A systematic literature review of mobility attitudes and mode choices: MENA and South Asian cities

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Urban mobility behavior is influenced by complex interrelations of personal attitudes, neighborhood design, emerging digitalized shared mobility services, and urban governance. The transformation of urban mobility ecosystems in the Middle East and North African (MENA) and the South Asian (SA) regions lacks an in-depth comparative review to understand the determinants of mobility attitudes and mode choices. The objective of this paper is to systematically study the existing literature on cities in the MENA and SA regions to provide a comparative review of the analyses and the findings on urban mobility attitudes in light of prevailing societal conditions and urban-spatial forms. A systematic methodology was deployed to shortlist recently published journal papers from the years 2000 to 2022 for the MENA and SA regions. Application of the (shortlisting) methodology has identified 43 studies from the MENA region and 43 papers from the SA region to be most suitable for the review of comparative analysis of urban mobility behavior. The review found that travel choices in both MENA and the SA regions are impacted by the usual determinants such as demography, socio-economic characteristics, vehicle ownership, and the quality and maturity of (urban transport) spatial forms. The mobility behavior in these regions, is to some extent, can be said to be in alignment with the observed behavior across the developed western cities elsewhere in Europe and North America. The review identified that in both the MENA and the SA regions, mobility choices are also influenced by certain additional factors, such as cultural norms, adverse climatic conditions and socio-economic standings, etc. The literature indicates that ethnic and income disparities are deeply embedded in the socio-spatial arrangements of the cities in the MENA and SA regions. Future research can assess the relative influence of these factors and to determine correlations between mobility attitudes and urban forms to build better cities.

KEYWORDS

mobility attitudes, urban form, public transport, shared mobility, mode choices, urban governance

1. Introduction

Historic and recent research in the field of travel behavior reiterates that relationships between mobility attitudes, travel behavior and the built environment are complex (De Vos, 2022). Before the 1960s the focus of transport research was simplified to the movement of humans between geographical regions and within urban areas rather than explaining the mechanism of behaving acts (Golledge et al., 1972). Then in the early 1960s two thinking streams emerged: one stream highlighted the role of people's perception of the environment

in explaining the human-environment relations and the second stream focused on exploring the effects of motivation, aspirations, and goals in the decision-making process (Golledge et al., 1972). Then from the 1970s onwards the inter-relationships between residents' demographics, urban form and travel became formalized as a research field in spatial sciences and transport sciences (Boarnet and Crane, 2001; Ewing and Cervero, 2001; Timmermans, 2003; Hickman and Banister, 2005; Scheiner and Holz-Rau, 2007). This understanding came from the concept that travel might be explained by urban form and this insight gradually arrived in the science of transport planning and led to extensive work (in both academia and industry) in terms of integrated urban and transport planning.

In 1980, Salomon researched attitude as a factor in explaining travel behavior and in the 1990s, transport researchers became more convinced that there are more complex interrelations to explain travel behavior than simply comparing it to spatial elements (Salomon, 1980). Hence, the transport research field added subjective dimensions such as attitudes to the objective dimensions of space and individual life situation (Kitamura et al., 1997; Boarnet and Sarmiento, 1998; Bagley and Mokhtarian, 2002; Golob, 2003; Parkany et al., 2004; Handy et al., 2005). The travel behaviors and their impacts vary markedly by income and other demographic groupings, but recently the disruptive innovations (such as smartphone-based shared mobility and MaaS) have been redefining the transportation industry and changing users' behaviors. Additionally, change in residential neighborhood has a strong impact on travel attitudes as examined by De Vos et al. (2021) in Belgium.

Travel behavior is affected by attitudes both directly and indirectly because travel attitudes are not stable constructs but are subject to change, especially when an inconsistency (or dissonance) exists between attitudes and related behavior (De Vos, 2022). In the same research De Vos (2022) found that five relationships seem present between travel attitudes, travel behavior, and the built environment: that between built environments and travel behavior, and four relations created by the interdependencies between (i) travel attitudes and the built environment, and (ii) travel attitudes and travel behavior. Attitudes mainly affect behavior in the case of high levels of freedom of choice. High-income households, for instance, will mostly have a free choice of where to live and how to travel, likely resulting in a chosen residential neighborhood and travel patterns in line with travel attitudes.

Attitude-based segmentation of the urban mobility market is gaining momentum in Western cities because it helps in differentiating commuters' needs and then drives the evolution of the commercial value of shared mobility modes. This approach is important in understanding customers' relation to time, work, society, money and preferences between price and comfort.

Overall, commuters' attitudinal factors toward the transport mode of interest are the most important determinants of their travel choices.

Positive attitudes toward a mobility mode increase the likelihood of a selected travel mode over other modes. For instance, pro-automobile/pro-driving attitudes are negatively associated with the use of non-motorized modes (De Vos et al., 2018) and public transportation (Ettema and Nieuwenhuis, 2017). Attitudes such as "pro-bike" or "prowalk" are positively associated with biking and walking (Cao et al., 2007; Maldonado-Hinarejos et al., 2014; De Vos et al., 2018; Park and Akar, 2019) and negatively associated with driving (Handy et al., 2005).

