.8 years) who were evaluated between 2016 and 2021. Regression models tested associations between PRS-SA and parental history of suicide attempt/death with youth-reported suicide attempt. Covariates included age and sex.

Results: Over three waves of assessments, 182 youth (3.5%) reported a past suicide attempt, with Black youth reporting significantly more suicide attempts than their White counterparts (6.1 vs. 2.8%, $p < 0.001$). PRS-SA was associated with suicide attempt [odds ratio (OR) = 1.3, 95% confidence interval (CI) 1.1–1.5, $p = 0.001$]. Parental history of suicide attempt/death was also associated with youth suicide attempt (OR = 3.1, 95% CI, 2.0–4.7, $p < 0.001$). PRS-SA remained significantly associated with suicide attempt even when accounting for parental history (OR = 1.29, 95% CI = 1.1–1.5, $p = 0.002$). In European ancestry youth ($n = 4,128$), inclusion of PRS-SA in models containing parental history explained more variance in suicide attempt compared to models that included only parental history ($\Delta R^2 = 0.7\%$, $p = 0.009$).

Conclusions: Findings suggest that PRS-SA may be useful for youth suicide risk classification in addition to established risk factors.

Introduction

Suicide is the second leading cause of death in US adolescents (1). The rising rates of suicide among Black or African American youth are especially concerning (2). Suicide attempt is a complex behavior influenced by multiple risk factors including preexisting psychopathology, interpersonal stressors, socioeconomic, and genetic factors (3). Clinicians often use parental history of suicide attempt/death to estimate suicide risk (4). The potential of using polygenic scores of psychiatric phenotypes to assess genetic suicide risk is uncertain (5). It is not known whether a polygenic score of suicide attempts (PRS-SA) can contribute to suicide risk classification or whether PRS-SA adds useful information beyond the commonly used risk assessment based on parental history.

The Adolescent Brain Cognitive Development (ABCD) Study follows diverse genotyped US youth from ages 9–10 into adolescence (6). The study collects data on parental history of psychiatric conditions (7), including suicide attempt/death. Participants are evaluated annually for history of suicide attempts, and endorsement of suicide attempts in Black participants is significantly higher (8). Here, we aimed to evaluate the contribution of PRS-SA to explaining variance in self-reported suicide attempt by early adolescence and to determine the additive effect of this score over and above parental history of suicide attempt/death.

Methods

Participants

We included $N = 5,214$ non-related ABCD Study participants of African and European genetic ancestry who had data on parental history of suicide attempt or death ($n = 302$ missing such data were excluded from analyses). From each family, only the oldest sibling was selected for this study ($n = 1,002$ siblings were excluded: Supplementary Figure 1). We imputed age at clinical assessment for the 21 participants (0.4%) included in our analysis who did not complete the last ABCD Study assessment.

Of the total sample, $n = 1,086$ were classified as having African genetic ancestry [of whom 988 (97.1%) were parent reported as being Black and 71 (6.6%) were parent reported being Hispanic]; and $n = 4,128$ had European genetic ancestry [of whom 4,093 (99.2%) were parent reported as being White and 123 (3%) were parent reported as being Hispanic]. The ABCD Study[®] protocol was approved by the University of California, San Diego Institutional Review Board (IRB) and was exempted from a full review by University of Pennsylvania IRB.

Genotyping, quality control, and imputation

ABCD genotype data were obtained from saliva samples using the Affymetrix NIDA SmokeScreen array (NDA #2573, fix release 2.0.1). We used PLINK 1.9 (9) to remove single nucleotide polymorphisms (SNPs) with >5% missingness, samples with more than 10% missingness, and samples with a genotyped sex that did not match the reported sex phenotype. Then, we compared SNP frequencies against the 1,000 Genomes ALL reference panel (10). This fixed strand reversals and improper Ref/Alt assignments and also removed palindromic A/T and C/G SNPs with minor allele frequency (MAF) >0.4, SNPs with alleles that did not match the reference panel, SNPs with allele frequencies differing by more than 0.2 from the reference, and SNPs not present in the reference panel. The pre-imputation QC process yielded a genomic dataset comprised of 485,329 variants and 10,318 individuals.

Genotypes were phased (Eagle v.2.4) and imputed by chromosome to the 1,000 Genomes Other/Mixed GRCh37/hg19 reference panel (Phase 3 v.5) using Minimac 4 *via* the Michigan Imputation Server (11). All post-imputation QC was run using bcftools (12). Only polymorphic sites with imputation quality $R^2 \geq 0.7$ and MAF ≥ 0.01 were included in the final PLINK 1.9 hard-call post-imputation dataset comprised of 9,768,092 variants.

Multidimensional scaling (MDS) was conducted using KING (v.2.2.4) (13) to identify the top ten ancestry components for each sample. The ancestry PCs were projected onto the 1,000 Genomes PC space, and genetic ancestry was inferred using the e1071 (14) support vector machines package in R version 4.1.0 (15). The African ($n = 1,741$) and European ($n = 5,815$) ancestry individuals eligible to be included in the present study were defined by these inferences; all other ancestry groups were excluded from further analysis. A second round of unprojected MDS was then performed within the EUR- and AFR-ancestry groups to produce ten PCs that were regressed out of the standardized PRS-SA to adjust for genetic ancestry.

Variables

Exposures

Polygenic risk score of suicide attempt

Summary statistics were obtained for a suicide attempt genome-wide association study (GWAS) meta-analysis run by the International Suicide Genetics Consortium (16). Given that this is a trans-ancestry GWAS (i.e., ~90% EUR, ~6% Asian, and ~4% admixed; 29,782 suicide attempt cases and 519,961 controls), we opted to use PRSice-2 (17) to compute PRS-SA separately for the African and European ancestry ABCD participants to allow for differing linkage disequilibrium (LD)

structure in these groups. SNPs in the two target datasets were clumped to minimize LD using an $r^2 \geq 0.1$ threshold in sliding windows of 250 kB and then selected from the discovery GWAS for inclusion in the PRS-SA calculations based on a series of eight P-value thresholds, ranging from 0.0001 to 1 (Supplementary Table 1). Raw PRS-SA was computed at each P-value threshold by summing the effect alleles weighted by the log-odds ratio estimated by the discovery GWAS. The two ancestry-specific sets of PRS-SA were then z-scored and corrected for population stratification by regressing out 10 within-ancestry PCs at each P-value threshold, yielding eight PRS-SA per study participant.

Parental history of suicide attempt

Parental history was evaluated using parent reports on parents' suicide attempt/death (variable: "famhx_ss_momdad_scd_p") in the first assessment of the ABCD study.

Outcome measure

The ABCD Study clinical assessment was based on the Kiddie Schedule for Affective Disorders and Schizophrenia 5 (KSADS-5) and included detailed questions on suicidal thoughts and behavior (18, 19). The participants were specifically asked about history of suicide attempt ("was there ever a time when you did something to try to kill yourself and actually made a suicide attempt?"), including aborted or interrupted attempts ["did you start to do something to end your life, but either stopped yourself or were interrupted by someone else (for example, you were about to take pills or had a gun ready, or were about to jump or hang yourself, but either stopped yourself or were stopped by someone else?)"].

The participants who endorsed any of the above questions at least one time in any of the three first ABCD Study assessments were considered as suicide attempters. The participants who denied history of suicide attempt in all three assessments were considered controls. All other participants [$n = 1,038$] were excluded from the analysis.

Statistical analyses

Analyses were conducted from January-March 2022 using ABCD Study data release 4.0. We used R version 4.1.0. for data analyses. Data preprocessing and analysis are detailed at https://github.com/barzilab1/ABCD_SA_genetics_FH.

