



The Role of Socioeconomic Status, Family Resilience, and Social Support in Predicting Psychological Resilience Among Chinese Maintenance Hemodialysis Patients

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OPEN ACCESS

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Specialty section:

This article was submitted to
Psychosomatic Medicine,
a section of the journal
Frontiers in Psychiatry

Received: 10 June 2021

Accepted: 30 August 2021

Published: 30 September 2021

Citation:

Qiu Y, Huang Y, Wang Y, Ren L,
Jiang H, Zhang L and Dong C (2021)
The Role of Socioeconomic Status,
Family Resilience, and Social Support
in Predicting Psychological Resilience
Among Chinese Maintenance
Hemodialysis Patients.
Front. Psychiatry 12:723344.
doi: 10.3389/fpsy.2021.723344

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Objectives: Evidence regarding the possible influence of social factors on psychological resilience among maintenance hemodialysis patients is scarce. The aim of this study was to explore the relationship among socioeconomic status, family resilience, and social support, and psychological resilience among Chinese maintenance hemodialysis patients.

Methods: This cross-sectional study was conducted in the hemodialysis centers of three comprehensive hospitals in China from September to December 2020 using convenience sampling. Two hundred fifty-eight patients receiving maintenance hemodialysis were investigated using a sociodemographic questionnaire, the Chinese version of the Medical Outcomes Study-Social Support Survey (MOS-SSS), Chinese Family Resilience Assessment Scale (C-FRAS), and Chinese version of the Conner and Davidson resilience scale (CD-RISC).

Results: Maintenance hemodialysis patients reported a low level of physical resilience, with a score of (58.92 ± 15.27) . Hierarchical linear regression analysis showed that education level ($\beta = 0.127, p = 0.018$), maintenance of a positive outlook by the family ($\beta = 0.269, p = 0.001$), positive social interaction support from the family ($\beta = 0.233, p = 0.002$), and tangible support ($\beta = -0.135, p = 0.037$) were significantly associated with psychological resilience.

Conclusion: SES, family resilience and social support may be potential predictive factors of psychological resilience. Interventions to improve the family resilience and social support may be beneficial to promote the psychological resilience of Chinese maintenance hemodialysis patients.

Keywords: maintenance hemodialysis, social support, family resilience, psychological resilience, socioeconomic status

INTRODUCTION

Hemodialysis is the main form of renal replacement therapy in the terminal stage of chronic renal failure (1). According to the latest census data released in the China Kidney Disease Network Data Report (2), the prevalence of maintenance hemodialysis among patients with chronic renal failure in China is 402.18 per million. Hemodialysis treatment preserves the lives of patients with terminal stage renal failure but does not prevent the emotional suffering associated with chronic stress related to the disease burden, dialysis treatment, functional limitation, and fear of death (3–7). The incidence of emotional distress is higher in patients who received maintenance hemodialysis than in those with chronic kidney disease alone (8). It has been proposed that an individual's internal resources and external support play important roles in overcoming emotional distress during the treatment (9, 10).

Psychological resilience, defined as an individual's ability to actively mobilize all favorable factors to maintain or restore relatively stable mental and physical functions in the face of stressful life events and adversity (11), is widely recognized as an individual's competency and strength to successfully cope with stress (12). Higher psychological resilience is associated with greater acceptance of the disease, higher compliance with therapeutic regimens, and more favorable outcomes in patients with chronic renal diseases (13, 14). Lower psychological resilience is associated with emotional dysregulation (15) and variations in sensory processing (16, 17), which can increase the risk of suicidality in some patient populations (18). As cognitive flexibility is reported to be a critical factor to prevent negative outcomes and suicidal behavior in response to stressful life events (19), it is important to explore the psychological resilience of maintenance hemodialysis patients.

The systematic self-reflection model of resilience highlights the resilience resource of an individual, such as socioeconomic status (SES), family resources, and social support, which is one of the fundamental capacities for psychological resilience. The role of SES in the development of psychological resilience is contradictory. Wister et al. (20) suggests that individuals with higher SES have greater resilience, as they have greater social and economic resources available to them compared to individuals of lower SES. Other theorists (21) hypothesized that individual with low SES will exhibit prolonged, high-effort coping behavior to deal with emotional stress. To our best knowledge, there is no empirical study exploring the relationship of SES and psychological resilience among maintenance hemodialysis patients.