Western cities have investigated the complex interrelations of urban form, travel behavior, mobility attitudes for almost six decades but the state of the research in the MENA and the SA cities is limited.

The MENA region has been noted as one of the fastest growing regions (10%) in terms of population between 2006 (355 million) and 2013 (392 million) and by the end of this decade —2030— about 60% of the population in the MENA and SA regions will live in cities (World Economic Forum, 2015). Both the regions are amongst the most populous areas of the Global South and face some common challenges such as urban sprawl, high motorization, and increased urban population. Most of the MENA and SA cities follow a traditional transport planning process, where private cars occupy most space on the street, which is given by a complex set of processes, institutions and actors. The consideration for individualized travel as a norm is creating adverse impacts on societies and the environment.

The two large regions of the Global South include megacities with a wide range of maturity levels in terms of mobility ecosystems, modal choices, and urban forms.

The objective of this paper is to systematically study the existing literature on cities in the MENA and SA regions to provide a comparative review of the analyses and the findings on urban mobility attitudes in light of prevailing societal conditions and urban-spatial forms. First objective of the paper is to review interrelations of travel attitudes, mode choices and socio-spatial attributes in the MENA and SA regions. Secondly it seeks to summarize the determinants of mobility attitudes and urban travel behavior (mode choices) from the literature review and thirdly, it presents the impact of traditional public transport systems and emerging shared mobility modes in the context of mobility attitudes and travel behavior in the MENA and SA regions.

The paper has examined the published journal papers from the first two decades of the 21st century in the MENA and SA regions to understand the factors ranging from built environment to shared mobility trends (which includes sharing vehicles, bicycles, e-scooters, demand-responsive vans, ride-hailing) shaping urban mobility attitudes and mode choices. The paper contributes toward the limited body of research for MENA and SA cities. While the paper is relevant for transportation researchers, it is also beneficial for transport and urban planners; policymakers; and new mobility solution providers addressing urban mobility challenges.

The paper is organized in the following five sections. The subsequent section elaborates the systematic literature search and analysis method. This is followed by the results section illustrating interrelations of travel attitudes, mode choices and socio-spatial issues in the MENA and SA regions. The penultimate section provides a discussion of descriptive perspectives on contextual differences between MENA and SA cities on the one hand and Western cities on the other, and a presentation of knowledge gaps. The final section offers a conclusion and highlights the scope for future research.

2. Research methods

The paper applied a systematic search approach known as the Preferred Reporting Items for Systematic Reviews and Meta Analyses (PRISMA) protocol (Moher et al., 2009). The search was applied to review three online databases: the Web of Science, Google Scholar, and TRB's Transport Research International Documentation (TRID).

Due to the novelty of published literature in the fields of mobility attitudes and travel behavior for the MENA and SA regions, a low number of search results were achieved in the search engine. Hence, other databases were used to broaden the scope of analysis, namely, Google Scholar and the TRB's Transport Research International Documentation (TRID) database. Keywords for the literature search included a combination of three categories: "mobility attitudes" ("attitudes" OR "attitude" OR "attitud*"); "travel behavior" OR "travel behavior" ("travel mode choices" OR "public transport" OR "shared mobility" OR "mobility culture" OR "travel patterns"); and "Built Environment" ("urban form" OR "neighborhood design" OR "land use" and related concepts). The time span filter of "2000—April, 2022" was applied and any studies or reports not subject to peer review were not included.

Figure 1 describes the steps taken to systematically conduct search and the results obtained. A search on May 10, 2022 in the Web of Science produced 282 hits, Google Scholar resulted in 4,480 hits, and TRB's TRID showed 1,482 hits. The articles found in the Web of Science and TRID were also repeated in the Google Scholar and hence the duplications were removed. Subsequently, a detailed search was conducted for the terms mentioned above in the papers, looking for sections discussing explanations and causality hypotheses.

Based on the above approach, the study found 43 publications for MENA cities and 43 papers for SA cities (mapped in Figure 2). An exhaustive analysis of published papers covered six salient features: Correlations studied; transport modes analyzed; sample size; data collection method; analysis method; and summary of relevant insights for this manuscript. The review is detailed in Supplementary Appendices 1, 2 of this paper.

3. Results

This section summarizes the findings for each of the research questions. Figure 2 shown below illustrates the number of relevant empirical studies conducted per each country in the MENA and SA regions.

3.1. Review of interrelations of travel attitudes, mode choices and socio-spatial attributes in the MENA and SA cities

Based on the previous conducted research, the section distills the factors influencing mobility attitudes and mode choices in the MENA and SA cities, followed by the influence of emerging shared mobility solutions compared to the traditional public transport.