Mean [standard deviation (SD)] and frequency (%) were reported for descriptive purposes. Univariate comparisons were

made using t-test or chi-square tests, as appropriate. We used two-tailed tests for all statistical models.

We estimated binary logistic regression models with suicide attempt as the dependent variable and PRS-SA as the independent variable, co-varying for age and sex. To allow inclusion of the participants from diverse ancestries in our analyses, we estimated models stratified by ancestry and then meta-analyzed the results. We determined the optimal GWAS P-value threshold for the PRS-SA based on the highest odds ratio and lowest P-value of PRS-SA in association with suicide attempt in the meta-analyzed results.

To explore the additive effects of PRS-SA on explaining variance in suicide attempt, estimated by Nagelkerke's R^2, we estimated stratified regression models in the African and European ancestry youth with and without PRS-SA and compared the goodness of fit using the likelihood ratio test.

Results

Among the 5,214 participants, 182 (3.5%) endorsed having made a suicide attempt at least one time in the three ABCD Study assessments. History of suicide attempt was more frequent among Black youth (66 of 1,087; 6.1%) than among their White counterparts (116 of 4,127; 2.8%, chi-square $p < 0.001$). No age or sex associations were observed. The participants who endorsed suicide attempt had more parental history of suicide attempt/death (14.8 vs. 5.5%, respectively, chi-square $p < 0.001$). Table 1 includes univariate comparisons between participants with and without history of a suicide attempt. Association of PRS-SA with suicide attempt was consistent across multiple P-value threshold tested, accounting for age, sex, and for ten within-ancestry genetic principal components (see Supplementary Table 2). Out of the eight GWAS P-value thresholds for the PRS-SA tested, the one that achieved the highest odds ratio and lowest P-value of PRS-SA was $p = 0.05$. We used a permutation test to validate this selection (see Supplementary Figure 2).

We then tested the association of PRS-SA at the P-value threshold of 0.05 with suicide attempt accounting for parental history of suicide attempt/death. When tested individually in separate models, both PRS-SA [odds ratio (OR) = 1.3, 95% confidence interval (CI) 1.1–1.5, $p = 0.001$] and parental history of suicide attempt/death (OR = 2.9, 95% CI = 1.9–4.4, $p < 0.001$) were significantly associated with suicide attempt in the full (meta-analyzed) sample. When included in the same model, PRS-SA remained associated with suicide attempt in a similar effect size (OR = 1.29, 95% CI = 1.1–1.5, $p = 0.002$, Table 2). Figure 1 illustrates the association between PRS-SA and the suicide attempt rate. Supplementary Table 3 includes the odds ratios obtained in the models stratified by ancestry (African or European) prior to meta-analysis. Associations of PRS-SA with suicide attempt were similar in direction in

TABLE 1 Sample characteristics and univariate comparison between suicide attempters and controls.

	Total sample $N = 5,214$	Control $n = 5,032$	Suicide attempt $n = 182$	P-value
Age, years, mean (SD)	12.04 (0.65)	12.04 (0.65)	12.09 (0.66)	0.325
Female sex, No. (%)	2,408 (46.2)	2,319 (46.1)	89 (48.9)	0.501
Race Black, No. (%)	1,087 (20.8)	1,021 (20.3)	66 (36.3)	<0.001
Parent suicide attempt/death, No. (%)	306 (5.9)	279 (5.5)	27 (14.8)	<0.001
Suicide attempt PRS[a], mean (SD)	0.00 (0.95)	−0.01 (0.95)	0.21 (0.89)	0.001

[a]PRS after standardizing the raw PRS produced at a GWAS P-value threshold of 0.05 and then regressing out the first ten within-ancestry genetic principal components.
PRS, polygenic risk score; GWAS, Genome-wide association study.

TABLE 2 Association of suicide attempt PRS, parental history of suicide attempt/death and suicide attempt in the meta-analyzed study population ($N = 5,214$).

Predictors	Model 1[a]			Model 2[b]			Model 3[c]			Model 4[d]		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P-value
Age	1.01	0.99–1.03	0.218	1.01	0.99–1.03	0.197	1.01	0.99–1.03	0.223	1.01	0.99–1.03	0.192
Female sex	1.11	0.82–1.50	0.488	1.11	0.82–1.50	0.494	1.12	0.83–1.52	0.454	1.12	0.83–1.52	0.454
Suicide attempt PRS[e]				1.31	1.11–1.54	0.001				1.29	1.10–1.52	0.002
Parental suicide risk[f]							2.96	1.93–4.54	<0.001	2.88	1.87–4.42	<0.001

Meta-analyzed effect sizes (odds ratio) derived from binary logistic regression models with age, sex, suicide attempt PRS, and parental history of suicide attempt/death as independent variables and self-reported suicide attempt as the dependent variable.
[a]Model 1 includes age and sex as independent variables.
[b]Model 2 includes age, sex, and suicide attempt PRS as independent variables.
[c]Model 3 includes age, sex, and suicide attempt parental history as independent variables.
[d]Model 4 includes age, sex, suicide attempt PRS, and suicide attempt parental history as independent variables.
[e]PRS after standardizing the raw PRS produced by PRSice-2 at a GWAS P-value threshold of 0.05 and then regressing out the first ten within-ancestry genetic ancestry principal components.
[f]Suicide attempt/death.
PRS, polygenic risk score; GWAS, Genome-wide association study.

both European and African ancestries and were statistically significant in European but not in the African ancestry.

Lastly, we explored the additive explanatory contribution of PRS-SA to youth suicide attempt over and above demographics (age and sex) and parental family history of suicide attempt/death (Table 3). In the European ancestry participants, the model that included PRS-SA explained 1% of the variance (Nagelkerke's $R^2 = 0.01$), significantly more than the base model that only included age and sex that explained 0.1% of the variance (Nagelkerke's $R^2 = 0.001$, the likelihood ratio Chi-square test, $p = 0.004$). Addition of PRS-SA to a model that included family history of parental suicide attempt/death increased the variance explained from 1.9% to 2.6% (the likelihood ratio chi-square test, $p = 0.009$). The improvement in model performance ($\Delta R^2 = 0.7\%$, from 1.9% to 2.6%) obtained when adding SA-PRS was on the order of 39% of the ΔR^2 obtained when adding parental history to the base model ($\Delta R^2 = 1.8\%$, from 0.1% to 1.9%). In the African ancestry group, PRS-SA increased the variance explained in models explaining suicide attempt, but the differences in R^2 were not statistically significant.

Discussion

We present evidence suggesting clinical utility of a polygenic score explaining suicide attempt in Black and White US youth. Two main strengths of this work are noteworthy. First, the focus on suicide attempt highlights the clinical significance of the findings. Notably, most research in this age range lumps ideation and attempt together (20, 21), even though most ideators do not make an attempt (3, 22). Second, the inclusion of Black youth in the current work is critical to address racial disparities in psychiatric genetics research (23). This disparity is especially concerning in the field of youth suicide, where Black US youth are particularly vulnerable (2, 24). Our findings extend recent ABCD Study results, showing associations of a depression polygenic risk score with suicide attempt in an analysis limited to European ancestry individuals (25) and a schizophrenia polygenic risk score with suicide attempt reported in the baseline ABCD Study assessment in admixed population with substantially fewer suicide attempt participants (64 vs. 182 in the current analysis) (26).