Social support, a multidimensional concept, is defined as the provision of psychological and material resources by caregivers, medical staff, and other social networks to benefit an individual's ability to cope with stress (22). The subjective perception of social support has been identified as a protective factor for psychological resilience in other populations, such as adolescents (23, 24), cancer patients (25, 26), and older individuals (27). However, the role of objective social support on psychological resilience is less clear. Objective social support can come in varying forms, including tangible support,

informational/emotional support, positive social interaction support, and affectionate support (28). To better understand the mechanisms underlying the effects of social support, it is vital to understand the types of social support that are beneficial for psychological resilience.

Family resilience, one of the most important family resources, is defined as a family's ability to withstand and rebound from adversity and to become stronger and more resourceful (29). Previous studies have identified multiple dimensions of family resilience, such as family cohesion, family communication, a family's ability to make meaning of adversity, maintaining a positive outlook, utilizing social and economic resources, etc. (30). However, there are few studies exploring the effect of each aspect of family resilience on individual resilience. Only one recent study of Japanese hemodialysis patients found family communication was associated with higher psychological resilience, while family cohesion was not associated with individual resilience (31).

Some scholars caution that the protective or risk characteristic of psychological resilience depends on the context and meaning of each element, particularly how each factor is perceived by an individual (32). Therefore, the purpose of this study is to examine the predictive roles of SES, family resilience, and social support for psychological resilience among Chinese Maintenance hemodialysis patients. We hypothesized that socioeconomic status, family resilience, and social support will be positively associated with psychological resilience after controlling for demographic and clinical variables.

METHODS

Participants

Two hundred eighty patients were recruited using the convenience sampling method in this study. The inclusion criteria were as follows: (1) age 18 years or above; (2) receiving hemodialysis regularly for more than 3 months; (3) no communication barriers; (4) willing to participate in this study. The exclusion criteria were: (1) physician-diagnosed psychiatric or mental disorders based on the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, TR) (33), such as schizophrenia, bipolar disorder, and depression; (2) neurological disorders or cognitive impairments (e.g. delirium, dementia); and (3) inability to communicate verbally or complete the questionnaires. The investigator carefully collected the participants' psychiatric histories by reviewing their medical records and questioning the patients or their family members. Of the 280 eligible maintenance hemodialysis patients invited to participate, 22 eligible participants declined to participate due to a lack of interest or fatigue. The remaining 258 participants all returned complete and valid questionnaires, resulting in a valid sample size of 258 (participation rate = 92.14%).

Procedure

After obtaining ethical approval for the study from the Affiliated Hospital of the Medical University Ethics Committee (No. 2020198), this cross-sectional study was conducted in accordance with the Declaration of Helsinki in the hemodialysis center

of three comprehensive hospitals in Zhejiang Province, China, from September to December 2020. Data were collected using structured questionnaires with the cooperation of hemodialysis center nurses. A trained investigator identified potential eligible patients by reviewing their medical records and asking about their psychiatric history for initial screening. The eligible participants were informed of the purpose and procedure of the study. Written informed consent was obtained from all participants before starting any procedures, and the confidentiality of their information was guaranteed. The participants were instructed to complete the pen-and-paper self-reported questionnaires in a quiet room before the hemodialysis treatment. For participants who could not write, the investigator read out the questionnaire items verbatim without adding further explanation and completed the questionnaires according to the patient's responses. The entire survey process lasted for 20–30 min, and the investigator immediately reviewed the questionnaires and asked the patients to provide any missing items after each survey was completed. All participants were provided with a small gift of a cookie valued at \$1 as compensation.

Measures

Demographic and Clinical Variables

The following variables were assessed: age, gender, employment status, marital status, medical insurance (yes/no), disease duration, dialysis duration, and frequency of hemodialysis and comorbidities.