There are more similarities than differences between the MENA and SA regions in terms of urban mobility behaviors, travel attitudes and urban forms, which are discussed later in more detail (see Supplementary Appendices 1, 2). The main resemblance between the two regions is their large population of millennials, which is one of the highest in the world. Millennials' attitude is unique due to the digital connectivity and flexibility toward a sharing attitude rather than owning a car, which makes it a nurturing place for the new mobility solutions (Lyons and Goodwin, 2014). The centrality of attitudes to urban metabolism and the drive toward collaborative consumption is well studied in Western societies (Lyons et al., 2018; De Vos et al., 2021; De Vos, 2022).

Within the MENA region, the high-income block which consists of Gulf Cooperation Council (GCC) states that includes the UAE, Saudi Arabia, Kuwait, Oman, Bahrain, and Qatar differs in terms of urban mobility systems and maintains high quality transport infrastructure. Due to high GDP and income per capita among GCC countries, the private car has been a dominant mode of transport among residents. Additionally, the private car ownership in the GCC countries is considered a social symbol and a norm, which makes private vehicles a default mode choice for Millennials in the MENA region. However, this trend has been evolving since 2009 when the region's first metro system came into operation in Dubai. Based on the success of the Dubai metro system, other cities in the region such as Doha and Riyadh have followed the trend of deploying a public transport system. The trend seems set to continue in the coming decade as well due to the recent launch of some ambitious giga-projects in the region such as NEOM in Saudi Arabia, which is envisioned as an "accelerator of human progress" and plans to operate a zero-carbon mobility system by offset (NEOM., 2020).
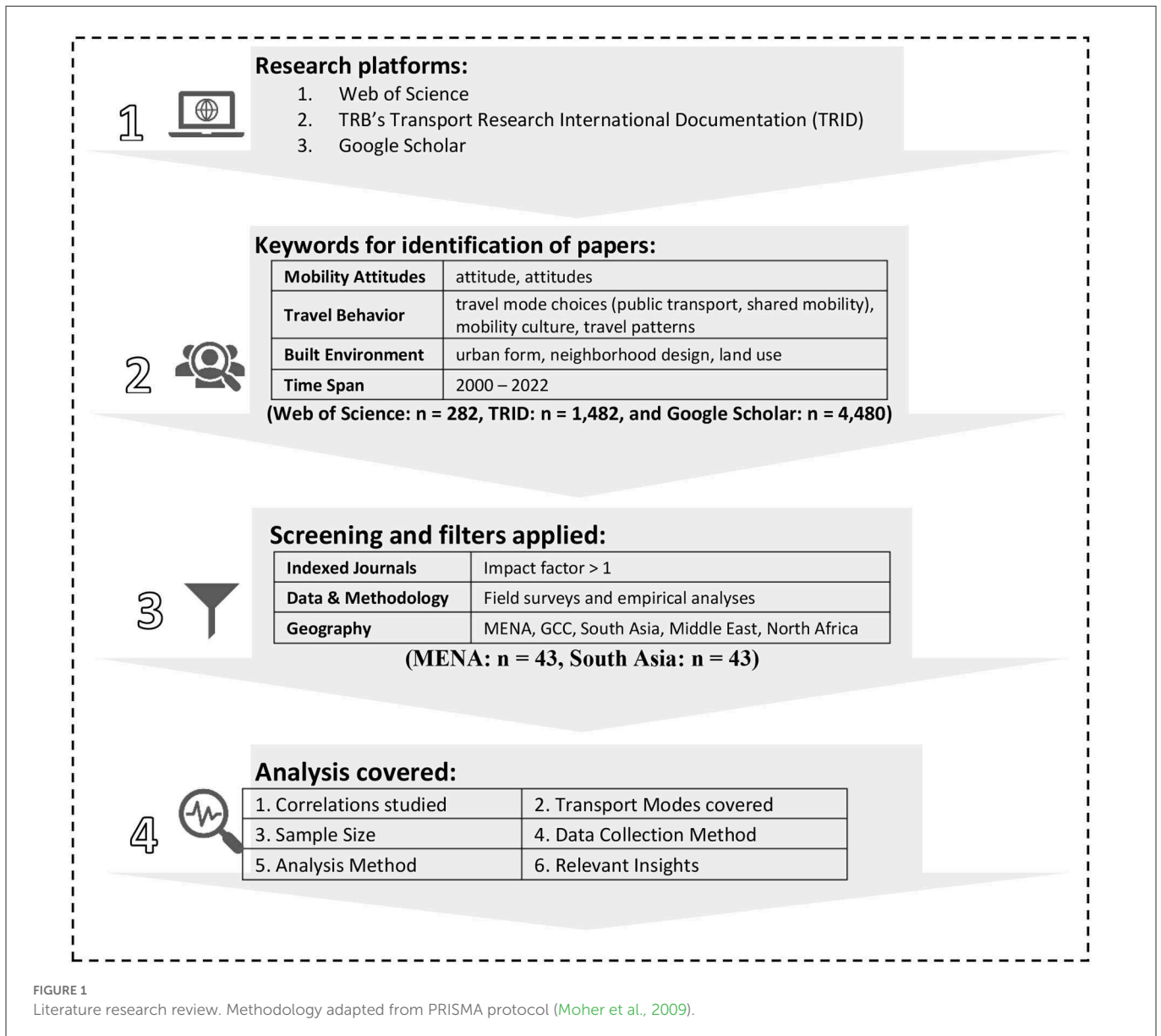
In the MENA region, it is predominantly Iranian cities on which research in the field of urban mobility behavior and urban form has been published (Arabani and Amani, 2007; Soltani and Ivaki, 2011; Shahangian et al., 2012; Soltanzadeh and Masoumi, 2014); it concluded that travel behavior is strongly influenced by socio-economic factors compared to urban form. Subsequently only a few cities—Istanbul, Turkey (Özbil, 2013; Özbil et al., 2016) and Amman, Jordan (Shbeeb and Awad, 2013)—in the MENA region have provided limited additional literature in this arena.