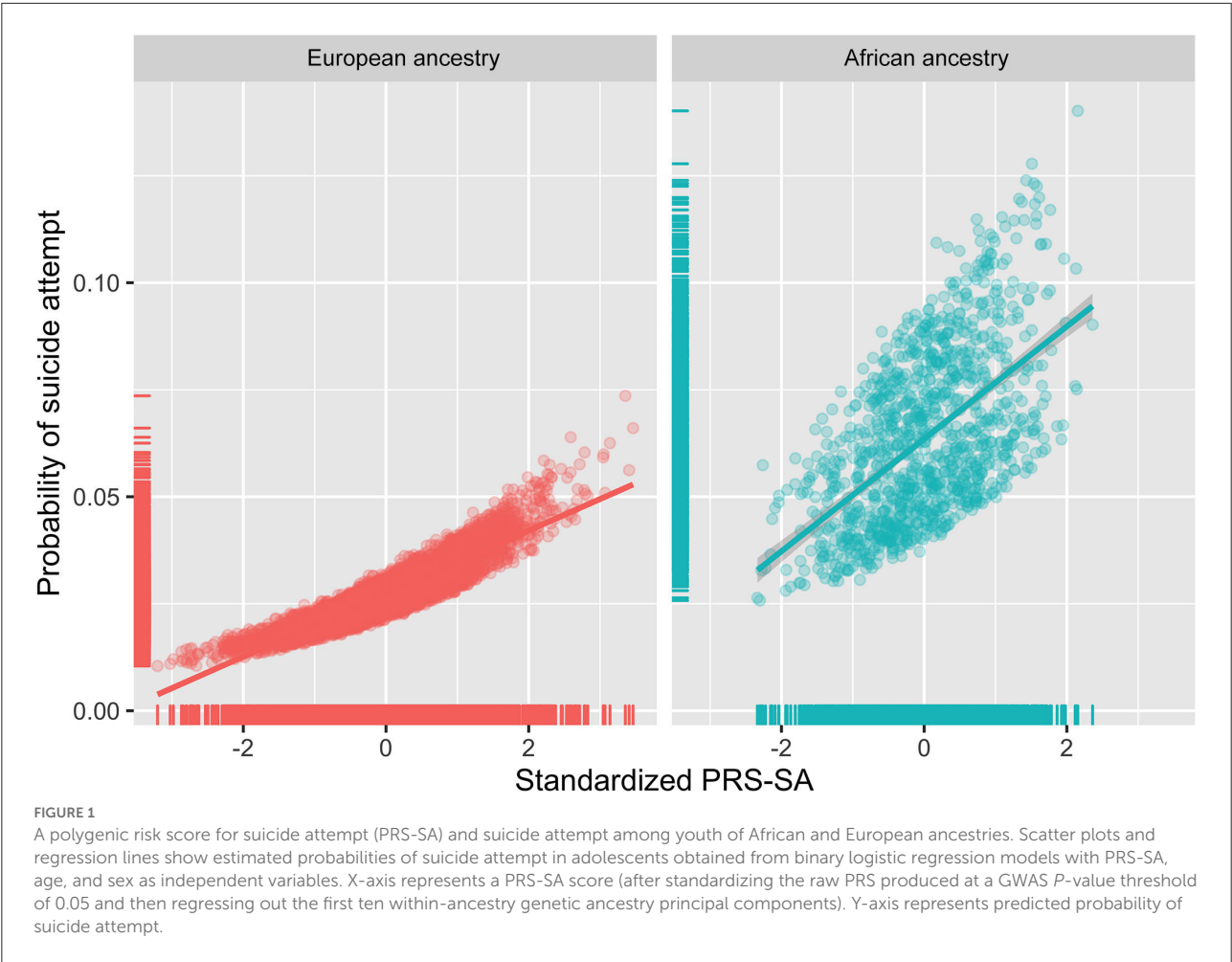We found that PRS-SA additively explains variance in suicide attempt beyond parental history of suicide

FIGURE 1
A polygenic risk score for suicide attempt (PRS-SA) and suicide attempt among youth of African and European ancestries. Scatter plots and regression lines show estimated probabilities of suicide attempt in adolescents obtained from binary logistic regression models with PRS-SA, age, and sex as independent variables. X-axis represents a PRS-SA score (after standardizing the raw PRS produced at a GWAS *P*-value threshold of 0.05 and then regressing out the first ten within-ancestry genetic ancestry principal components). Y-axis represents predicted probability of suicide attempt.

TABLE 3 Explained variance in youth suicide attempt derived from binary logistic models estimated separately in European and African ancestry participants.

	Independent variables	European ancestry $n = 4,128$ Nagelkerke R^2%	African ancestry $n = 1,086$ Nagelkerke R^2%
Model 1	Age, Sex	0.1	1.1
Model 2[a]	Age, Sex, SA PRS[d]	1.0	1.7
Model 3[b]	Age, Sex, SA parental risk[e]	1.9	2.0
Model 3[c]	Age, Sex, SA parental risk[e], SA PRS[d]	2.6	2.7

Nagelkerke R^2 values were derived from binary logistic regression models with self-reported suicide attempt as the dependent variable.

[a] Model 2 significantly explains more variance than Model 1 in the European ancestry (the likelihood ratio chi-square test, p = 0.004) but not in the African ancestry (p = 0.111).

[b] Model 3 significantly explains more variance than Model 1 in the European ancestry (the likelihood ratio chi-square test, p < 0.001) and in the African ancestry (p = 0.047).

[c] Model 4 significantly explains more variance than Model 3 in the European ancestry (the likelihood ratio chi-square test, p = 0.009) but not in the African ancestry (p = 0.096).

[d] PRS after standardizing the raw PRS produced by PRSice-2 at a GWAS P-value threshold of 0.05 and then regressing out the first ten within-ancestry genetic ancestry principal components.

[e] Suicide attempt/death.

SA, suicide attempt; PRS, polygenic risk score; GWAS, Genome-wide association study.

attempt/death. *From a clinical perspective*, assessment of family history is common practice for clinicians to help their risk classification. We believe that clinicians can intuitively appreciate the value of PRS-SA when it is compared to this benchmark of clinical good practice. *From a research perspective*, considering skepticism in the field toward incorporating PRS

in multivariable predictive algorithms in psychiatry (5), our findings provide support for incorporation of genetic scores, including that of suicide attempt, in suicide risk prediction (27). We suggest that this work serves as a proof of a concept for the potential utility of integrating polygenic risk as part of the comprehensive youth suicide risk assessment. Nonetheless, it is critical to remember that etiology of suicidal behavior is complex and is driven by multiple non-genetic factors (e.g., environmental stressors, socioeconomic factors) (28, 29), which may interact among themselves (Environment by Environment interaction) (30). Additionally, factors such as preexisting psychiatric morbidity also explain substantial variance in suicide-related outcomes, including among ABCD Study participants (19).

The inclusion of African ancestry youth is a notable strength of this work. However, the trans-ancestry discovery GWAS we used (16) presented computational challenges. Such GWAS are becoming increasingly popular as a means to increase explanatory power through fine tuning and increased sample sizes (31), but they present a technical hurdle for newer Bayesian PRS computing methods. PRS-CS, for example, requires the use of an external, single-ancestry LD panel that is matched to the ancestry of a single-ancestry discovery GWAS (32). We opted to use a trans-ancestry discovery GWAS with PRSice-2 instead of using a EUR-only discovery GWAS with PRS-CS because we placed a higher priority on being able to produce PRS-SA for both African and European ancestry adolescents than on using a marginally more predictive Bayesian method that would only be feasible for computing PRS-SA for European ancestry adolescents. If an African ancestry discovery GWAS for suicide attempt had been available, we would have opted instead to use the two single-ancestry discovery GWAS to compute PRS-SA for both groups of adolescents with PRS-CS as we have done previously (20).