SES

Two indicators for SES were assessed. Financial status was measured as the monthly household income per capita and was coded into four categories, from 1 (<2,000 RMB) to 4 (>6,000 RMB). Education was measured as the highest grade of schooling completed and was coded into four categories, from 1 (primary school) to 4 (college or higher).

Social Support

The Chinese version of the Medical Outcomes Study–Social Support Survey (MOS-SSS) (34), a 19-item scale, was used to assess the extent to which each individual had the support of others to cope with their stressful situation during the course of chronic disease. MOS-SSS recognizes the following four types of social support: informational/emotional support (eight items, expression of positive effect and empathetic understanding/offering of advice, information, guidance or feedback), tangible support (four items, provision of material aid or behavioral assistance), positive social interactive support (four items, the availability of other persons to entertain the patient), and affectionate support (three items, expressions of love and affection). Participants are asked to indicate how often each type of social support is available to them when they need it. A 5-point response ranging from 1 = none of the time to 5 = all of the time is used. The total score ranges from 19 to 95, with higher scores indicating higher levels of social support. The Cronbach's α coefficient was 0.944 for the total score in the present study.

Family Resilience

Family resilience was measured using the 44-item Chinese version of the Family Resilience Assessment Scale (C-FRAS) (30), which comprises four subscales: family communication and problem solving (27 items), utilizing social and economic resources (eight items), maintaining a positive outlook (six items), and ability to make meaning of adversity (three items). Each item is rated on a four-point Likert scale from 1 = strongly disagree to 4 = strongly agree, with total scores ranging from 44 to 176. Higher scores indicate higher levels of family resilience. The Cronbach's α coefficient was 0.968 for the total score in the present study.

Psychological Resilience

Psychological resilience was assessed using the Chinese version of the Conner and Davidson resilience scale (CD-RISC) (35). The 25-item CD-RISC contains three subscales, namely tenacity (13 items), strength (eight items), and optimism (four items). It uses a Likert five-point scale from 0 = not true at all to 4 = true all the time, with a total score of 0–100. Higher scores indicate higher levels of psychological resilience. The Cronbach's α coefficient of the scale in the present study was 0.927.

Statistical Analysis

All statistical analysis was performed using IBM SPSS 25.0 (IBM Corp., Armonk, NY, USA). The *t*-test or one-way ANOVA was used to compare the groups. Pearson's *r* correlations were calculated to test for unadjusted associations between SES, social support, family resilience, and psychological resilience.

As the total scores of psychological resilience approached normality ($W = 0.995$, $p = 0.479$), hierarchical linear regression analyses were conducted with the sociodemographic and clinical variables in Step 1. SES was added in Step 2, family resilience was included in Step 3, and social support was entered in Step 4. Statistical significance was set at the level of 0.05 or less (two-tailed). Statistical significance was interpreted as a $p < 0.05$ (two-tailed).

RESULTS

Descriptive Statistics

Two hundred fifty-eight maintenance hemodialysis patients (174 men and 84 women), with a mean age of 57.6 ± 13.83 years, submitted complete questionnaires. Participants were predominantly unemployed ($n = 213$, 82.6%), married/cohabitating ($n = 228$, 88.4%), with medical insurance ($n = 253$, 98.1%), and diagnosed with chronic renal failure for no <10 years ($n = 137$, 53.1%). Regarding the duration of hemodialysis, 48 (18.6%) participants had been treated for <1 year, 109 (42.2%) for 1–5 years (not including 5 years), 65 (25.2%) for 5–10 years (not including 10 years), and 36 (14%) for no <10 years. The mean duration of maintenance hemodialysis treatment was 58.38 months (SD = 48.33, range 4–236).

Regarding the SES, the sample comprised participants with education levels of primary school or below ($n = 70$, 27.1%), middle school ($n = 97$, 37.6%), high school ($n = 59$, 22.9%), and college or higher ($n = 32$, 12.4%). For financial status, 38 (14.7%)

participants reported a family monthly income of <2,000 RMB, 93 (36.0%) reported a family monthly income of 2,000–4,000 RMB, 76 (29.5%) reported a family monthly income of 4,001–6,000 RMB, and 51 (19.8%) reported a family monthly income of >6,000 RMB. The characteristics of the study population are summarized in **Table 1**.