From Saudi Arabia, in Riyadh, Alotaibi and Potoglou (2017) examined the influence of TDM measures on public transport usage and travel behavior. Within the Arabian Peninsula, Alkaabi (2014) assessed factors persuading public and private sector workers to choose the metro as their main commuting mode in Dubai, United Arab Emirates. Majority of the cities still follow a car-dominated mobility infrastructure but there are exceptions like Dubai, where a multi-modal mobility ecosystem is maturing and follows the Singapore example.

The use of private motorcycles or two-wheelers and shared rickshaw is more prominent in the SA region than the MENA region. The SA region has the most spatially dense population in the world and generally has low household income levels compared to the MENA region, which makes non-motorized transportation like walking and cycling the primary form of mobility; inhabitants are also often forced to live in peripheral settlements on the edge of their cities.

3.2. The determinants of mobility attitudes and mode choices

Travel behavior is influenced by various built environment variables. This is one of the most heavily researched subjects in travel studies (Handy, 1993; Cervero and Kockelman, 1997; Boarnet and Sarmiento, 1998; Boarnet and Crane, 2001; Ewing and Cervero, 2001, 2010; Cervero, 2002; Chatman, 2003, 2008; Ewing et al., 2003; Frank et al., 2008; Ewing and Handy, 2009; Lee et al., 2014). The concept of individuals' attitudes and their influence on travel behavior was introduced in the 1970s (Golob et al., 1977; Reichman, 1977; Tardiff, 1977; Dobson et al., 1978; Salomon and Ben-Akiva, 1983; Cooper

FIGURE 1
Literature research review. Methodology adapted from PRISMA protocol (Moher et al., 2009).

et al., 2001; Hildebrand, 2003; Parkany et al., 2004; Thogersen, 2006). Attitude can be defined as positive or negative evaluations or beliefs held about something that in turn may affect one's behavior; attitudes are typically broken down into cognitive, affective, and behavioral components as per Nairne in 1997 (Nairne, 1997). Attitudes are considered a component of the decision-making process by social psychologists (Parkany et al., 2004) and are defined as part of the decision process by transportation researchers (Sunkanapalli et al., 2000). Additionally, Outwater et al., in 2003 established that attitudes along with intentions have significant impact in understanding travel mode choices (Outwater et al., 2003). Other researchers have also found attitude to be a more significant indicator than demographics and travel needs in choosing public transportation (Gärling et al., 1998; Fujii and Gärling, 2003; Parkany et al., 2004). Commuters' mobility attitudes are an important aspect in mode choices, and attitude refers to evaluation of a behavior, which disposes a person to behave in a certain way toward it based on attitude theory (Parkany et al., 2004). While abundant literature exists on cities in the Global

North, limited empirical research has been conducted to examine and quantify the factors influencing the attitudes and travel behavior of users in the MENA and SA regions.

There are scant travel behavior studies for the MENA region which relate to attitudes and built environment. Etminani-Ghasrodashti and Ardeshiri in 2016 empirically studied the effect of individuals' mobility patterns on their non-working trips in Shiraz, Iran and found a strong influence of attitudes as compared to the built environment. In addition to the built environment, other key variables such as mobility attitudes are found to be key determinants of travel behavior (Etminani-Ghasrodashti and Ardeshiri, 2016). Other recent studies have explored mobility habits, influence on women commuters and their perceptions about public transport services in Algiers, Amman, Beirut, Casablanca, and Muscat (Delatte et al., 2018). Masoumi et al., in 2018 studied associations between urban mobility decisions, built environment, human perceptions, and infrastructure in Tehran, Cairo, and Istanbul. Similarly, some MENA researchers have focused on the impact of personal characteristics