Our findings should be interpreted in the context of some limitations. First, the variance explained by addition of PRS-SA to models of parental history is still relatively small. Larger studies that are more high-powered with diverse samples are needed to further explore the potential of PRS-SA to explain greater variance in suicide attempts. Second, it is possible that suicide attempt was underreported by youth. Still, the ABCD Study used a well-validated tool to probe for suicide attempts. Third, we needed to exclude participants from the analyses who did not provide data on suicide attempts, on parental history, or had different genetic ancestries. Still, the included sample was diverse and included >5,000 youth. We believe that, as more longitudinal ABCD Study data become available and as more diverse GWAS becomes available, future works will be able to include more participants. Fourth, the relative size of the African ancestry population was substantially smaller than that of the European ancestry (∼1,000 vs. ∼4,000). Additionally, given the primarily European composition of the original GWAS, the

PRS is expected to have lower predictive power in African ancestry individuals, explaining 0.69–0.88% of the phenotypic variance in suicide attempt in European ancestry populations and only 0.21–0.58% in African ancestry populations (16). This may explain the lack of statistical significance in the African ancestry-stratified models in ABCD. Nonetheless, the direction of effects was similar across ancestries, and meta-analyzed results were significant. Therefore, we believe that this work is an important step forward for the field due to the inclusion of Black youth who are at increased risk for suicide.

Conclusions

In this cohort of young adolescents, PRS-SA was associated with suicide attempts and significantly improved models explaining variance over and above parental history of suicide attempt/death, which is commonly used in clinical settings to assess suicide risk. Findings suggest that PRS-SA may be useful for suicide risk classification in both Black and White youth.

Data availability statement

Data used in the preparation of this article were obtained from the Adolescent Brain Cognitive Development Study (https://abcdstudy.org) held in the National Institute of Mental Health Data Archive.

Ethics statement

All participants gave assent. Parents and/or caregivers provided written informed consent. The ABCD Study protocol was approved by the University of California, San Diego, Institutional Review Board and was exempted from a full review by the University of Pennsylvania Institutional Review Board.

Author contributions

Conflict of interest

RB serves on the scientific board and receives consulting fees from "Taliaz Health" and "Zynerba Pharmaceuticals" and reports stock ownership in "Taliaz Health", with no conflict of interest relevant to this work. EV's spouse is a shareholder and executive in 'Kidas', with no conflict of interest relevant to this work. In the past 3 years, ND has been a consultant for Sunovion Pharmaceuticals and is on the scientific advisory board for Sentio Solutions and Circular Genomics for unrelated work.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.941772/full#supplementary-material

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The relationship between daily positive future thinking and past-week suicidal ideation in youth: An experience sampling study

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Reduced positive future thinking has been associated with suicidal ideation and behavior in adults, and appears to be exacerbated by negative affect. Yet, this has received little attention in youth. Prior research has also focused on longer-term future thinking, e.g., months and years, and relied on lab-based assessments. Using the experience sampling method (ESM), we investigated whether short-term future thinking in daily life was associated with suicidal ideation in youth and explored the role of affect in the future thinking–suicidal ideation relationship. A community sample of $N = 722$ adolescent twins and their non-twin siblings completed ESM as part of the TwinssCan study ($n = 55$ with, and $n = 667$ without, past-week suicidal ideation). Participants completed self-report questionnaires, including on past-week

suicidal ideation as part of the SCL-90. Subsequently, daily future thinking was assessed each morning for six days with ESM. To investigate the relationship between daily positive future thinking and past-week suicidal ideation, we estimated a mixed-effects linear regression model with a random intercept for participant, including age and sex as covariates. The relationship between daily positive future thinking, past-week suicidal ideation, and average positive and negative affect from the previous day was investigated by estimating two separate mixed-effects linear regression models (one for negative affect, one for positive affect), with a random intercept for participant, and random slopes for average positive and negative affect. Our results showed that participants reporting higher past-week suicidal ideation also reported significantly less daily positive future thinking during the ESM period, and this association remained significant when controlling for previous-day average positive and negative affect. Higher average positive affect from the previous day was significantly associated with higher positive future thinking. Although average negative affect from the previous day was associated with lower positive future thinking, this association was not statistically significant. Our findings indicate that short-term future thinking relates to suicidal ideation among a non-clinical sample of adolescents. Future research should investigate the directionality of the future thinking−suicidal ideation relationship, in order to investigate whether impaired future thinking may be an early warning signal for escalating suicidal ideation in youth.

Introduction

Being unable to anticipate positive future experiences has been consistently associated with self-harm ideation and behaviors, as have a range of other future oriented constructs (1–7). Previous research has found that individuals who ideate about or engage in self-harm behaviors, generate fewer *positive*– but not more negative-future thoughts than those without a history of self-harm thoughts or behaviors (8–11). Whilst this association appears to be robust, there are several critical unknowns regarding the association between positive future thinking and suicidal ideation that must be addressed if research on positive future thinking is to be translated into clinical practice.

The vast majority of previous studies in this area have measured positive future thinking using the Future Thinking Task [FTT; (8)], in which individuals are asked to free-generate responses to questions regarding what they are looking forward to in one week (including today), one year, and five to ten years. Whilst future thinking within these time-windows prospectively predicts suicidal ideation in adults (12), the extent to which more short-term future thinking, e.g., the next day, relates to suicidal ideation is unknown. Additionally, findings from two studies have demonstrated that positive future thinking decreases following a negative mood manipulation (13, 14), suggesting that the ability to anticipate positive future experiences may be a dynamic process that fluctuates with changes in negative affect. Other research with community samples of adults (15), adolescents (16), and adults with panic disorder and depression (17) has found associations between positive, but not negative, affect, and positive future thinking. To our knowledge, the relationship between naturally occurring, i.e., non-induced, positive and negative affect and positive future thinking has not been examined in individuals experiencing suicidal ideation. Furthermore, as all previous research on future thinking and suicidal thoughts and behaviors has been conducted in the laboratory, we do not know whether positive future thinking as it occurs naturally, in individuals' daily lives, relates similarly to suicidal ideation.

The laboratory-and survey-based nature of the majority of research on suicidal ideation and behavior limits our capacity to achieve a truly fine-grained understanding of the psychological factors that relate to suicidal ideation and behaviors. To address this, we need to employ methodologies capable of capturing dynamic psychological processes. The Experience Sampling Method [ESM; (18, 19)]—also referred to as Ecological Momentary Assessment [EMA; (20)]—offers an invaluable opportunity to gain insights into individuals' everyday lives

by allowing the collection of dynamic data on individuals' behaviors and experiences (19). Use of ESM to investigate suicidal ideation has increased rapidly (21–25), building on seminal work by Nock et al. (26), which used ESM to investigate self-injurious thoughts and behaviors. ESM techniques therefore represent an innovative method of investigating dynamic variations in suicidal ideation and behaviors, as well as the psychosocial and environmental factors associated with these thoughts and behaviors.

Whilst there have been a number of studies investigating the relationship between future thinking, and suicidal thoughts and behaviors in adults (8, 9, 14), there has been only one investigation of this in adolescents (27). Intriguingly and contrary to predictions based on the Integrated Motivational Volitional model of suicide [IMV; (28)], 3-month suicidal ideation was associated with defeat and entrapment when positive future thinking was higher; an effect which seemed to be explained by adolescents reporting higher defeat and entrapment generating more unrealistic positive future thoughts (27). That positive future thinking among suicidal youth has received so little attention is surprising, considering that adolescence is an important developmental period for future thinking abilities (29–31). Further, there is a pressing need to better understand factors associated with suicidal ideation and behavior within this age group. In youth, prevalence estimates for suicidal ideation range from 19.8 to 24% (32), and although not all young people who think about suicide will go on to engage in suicidal behavior, among adolescents who experience suicidal ideation, more than one third go on to make a suicide attempt (33). Given that suicide is the fourth leading cause of death worldwide for young people aged 15–29 (34), identification of targets for early intervention in youth—especially for short-term suicide risk—is of critical importance (35). In a recent review of research on youth suicide, Cha et al. (36) further emphasized the need to devote greater attention to the psychological factors associated with suicidal ideation and behaviors in youth in the short-term. Moreover, they also highlighted the overreliance on traditional self-report methods when investigating factors associated with suicidal ideation and behavior in youth and encouraged researchers to "move beyond traditional tools used in psychology research..." [p473; (36)].