FIGURE 2
Overview of previous published studies for cities in MENA and SA regions.
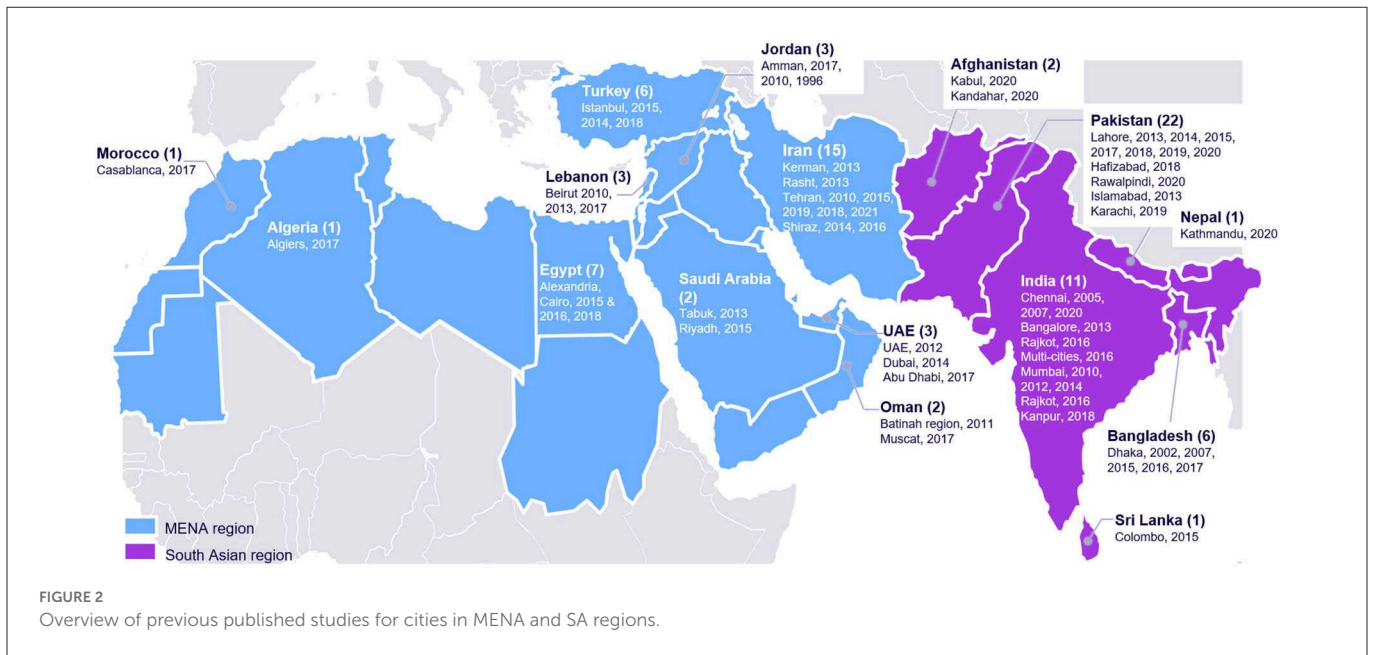
and built environment factors on an individual's travel choices (Al-Atawi and Saleh, 2014; Soltanzadeh and Masoumi, 2014; Soltani and Shams, 2017). Özbil in 2013 researched street connectivity and layout in neighborhoods in Istanbul and found that street features do impact the pedestrian demand. Similarly, Özbil et al. in 2014 assessed the walkability for students aged between 12 and 14 and concluded that street related features such as width, length, number of crossing, and traffic signals majorly impact the route choice of students. In Jordan, Shbeeb and Awad (2013) studied the impacts of the urban environment and the condition of sidewalks in providing safety for school students' walkability in Amman.

Similarly, the SA region also contains limited travel behavior (mode choices) research compared to Western literature but comparatively more than the MENA region. For example, a number of researchers have studied the urban sprawl impact on travel demand and choices in Dhaka (Nasrin et al., 2015), Chennai (Srinivasan et al., 2007a,b), Rajkot (Munshi, 2016), in all of India (Ahmad and de Oliveira, 2016), in Kathmandu (Bajracharya et al., 2020), Kabul (Kakar and Prasad, 2020), Lahore (Kamran et al., 2016; Shakeel and Jahanzaib, 2019) and Sri Lanka (Ranasinghe et al., 2015). Very few studies have evaluated the influence of people's attitudes (Javid, 2017a,b; Javid et al., 2021; Mehriar et al., 2021; Masoumi et al., 2022).

Besides the limited published research on the factors influencing urban mode choices at neighborhood level in the MENA and SA regions, a common deficit across most of the countries, when compared to Western counterparts, is the absence of in-depth modeling and simulation. Table 1 below groups the key determinants of mobility attitudes and mode choices as similar and dissimilar for the MENA and SA cities.