In order to address these open questions and issues regarding the relationship between short-term positive future thinking and suicidal ideation in youth, we conducted a study using pre-existing ESM data to investigate whether daily positive future thinking was associated with past-week history of suicidal ideation in youth. We hypothesized that higher past-week suicidal ideation would be significantly and negatively associated with daily positive future thinking. Based on previous research [e.g., (13, 14)] suggesting that affect influences and, in some cases, potentiates a decrease in positive future thinking, we also conducted exploratory analysis to investigate the relationship between past-week suicidal ideation

and daily positive future thinking, with and without positive and negative affect.

Materials and methods

Participants and recruitment

Participants were from the TwinssCan study (37), a large general population-based cohort of adolescent twins and their young adult non-twin siblings, which formed part of the East Flanders Prospective Twin Survey [EFPTS; (38)]. Twin participants were aged 15–18 years old at the time of enrollment and their non-twin siblings were aged 15–35 years old. Exclusion criteria were: (1) not understanding the purpose of the study and being unable to provide informed assent/consent; (2) not having parent/caregiver consent (if under 18 years old); (3) presence of pervasive mental disorder; and (4) being unable to complete the study procedure, or providing invalid/unreliable data on measures. The total TwinssCan ESM dataset (version 2.3) sample comprised $N = 840$ individuals; however, $n = 13$ participants had missing data in ESM design variables required for multilevel modeling of the data, so were excluded. For the purposes of this study we specifically focused on youth,[1] so excluded $n = 39$ participants older than 25, leaving a sample of 788 participants before additional data cleaning (see Data Cleaning section below for further details). No information regarding participants' ethnicity was available; however, as a proxy, participants were asked whether they spoke any languages other than Dutch at home. A small number of participants indicated yes ($n = 27$), the majority indicated no ($n = 705$), and $n = 11$ participants' responses were missing. Participants' perceived social status was assessed using the MacArthur Scale of Subjective Social Status (39, 40), wherein they were shown an illustration of a ten-rung ladder, with each rung corresponding to individuals' position within the community. Using a 1–100 visual analogue scale, researchers asked participants to indicate their position on the ladder for the community that was most relevant to them. Within the current study, participants' mean score on the ladder was 37.09 (SD: 27.57), and the median score was 50. The study received local ethics committee approval (Medical Ethics Committee UZ/KU Leuven, No. B32220107766), and informed consent was obtained from all participants (and parents where participants were aged < 18 years old).

Procedure

The procedure for the TwinssCan study is fully described elsewhere (37). During a baseline interview session with a member of the TwinssCan research team, participants completed a battery of self-report questionnaires, including

questions regarding various psychosocial factors and experiences of psychopathology symptoms. At the end of the baseline session, the researcher briefed participants regarding the ESM protocol, where participants were asked to complete a series of brief questionnaires, ten times per day for six days, plus additional shorter morning and evening questionnaires. Future thinking was measured during the morning questionnaire and positive and negative affect were assessed in the momentary questionnaires. All ESM measures were administered using Psy-mate©, a custom-made Personal Digital Assistant (41), which emitted a notification prompting participants to complete a questionnaire. Notifications were given between 7:30 am and 10:30 pm, thus the morning questionnaire was available to participants from 7:30 am.

Measures

Past-week suicidal ideation

Past week suicidal ideation was assessed using a single item from the Dutch version of the SCL-90-R (42) administered at baseline, which asked "[How often in the past week including today have you been troubled by] thoughts of ending your life?" Responses were given on a five-point Likert-type scale ranging from 0 (not at all) to 4 (extremely).

Future thinking

To assess daily future thinking, we used the Experience Sampling Method (18, 19). In the current study, future thinking was assessed using a single item from the ESM morning questionnaire, which asked participants to indicate "How much you are looking forward to today" on a seven-point Likert-type scale ranging from 1 (not at all) to 7 (extremely). The intraclass correlation coefficient (ICC), which indicates the amount of variance that is due to between-person differences, was 0.30 for the future thinking ESM item, and the adjusted and conditional ICC values were identical. The morning questionnaire was presented to participants once a day for a period of six days and was the first questionnaire received by participants each day. The morning questionnaire included a total of five items.

Previous day mean positive and negative affect

Between the morning and evening questionnaires, 10 momentary questionnaires were administered consisting of a maximum of 57 items (depending upon answers to conditionally branched questions). Following receipt of the prompt, participants had 15 min to respond to questionnaires. During each of the 10 momentary ESM questionnaires, participants were presented with items assessing positive and negative affect. All affect items began with the stem "I feel..." followed by five items assessing positive affect (cheerful, relaxed, satisfied, enthusiastic, and generally well) and four items assessing negative affect (insecure, lonely, anxious, and

annoyed). Responses to all items were provided on a seven-point Likert-type scale, ranging from 1 (not at all) to 7 (very much so). Separate means were calculated for positive and negative affect at each beep by averaging item scores. These questionnaire-level means were then aggregated within days to create average daily positive and negative affect scores, which were then lagged to provide average positive and daily negative affect scores for the day prior to completion of the morning questionnaire. ICCs for the mean positive and negative affect variables were 0.58 and 0.65, respectively, and values for adjusted and conditional ICCs were identical. Within-and between-person reliability (ω) for positive affect were 0.82 and 0.92, and 0.78 and 0.91 for negative affect.

Data cleaning

Participants who completed fewer than 30% of questionnaires during the ESM period were asked to continue with ESM for longer than the 6-day protocol. Compliance with ESM protocols, defined as the proportion of completed questionnaires out of the total number of questionnaires delivered, is related to a number of different participant characteristics, including presence of psychopathology symptoms (43), therefore to minimize heterogeneity within the sample, we excluded participants with ESM compliance below 30%. This resulted in a sample size of $N = 743$. Following concerns regarding use of the 30% compliance rule of thumb as a basis for excluding participants (44), we also conducted an exploratory sensitivity analysis in which we re-estimated all models including participants with compliance below 30%. The results of these sensitivity analyses are presented in **Supplementary 1** and were virtually identical to the results of the analyses excluding participants with < 30% compliance.

Statistical analysis
Open research practices

The research questions, hypotheses, variables, data inclusion/exclusion criteria, and statistical analysis plan were postregistered on the Open Science Framework,[1] a type of preregistration occurring after data collection, but before data analysis (45). Prior to postregistration, data had not been accessed.

Subsequent to registration and data access, a number of issues emerged and consequently, several major aspects of our preregistered plan were changed. These changes are detailed in a supplement to our original registration[2] and in more detail in the **Supplementary materials** (**Supplementary 2**). Briefly, the major deviation from our original postregistered analysis plan was a change in our independent variable from

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1   https://osf.io/6mja2

2   https://osf.io/4nck7

past-year suicidal ideation and attempts, to past-week suicidal ideation. This was due to unexpected conditional branching within the CIDI questionnaire, which meant that too few individuals had received the questions pertaining to past-year suicidal ideation and behavior for meaningful analysis to be feasible. For transparency, we report the results of these original postregistered analyses in **Supplementary 3**.

The full ESM questionnaire from the TwinssCan study (37) and R Markdown files for all analyses from the current study are available on the Open Science Framework.[3] The **Supplementary materials** for the current manuscript are also available on the OSF project page for this study.

Analysis plan

The statistical analysis plan presented here is that outlined in the supplementary registration, not the original registration. Data were cleaned and analyzed using R v4.1.2 (46) *via* R Studio v2022.2.0.443 (47). As observations (level 1) were nested within participants (level 2), mixed effects linear regressions with random intercepts were conducted using the "lmer" function from the "lme4" package (48) for analyses of past week suicidal ideation and daily future thinking. Tables of model summaries were generated with the "SjPlot" package v2.8.10 (49) and plots were generated using "ggeffects" v1.1.1.1 (50) and "cowplot" v1.1.1 (51). Intraclass Correlation Coefficients (ICCs) and (where possible) reliability for ESM items were calculated using the "psych" package (52) v1.5.8 and the "multilevel tools" package (53) v0.1.1. Appropriateness of multilevel modeling for these data was assessed by estimating an unconditional model, which included only the outcome variable (daily future thinking) and the random intercept (participant). As the unconditional model was statistically significant ($p < 0.001$), multilevel modeling was considered appropriate for these data (54, 55). For analyses of the relationship between past week suicidal ideation and daily future thinking including affect covariates, two separate mixed effects linear regressions with random intercepts and random slopes were estimated, one including average positive affect and one including average negative affect, from the previous day. In all analyses, daily future thinking was the dependent variable and past-week suicidal ideation was the independent variable. The past-week suicidal ideation variable was grand mean-centered, i.e., centered using the mean calculated across all participants, in order to aid interpretability of the intercept (56). Average lagged positive and negative affect were participant mean-centered. This is recommended for time-varying variables in order to avoid conflation between the association between the dependent variable and variation of the independent variables at the within-and between-person level (56). Given associations between sex, age, and both suicidal ideation (57, 58) and future

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3 https://osf.io/up63x/

thinking (31), we included both age and sex as covariates. The covariance structure of the Level 1 within-person errors was assumed to be independent. As stated in our original post-registration, due to the absence of comparable published literature from which to draw parameters for simulation-based power calculations, we did not conduct an *a priori* or sensitivity power calculation.

Results

Fifty-five (7.4%) participants reported experiencing suicidal ideation within the past week, relative to 677 (89.8%) participants who reported no past-week suicidal ideation. Twenty-one (2.8%) participants were missing responses to the suicidal ideation item. Mean compliance, i.e., mean number of completed ESM questionnaires out of the total 60, within the full sample was 41.72 (SD: 10.49; 69.53% compliance). Neither age ($\beta = 0.00958$, $SE = 0.015$, $p = 0.53$) nor sex ($\beta = 0.00149$, $SE = 0.075$, $p = 0.98$) were significantly related to positive future thinking. However, both were related to past-week suicidal ideation: younger age was associated with higher suicidal ideation ($\beta = -0.016$, $SE = 0.003$, $p < 0.001$) and youth reporting suicidal ideation were more likely to be female ($\beta = 0.046$, $SE = 0.014$, $p = 0.00075$). For sample and variable descriptive information, see **Tables 1**, **2** for variable descriptives according to endorsement vs. non-endorsement of past-week suicidal ideation. Results of the analyses investigating the relationship between past-week suicidal ideation and daily future thinking (with and without affect) are reported below. Results of multilevel analyses are presented in **Figure 1** and **Table 3**.

There was a significant negative association between past-week suicidal ideation and daily positive future thinking, such that youth who reported higher levels of suicidal ideation within the past-week also reported lower levels of daily positive future thinking during the ESM period. Higher levels of daily positive future thinking were associated with reporting higher average positive affect on the preceding day. Higher levels of daily positive future thinking were associated with reporting lower average levels of negative affect the previous day (i.e., a negative association), however this association was

TABLE 1 Sample and variable descriptives.

	Mean (SD)	**Median**	**Range**
Age (years)	16.85 (2.39)	16.00	15–25
Sex (% female)	58.5%	–	–
Past week suicidal ideation	0.108 (0.44)	0	0–4
Daily positive future thinking	4.91 (1.04)	5	1–7
Average daily positive affect	5.01 (0.68)	5.07	2.19–6.77
Average daily negative affect	1.78 (0.56)	1.68	1.01–4.51

TABLE 2   Variable descriptives for adolescents reporting vs. not reporting past-week suicidal ideation.

	Past-week suicidal ideation			No past-week suicidal ideation		
	Mean (SD)	Median	Range	Mean (SD)	Median	Range
Past week suicidal ideation	1.42 (0.85)	1	1–4	–	–	–
Daily positive future thinking	4.52 (1.14)	4.5	1–6.6	4.94 (1.022)	5	1–7
Average daily positive affect	4.53 (0.94)	4.58	2.19–6.55	5.05 (0.64)	5.09	3.17–6.77
Average daily negative affect	2.25 (0.79)	2.04	1.24–3.76	1.74 (0.51)	1.66	1.007–3.81

FIGURE 1
The association between daily positive future thinking and past-week suicidal ideation, controlling for (A) age and sex; (B) age, sex, and average positive affect from the previous day; and (C) age, sex, and average negative affect from the previous day. Shading represents 95% confidence interval.
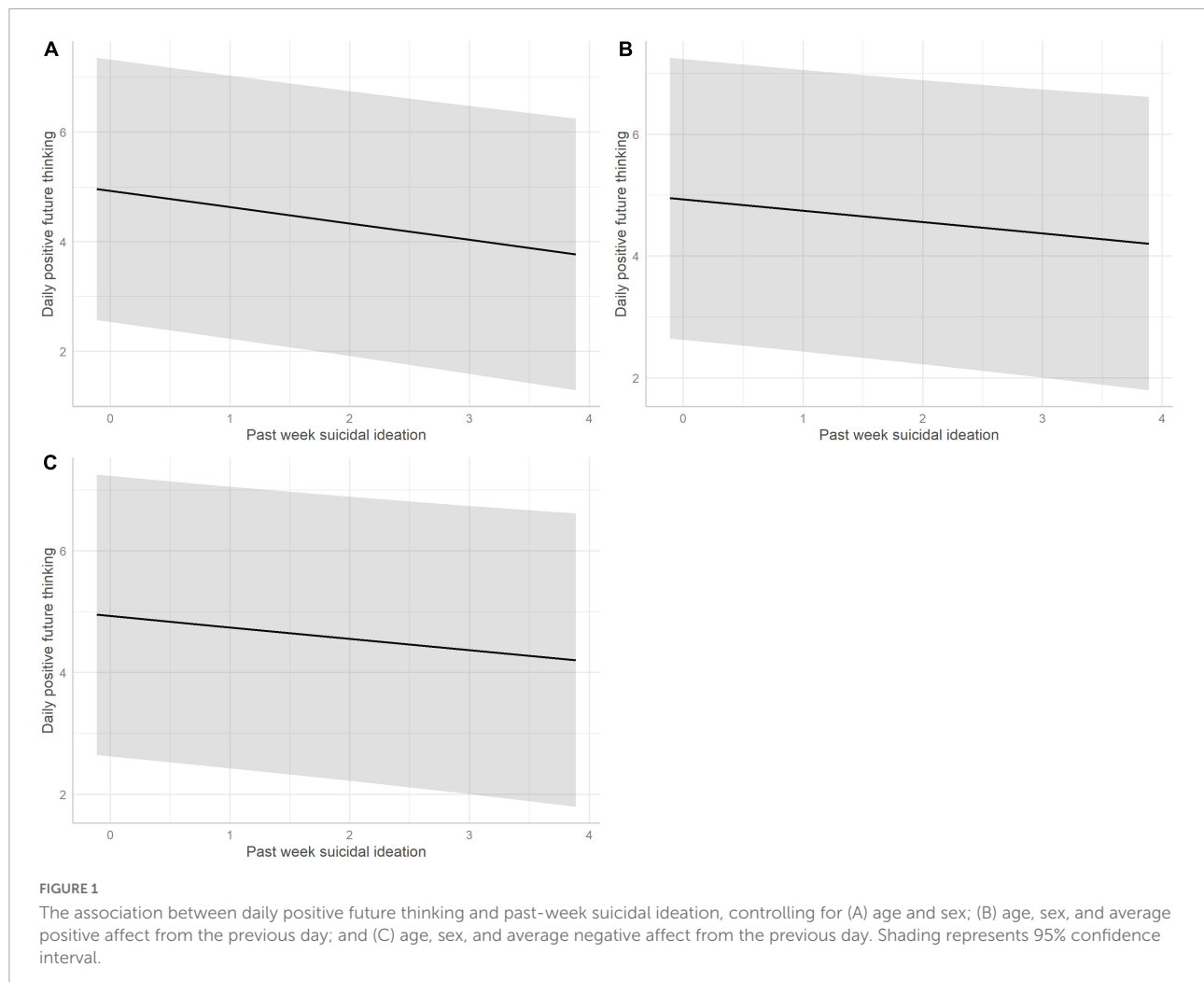
not statistically significant and should therefore be interpreted with caution.