3.3. Traditional public transport and emerging shared mobility modes

Revolution in mobility is undisputed—the only question is when the new disruptive technologies will be fully embedded into the existing mobility ecosystems. The traditional public transport systems remain the backbone of cities' urban mobility ecosystem. The traditional public transport sector had been innovating at its natural pace, but this pace was rapidly accelerated after the launch of the smartphone in 2007. These trends have given rise to emerging shared mobility modes (which includes sharing vehicles, bicycles, e-scooters, demand-responsive vans, ride-hailing) and studies have found that there are numerous fiscal, social, and environmental benefits of shared mobility (Shaheen et al., 2016; Xue et al., 2018). The smartphone application-based (app-based) ride-hailing services—also known as ride-hailing or e-hailing, or Transportation Network Company (TNC) services in the United States and VTC or Véhicule (or Voitures) de Transport avec Chauffeur in European countries—are intended to bridge the gap between private and public transport by offering reliable, comfortable, on-demand, end-to-end travel without the hassle of owning and driving a private vehicle. A substantial body of literature has acknowledged that younger, better-educated, and more affluent individuals are more likely to be ride-hailing users (McGrath, 2015; Rayle et al., 2016; Clewlow and Mishra, 2017). Industry has proven that disruptive innovations have the power to redefine the transportation industry and change users' behaviors (EBRD., 2019). Over the last decade, a variety of new mobility services and technologies have been developed, such as autonomous vehicles, drones, and mobility-as-a-service, and these innovations are critical to the development of a sustainable urban mobility ecosystem (Gössling, 2017).

Among MENA cities, a couple of major empirical studies were completed recently for Tehran and Cairo (Mehriar et al., 2020; Masoumi, 2021, 2022). Etminani-Ghasrodashti and Hamidi (2019) found in Tehran that individuals who prefer driving and semi-public transit also have a higher number of Snapp trips than other demographics. These findings support the effects of attitudes on the demand for app-based taxis in Iran. Trip security, cost-effectiveness, anti-shared mobility, and technology-oriented attitudes have a direct effect on the frequency of ride-hailing trips. Individuals with strong and positive preferences toward technology are more likely to use an app-based taxi (Alemi et al., 2018). Our findings align with the literature that suggests trip security is an essential element of

TABLE 1 Key determinants of mobility attitudes and travel behaviors among MENA and SA cities.

Determinants of ↓ in MENA and SA	Similar	Dissimilar
Mobility attitudes	**Socio-demographic**	
	• Gender, age, household size • Car ownership • Education • Occupation • Culture and values	Motorcycle ownership is higher in the SA region than the MENA region. The motorcycle is used as a private car
	Socio-economic	
	• Employment situation • Household income	Societal/peer pressure in the MENA is higher compared to the SA region
	Safety	
	• Road safety • Women face more safety challenges while traveling on public transport compared to men • Drivers' behavior and conduct	Women traveling in SA have more safety and harassment issues compared to the MENA region
	Lifestyles	
	• Non-working trips (high) • Technology savvy • Comfort and convenience (high importance) • Social media influenced	Cost-consciousness in the SA region is higher and image-consciousness in the MENA region is higher
Urban travel behavior	**Modal choices**	
	• Walking • Cycling (limited) • Private car (high) • Public bus • Taxi (high) • Ride-sharing/e-hailing/ride-sourcing • Urban rail • Metro • Informal transport (mini-buses/private taxis)	• Motorcycle (high) • Informal/paratransit modes (mini-buses/private taxis/rickshaw)
	Travel mode attributes	
	• Travel time • Travel cost • Connectivity • Vehicle aesthetics • Infrastructure facilities • Safety and security	
	Built environment factors	
	• Travel distance • Street length and connectivity • Accessibility • Urban form (less significant) • Urban density • Land-use diversity • Neighborhood safety and security	Residence location in the MENA region impacts the travel behavior but is less influential in the SA region

public and semi-public transit mode choices. According to our findings, on-demand ride services could complement or compete with other modes of transport, especially in areas with limited access to public transit. However, the presence of ride-hailing services does not necessarily result in fewer car trips if the service operates as a private (single-person occupancy) vehicle and not as a shared mobility option.

Second, Mostofi et al. (2020), determined for Tehran and Cairo that the gender ratio of the regular ride-hailing users indicates that women are more frequent users than men in these two cities (60.6% in Tehran and 64% in Cairo). It showed that in Cairo and Tehran, the citizens who adopt ride-hailing as their regular motorized modes

for their trips outside their neighborhood are less likely to use a vehicle instead of walking for near destinations than regular private car users. Therefore, these results indicate that car dependence of frequent ride-hailing users is significantly less than regular car users in both cities. However, in Cairo, they are more likely to replace walking by using a vehicle for trips inside the neighborhood than regular users of public bus and urban rail transits. Therefore, there is a concern that in Cairo, by shifting more regular public transport users to ride-hailing, the share of the walking mode decreases in the modal split of Cairo. In addition, the findings showed that frequent users of ride-hailing have remarkably higher household incomes and a higher car ownership rate in 2017 in both cities. However, the

adoption of regular ride-hailing might be increased among lower-income households and non-household car owners by a decrease in the service fare through the competition of ride-hailing companies, and improvement of internet services in the coming years.