Discussion

In the current study, we found that past-week suicidal ideation was significantly associated with daily positive future thinking in a non-clinical, youth sample. Higher levels of daily positive future thinking were associated with lower levels of past-week suicidal ideation. Both average negative and positive affect from the previous day were associated with daily positive future thinking, such that youth experiencing higher positive and lower negative affect during the previous day also experienced higher levels of positive future thinking the next day. However, only the association between previous day positive affect and daily positive future thinking was statistically significant. The non-significant negative association between previous day negative affect and daily positive future thinking should therefore be interpreted with caution.

TABLE 3 Multilevel model summaries.

Predictors	Daily positive future thinking			Daily positive future thinking			Daily positive future thinking			Daily positive future thinking		
	Estimates	CI	p	Estimates	CI	p	Estimates	CI	p	Estimates	CI	p
(Intercept)	4.93	4.86 to 5.00	**< 0.001**	4.82	4.28 to 5.36	**< 0.001**	4.77	4.21 to 5.34	**< 0.001**	4.75	4.19 to 5.31	**< 0.001**
Past week suicidal ideation				−0.30	−0.46 to −0.13	**< 0.001**	−0.19	−0.36 to −0.01	**0.041**	−0.19	−0.37 to −0.02	**0.031**
Age				0.01	−0.02 to 0.04	0.741	0.00	−0.03 to 0.03	0.872	0.00	−0.03 to 0.03	0.814
Sex				0.02	−0.13 to 0.16	0.838	0.07	−0.08 to 0.22	0.368	0.07	−0.08 to 0.22	0.377
Average positive affect from previous day							0.23	0.11 to 0.36	**< 0.001**			
Average negative affect from previous day										−0.11	−0.29 to 0.07	0.236
Random effects												
σ^2	1.50			1.49			1.38			1.37		
τ_{00}	0.64$_{subjid}$			0.62$_{subjid}$			0.62$_{subjid}$			0.62$_{subjid}$		
τ_{11}							0.34$_{subjid.cent\_day\_pa\_lag}$			0.87$_{subjid.cent\_day\_na\_lag}$		
ρ_{01}							−0.10$_{subjid}$			−0.16$_{subjid}$		
ICC	0.30			0.30			0.33			0.34		
N	737$_{subjid}$			716$_{subjid}$			709$_{subjid}$			708$_{subjid}$		
Observations	3474			3377			2622			2617		
Marginal R^2/conditional R^2	0.000/0.300			0.008/0.301			0.009/0.338			0.004/0.343		
AIC	12079.709			11723.155			9099.862			9090.215		

σ^2 = Within-group residual variance; τ_{00} = Between-group variance; τ_{11} = Random-slope variance; ρ_{01} = Random-slope intercept correlation.

Our results are consistent with previous laboratory-based studies, finding that individuals who have thought about or engaged in self-harm also exhibit reduced positive future thinking (8–11). All previous research, however, has focused on positive future thinking over longer time-frames, generally including the next week, month, year, and five to ten years, and our study provides the first evidence indicating that short-term positive future thinking is also associated with recent suicidal ideation. Moreover, we show that future thinking in youths' normal, everyday lives–outside of the controlled laboratory environment–relates to recent thoughts of suicide. Previous research using ESM has found that relationships between suicidal ideation and other risk factors, previously established with self-report questionnaires, do not always translate to everyday life. For example, despite a large body of questionnaire-based research associating perceived burdensomeness and thwarted belongingness with suicidal ideation [e.g., (59, 60)], ESM research has not replicated these associations (24). This suggests that some risk and protective factors are less dynamic, and associated with suicidal ideation over longer timeframes, e.g., weeks, months, or years, whereas others are more dynamic and relate to suicidal ideation over minutes, hours, or days. Such dynamic factors may also be more amenable to change. That both short-term and longer-term positive future thinking both appear to be related to suicidal ideation may indicate the temporal robustness of future thinking as a correlate of suicidal ideation.

Combined with results of previous research with clinical populations [e.g., (10, 11, 14)], our finding that daily positive future thinking relates to even very low levels of recent suicidal ideation in a non-clinical youth sample, suggests that impaired positive future thinking could be present even at the very early stages of suicidal ideation. The need to examine risk factors for suicidal ideation in non-clinical samples has recently been highlighted by Millner et al. (61), who argue that risk factors for the development of suicidal ideation can likely not be derived from research with samples who have already experienced severe ideation or engaged in suicide attempts. Processes involved in the genesis of suicidal thoughts must necessarily also be present among individuals experiencing no or low levels of suicidal ideation, in order for changes in these processes to cause escalation in suicidal ideation (61). In this regard, future thinking may hold promise, as it appears to be a process associated with suicidal ideation across the spectrum of severity.

In the current study, the relationship between daily positive future thinking and past-week suicidal ideation remained significant even when controlling for previous-day positive and negative affect. This suggests that past-week suicidal ideation is associated with variance in daily future thinking beyond the effects of average positive and

negative affect from the previous day. We also found a significant positive association between daily positive future thinking and positive affect from the previous day. This is consistent with previous studies demonstrating an association between positive affect and positive future thinking (15–17). Although we found a negative association between negative affect from the previous day and positive future thinking, this association was not statistically significant. Early studies of future thinking (15–17) found no association between negative affect and positive future thinking. Yet, these earlier studies' findings also appear at odds with later research demonstrating that negative mood inductions reduced positive future thinking (13, 14). There is evidently heterogeneity within the literature regarding the relationship between affect and positive future thinking, which warrants further exploration.

Although previous literature indicates that adolescence is a sensitive period for the development of future orientation abilities (29–31), we found no significant association between age and daily positive future thinking. The age-range of our sample was 15–25 years old, covering periods of developmental flux in future thinking identified in prior studies (31), thus our study should have been able to capture developmental differences in future thinking, had they been present. One explanation for the lack of association between age and future thinking observed in the current study is that developmental differences may be more apparent in static, as opposed to dynamic, measures of future thinking. As our study is, to the best of our knowledge, the first to investigate dynamic daily life future thinking, this hypothesis should be interrogated further in future research. It may also be possible that age-related differences in future thinking may have been apparent in a younger sample (e.g., 12–14 year-olds). Future research should also investigate future thinking in the daily lives of younger youth.

Strengths and limitations

Our study has a number of strengths. To our knowledge, this is the first investigation of positive future thinking in daily life and its association with recent suicidal ideation among a non-clinical sample of adolescents. Use of ESM to assess positive future thinking increases ecological validity (19), sheds new light on temporal aspects of future thinking, and provides the first indication that naturally occurring, positive future thinking relates to suicidal ideation. These findings therefore have theoretical and practical relevance for suicide research, where future thinking features within the IMV model of suicide (28). Only one previous study has investigated the relationship between suicidal ideation and future thinking in adolescents (27), thus our study adds to and extends the literature on this

topic, as well as the broader future thinking and suicide, and developmental future orientation, literature.

The field of suicide research, as well as clinical psychology and psychiatry more broadly, have been highlighted as in need of a greater focus on transparency, reproducibility, and replicability (62–66). To this end, we have made our analysis code available on the Open Science Framework (open code). We also postregistered our hypotheses and analysis plan. However, due to unexpected conditional branching in the dataset and consequently low numbers of individuals reporting suicidal ideation in our original independent variable, significant changes to our post-registration were necessary. We made every effort to document these deviations as transparently as possible, with a supplementary registration and a full description of deviations in the **Supplementary materials**. However, this undeniably compromised several key goals of preregistration (67–69) and we fully appreciate this is a limitation of our study.

We must also acknowledge several further limitations. The number of adolescents endorsing past-week suicidal ideation was low ($n = 55$) in this general population adolescent sample and even among those reporting past-week suicidal ideation, the mean level of suicidal ideation was low (1.43 on a 1–4 scale). Our findings therefore require further replication in larger samples, both with adolescents from the general population, as well as individuals endorsing higher levels of suicidal ideation. The difference in mean levels of daily positive future thinking between those with vs. without past-week suicidal ideation was also small. The extent to which daily positive future thinking may be predictive of clinically relevant suicidal ideation outcomes cannot be determined from this study, and should be tested in future prospective research with clinical samples, using validated suicidal ideation scales. However, an additional challenge for determining the clinical meaningfulness of effects is that effects cannot be compared easily across ESM studies due to difficulties in obtaining standardized effect size estimates (70).

Additionally, we assessed suicidal ideation using a single-item from the SCL-90 (42) and previous research has highlighted single-item assessments of suicidal ideation and behavior as suboptimal (71). As our study used pre-existing data from the TwinssCan study (37), we were constrained by the variables available within the dataset. Future thinking was also assessed using only a single item, which naturally limits the scope and level of future thinking we could capture. However, given the intensive nature of ESM data collection, use of single-item measures to assess constructs of interest is common (72). The single item we used to assess future thinking in the current study has not been psychometrically validated and as—to the best of our knowledge—this is the first study of future thinking in daily life, the extent to which this item demonstrates convergent validity with other measures of future thinking is unknown. There are currently no standard items for assessing future thinking (or related constructs) using ESM. Indeed, ESM suffers from a general lack of validated questions

for assessing constructs (72–74). Although initiatives such as the ESM Item Repository (75) are underway to build sets of psychometrically valid ESM items, future research should also invest in basic measurement groundwork to develop high quality items for assessing future thinking in daily life. Other laboratory research has underscored the relevance of assessing the content of positive future thoughts (10) and the likelihood of positive future events occurring (27), in relation to suicidal ideation. When developing ESM measures to assess future thinking, content and likelihood of future thoughts should also be considered.

Positive and negative affect were not assessed at the same moment as future thinking, because future thinking was included only in the morning questionnaire and affect only in the momentary questionnaires. We used average affect from the previous day, as this was temporally closest to completion of the morning questionnaire. However, this may have been too long a time-window to detect meaningful dynamic effects of affect upon future thinking. Subsequent research should investigate the relationship between affect and future thinking contemporaneously, as well as prospectively from one moment to the next.

As post-registered, we did not conduct a power calculation, because the lack of comparable literature and available data meant we had nothing from which to draw meaningful parameters for a power calculation. Power and sample size calculations are often neglected in ESM research (64, 76, 77) and future research should aim to replicate our findings in larger samples, guided by simulation-based power analyses.

Finally, although not specifically a limitation, it is worth noting that data are drawn from a sample of twins and their non-twin siblings. There is some debate regarding whether twins are representative of the general population, termed the "twin representativeness assumption" (78). However, researchers have argued that although some differences are apparent—for example, in internalizing symptoms and eating disorders—the small to moderate effect sizes of these differences suggest that results from twins can be generalized to non-twins (79). Nevertheless, the potential effect of twinness on positive future thinking is an empirical question and future research should investigate this using dyadic models that are able to account for the interdependence between participants in twin pairs [e.g., (80)]. We also suggest that the findings of the current study should be replicated in non-twin samples.

Future research and clinical directions

Our findings provide several avenues for further research. First, future thinking has been linked to suicidal ideation and behavior among individuals with chronic pain (81),

highlighting another group that could also benefit from further investigation of the relationship between short-term, positive future thinking and suicidal ideation. Second, future research should investigate future thinking in conjunction with other risk and protective factors for suicidal ideation. In the current study, we examined positive future thinking in isolation, but recent research (27, 82) and contemporary theoretical models of suicide—the IMV (28)—highlight that future thinking may influence suicidal ideation in concert with other factors. For example, within the IMV model, future thinking is posited as a "motivational moderator," disrupting or facilitating the pathway between defeat, entrapment, and suicidal ideation (28). Third, the relationship between future thinking, suicidal ideation and affect may feasibly differ as a function of context. Research should assess future thinking and suicidal ideation at the momentary level, to determine whether the future thinking—suicidal ideation association is robust across contexts. Future studies could also substantively examine the role of context in positive future thinking, to reveal whether particular contexts, e.g., being in company, are associated with more positive future thinking. Fourth, and finally, the ICCs observed in the current study suggest that meaningful variance can also be explained at the within-as well as the between-person level. Further research would benefit from examining potential within-person relationships between future thinking and suicidal ideation.

Clinically, given the lack of knowledge regarding short-term correlates of suicidal ideation and behavior (83, 84), we consider these to be promising findings which, following further replication, may provide novel targets for rapid interventions to prevent suicidal thoughts and behaviors in young people, especially from non-clinical populations. Ecological Momentary Interventions (85), including Just-in-time adaptive interventions (86), could be an optimal approach to target positive future thinking in youths' daily lives. These could also be blended with existing, e.g., Future Oriented Group Training (87) and emerging, e.g., "Edge of the Present" virtual reality therapy (88), interventions for future thinking.

Conclusion

The current study provides the first evidence to suggest that short-term (daily) positive future thinking is associated with past-week suicidal ideation in a non-clinical sample of adolescents. These findings are consistent with the broader experimental literature on future thinking and its association with suicidal ideation and behavior. Whilst the general population nature of the sample resulted in a relatively low number of adolescents endorsing recent suicidal ideation, our study indicates that daily positive future thinking is a promising avenue for future research.

Data availability statement

Ethics statement

The studies involving human participants were reviewed and approved by Medical Ethics Committee UZ/KU Leuven, No. B32220107766. Written informed consent to participate in this study was provided by all participants or participants' legal guardian/next of kin when participants were under 18 years old.

Author contributions

OJK and IM-G: conceptualization. SG: data curation. OJK: formal analysis, investigation, visualization, and writing – original draft. OJK, GL, TV, and IM-G: methodology. GL: software. OJK, GL, TV, JD, CD, SG, MD, NJ, CM-L, BR, ET, JO, RW, and IM-G: writing – review and editing. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/fpsyt.2022.915007/full#supplementary-material

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