In the SA region, very limited literature was found that has empirically studied the emerging shared mobility modes and their impacts on travel behavior. Devaraj et al. (2020), found in Chennai, India that there is significant interaction between ride-hailing adoption and the consideration propensity of IPT modes. Second, ride hailing adoption and factors such as residential and work location, vehicle ownership, and availability of other modes affect ride hailing adoption, whereas activity characteristics (purpose, duration, and timing) and perception of conventional modes influence the intensity of use: usage intensity decreases with an increase in the number of cars in the households, whereas it increases with the number of two-wheelers owned in non-car households. Third, a significant role is played by work-related spatial and temporal characteristics in the adoption and usage intensity of ride hailing services of workers in the developing country context (Javid et al., 2021).

As it can be noted there is a lack of comprehensive research to understand motives behind the adoption of these shared mobility services and their impacts on the use of traditional public transport modes. This deficit poses a number of challenges for decision-makers and policymakers in terms of governance, planning, demand assessment, policy development, funding, security and enforcement.

4. Discussion

4.1. Data and methods

The findings of this paper complement the debate about the determinants of mobility attitudes and the impact of urban forms on travel choices in the MENA and SA cities. This section provides tabular comparison of previous studies undertaken for various cities in the MENA and SA regions. Supplementary Appendices 1, 2 provide a comparative summary of analysis based on the following attributes: correlations studies, travel modes reviewed, sample size, data collection method, data analysis approach; a summary of key findings is provided for each study.

A general observation noted in the reviewed studies for the MENA and SA cities is that they contain smaller sample sizes compared to their Western counterparts, which can be associated with lower literacy rates, less public participation and lower responsiveness in surveys. Most of the respondents in the surveys are male, and female participation in surveys is limited. The demographics of the survey participants are most of the time university students in the respective university where the research is being conducted, which can be linked to convenience in the data collection process.

Another reflection concerns the methodology followed in the MENA and SA regions' transportation research; it tends to be more descriptive and limited conclusions are found based on empirical modeling results apart from a few exceptions (Soltanzadeh and Masoumi, 2014; Etminani-Ghasrodashti and Ardeshiri, 2016; Soltani and Shams, 2017; Etminani-Ghasrodashti and Hamidi, 2019; Masoumi, 2020, 2021, 2022;

Mehriar et al., 2020; Javid et al., 2021; Masoumi et al., 2021). The spatial data availability and analysis remains a challenge for most of the cities in the MENA and SA regions basically due to non-availability of updated information in a single repository and also hesitancy to share the information by the governing authorities.

4.2. Descriptive perspectives on contextual differences of MENA and South Asia with Western societies

Cities globally are experiencing rapid changes driven by technological advances, economic reforms, and behavioral shifts. The cities in the MENA and SA regions are not only facing an urban population challenge, which is predicted to double by 2050 (UN DESA, 2014), but also socio-cultural, demographic, and socio-economic dynamics there continue to challenge their urban mobility. These two important regions of the Global South differ from Western societies in travel behavior determinants in certain ways such as ethnic and faith values for women travelers, private transport mode dominance once available, and underdeveloped mobility governance systems.

The cities and provinces within the MENA and South Asia regions can range from highly developed (for instance Dubai) to very underdeveloped cities, even in the same country. Hence, it can be said that the findings for a city or a country cannot be generalized for the whole region. It is important to highlight that the cities of the GCC countries have a slightly different context compared to the other MENA cities, as the cities in the GCC countries have witnessed very rapid economic and population growth, which has been accompanied by major urban development and transportation system expansion. The dispersed urban developments and large highway-based transport systems have resulted in high car dependency. To be sure, a few cities like Dubai, Riyadh, and Doha have made major progress toward providing public transport systems by adding state-of-the-art driverless metro systems and enhanced public bus transport networks, but it remains a challenge to derive an attitudinal change from private cars to public transport.

A number of cities in the MENA and SA regions have started to aspire to being the happiest and safest places in order to attract intellectual talent and investment, but they will have to adopt a clearer roadmap for an effective governance framework to integrate the emerging digitalized shared mobility modes within the existing transportation systems. Agile governance that allows innovations is critical to the development of sustainable urban mobility. Hence, there is a need to better understand how these disruptive new mobility services and technologies influence mobility attitudes at a neighborhood level.

Most cities in the MENA region exhibit car-dominated travel behavior as the region faces hot climatic conditions, which makes the use of non-motorized mobility modes (walking and cycling) less convenient, and the transport infrastructure provided is mainly for cars. Megacities in the MENA region like Tehran, Cairo, and Istanbul possess a large informal transport sector contrary to Western societies. However, the GCC cities within the MENA region have more defined regulatory frameworks

to govern the transportation services in their cities. Hence, there are exceptional examples like Dubai, which is a regional benchmark for having a state-of-the-art multi-modal urban mobility system and is aspiring to be a world leader in seamless and sustainable mobility.

The SA region has high proliferation and use of the private motorcycle (two-wheeler), which is not very common in the MENA region and Western cities. High ownership and usage of private motorcycles in the SA cities is increasing congestion levels as well as environmental and health issues. Additionally, unregulated paratransit services and the informal transport sector make up the majority of the mobility share in the SA cities. Commuters' socio-economic standing and residence area characteristics affect their mobility attitudes.

Women in both MENA and SA regions face safety and security challenges and are reluctant to use public transport. The rapid emergence of ride-hailing mobility service providers has provided a safe alternative for women travelers in both regions.

The review indicates high car ownership and bus transport dominance in most cities of the MENA region, which is verified by a recent categorization of cities based urban typologies (Oke et al., 2020). Most of the cities in the MENA region are categorized as "Auto Sprawl," "Bus Transit Dense," and "Bus Transit Sprawl" typologies except for Dubai, which is labeled as "Hybrid Moderate" due to its multi-modal mobility system, whereas most megacities in the SA region are grouped as "Congested Boomer" and "Congested Emerging."

4.3. Knowledge gaps

Based on the literature from the MENA and SA regions, the knowledge gaps are summarized below:

- MENA contains limited research in terms of understanding the mode choices, attitudes toward urban mobility, and emerging digitalization influences, while the SA region has a greater quantity of research than the MENA region.
- There is limited diversity and participation of women in urban mobility research, decision-making, and consideration for their mobility requirements. This gap in understanding women commuters' attitudes limits the ability for inclusive policymaking for the regions.
- The influence of digitalized shared mobility services on travel mode choices in the MENA and SA cities is scarcely studied.

4.4. Study limitations

The research is based on the previous studies sourced from the three popular online platforms, but there may be a few studies that were missed as part of this literature review. However, the overall analysis of the determinants for travel choices in the MENA and SA regions might not alter significantly as a result. As it is obvious in this study that few megacities in the MENA and SA regions have limited empirical-based literature on mobility patterns,

the mode choices of residents in suburban and rural parts of the MENA and SA regions is not fully represented in this paper. Mobility attitudes and their spatial influence are not well captured in this study.

5. Conclusions

Transport and mobility literature reviews are common in European and North American cities. However, limited literature and reviews thereof exist for the Global South. This review paper articulates the key variables of travel choices in the MENA and SA cities. Additionally, the manuscript attempts to synthesize the existing literature and add a new perspective to it by discussing the influence of emerging shared mobility modes due to rapid digitalization and the vital role of cities' mobility governance frameworks. The findings can assist planners, policymakers, decision-makers, and mobility service providers to guide their approach toward providing an equitable mobility ecosystem and place-based communities by considering the importance of mobility attitudes and urban form.

Findings based on the literature suggest that mobility attitudes and travel choices in the MENA and SA regions are influenced by some factors in common with Western cities (Scheiner and Holz-Rau, 2007; Buehler, 2011; Cheng et al., 2020), namely socio-demographics (varying by gender, age, household income, driving license availability, education level, private vehicle ownership, and household structure), spatial attributes (urban forms) and lifestyles (Etminani-Ghasrodashti and Ardeshiri, 2016; Soltani and Shams, 2017; Masoumi et al., 2018). Cultural and climatic conditions as well as socio-economic standing have key impacts on the mobility choices in the MENA and SA regions, which is different to Western literature. Class and income disparities are deeply embedded in the socio-spatial arrangements and mobility challenges of the MENA and SA cities.

Key findings for the MENA region reveal that the users' attitude is an important determinant of mode choices and the urban form is less significant. Public transport usage is mainly related to the inability to use a private car (Delatte et al., 2018) and the perceived service quality of public transport (Hamed and Olaywah, 2000).

The study finds that the urban mobility governance frameworks in the MENA and SA regions require reforms to integrate the emerging digitalized shared mobility modes within the existing transportation systems. A timely policy shift in urban mobility governance is critical for a sustainable mobility ecosystem through an effective governance framework.

The suggested avenues for future research are to explore mobility attitudes in the MENA and SA context for assessing the sensitivity of the determinants of various mode choices in light of emerging digitalized shared mobility services. Future research could examine the influence of digitalized shared mobility trends, and reforms in governance need to be explored so as to deploy the best urban mobility ecosystem in cities, one that is for people, is equitable, integrated, sustainable, seamless and promotes place-based communities. Future studies specifically in the MENA and SA regions can investigate the importance of stability in the cities' governance system as a pre-requisite for the delivery of a sustainable urban mobility ecosystem.

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.

Author contributions

Conceptualization, methodology, analysis, and writing—original draft preparation: A-GC. Writing—review and editing: A-GC and HM. All authors have read and agreed to the published version of the 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/frsc.2022.1085784/full#supplementary-material

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