Association Between Demographic and Clinical Variables, SES, and Psychological Resilience

A significant difference in psychological resilience was found according to different demographic variables including age ($t = 2.027, p = 0.044$), occupational status ($t = 3.890, p < 0.001$), and marital status ($t = -2.122, p = 0.035$). A significant difference was also observed in the psychological resilience of patients with different educational levels ($F = 11.379, p < 0.001$) and different monthly household incomes per capita ($F = 9.667, p < 0.001$; see **Table 1**).

Correlation Between Social Support, Family Resilience, and Psychological Resilience

The results of the correlation analysis are shown in **Table 2**. Significant correlations were observed between all four domains of social support and psychological resilience ($r = 0.207$ – $0.543, p < 0.01$). The family resilience subscales also positively correlated with psychological resilience ($r = 0.390$ – $0.575, p < 0.01$).

Hierarchical Linear Regression Analysis

Hierarchical linear regression analysis was conducted to identify the relative contribution of the independent variables to psychological resilience (see **Table 3**). Variables correlated with psychological resilience in the univariate analyses were entered into the model. When the demographic characteristics were controlled in Step 1, SES, which was tested in Step 2, explained an additional 12.8% of variance in psychological resilience. Participants with higher levels of education ($\beta = 0.286, p < 0.001$) and monthly household income per capita ($\beta = 0.151, p = 0.014$) reported greater levels of psychological resilience. Family resilience, which was included in Step 3, explained 23.3% of the variance in psychological resilience. Higher scores in the maintenance of a positive outlook ($\beta = 0.325, p < 0.001$) were indicative of greater levels of psychological resilience. After controlling for the demographics, SES, and family resilience, tangible support ($\beta = -0.135, p = 0.037$) and positive social interaction support ($\beta = 0.233, p = 0.002$) emerged as significant predictors of psychological resilience. The addition of social support in Step 4 accounted for 5.5% incremental criterion variance. Furthermore, as shown in **Table 3**, monthly household income per capita no longer showed predictive utility in the last step ($\beta = 0.096, p = 0.058$).

DISCUSSION

In the present study, maintenance hemodialysis patients reported a low level of psychological resilience (58.92 ± 15.27), which

was significantly lower than the normal level in the general population in China (65.46 ± 13.93) (36), but was similar to the level of Chinese cancer patients (57.12 ± 13.56) (37). The treatment process and severe lifestyle changes related to maintenance hemodialysis may reduce the ability of patients to adapt and cope with adversity (38). Since the low psychological resilience of hemodialysis patients is associated with their lower health-promoting behavior and higher level of depression (8), it is highly important for clinical staff to help these patients increase their psychological resilience.

As hypothesized, the results of this study indicated that better SES (higher education level and family income) contributed to a higher level of psychological resilience in maintenance hemodialysis patients, which supports the theory proposed by Wister et al. (20). Maintenance hemodialysis patients with better SES might have more comprehensive understanding of the disease, adopt more effective problem-solving strategies, and have access to more information/health care services (39, 40). Interestingly, the predictive utility of family monthly income was no longer significant when social support was included in the model, which indicates that the family financial level of maintenance hemodialysis patients may affect the psychological resilience through the role of social support. Therefore, it will be more important in future studies to develop more appropriate social support systems for maintenance hemodialysis patients with low SES.

Our results support the hypothesis that family resilience is positively correlated with psychological resilience, indicating that having a family that flexibly responds to changes in a highly challenging environment may lead to positive changes in mental health among hemodialysis patients (41). Maintaining a positive outlook was an independent family resilience factor that influenced psychological resilience in this study, which suggests that maintaining a positive outlook is the most fundamental element of family resilience to foster an individual's psychological resilience (42). Our findings provide some new evidence that a family's shared belief in maintaining a positive outlook is essential to mobilize relational resources to support the positive adaptation of the family and, thus, to guide family members to embrace hope and flexibly respond to hardship when faced with stressful events. Therefore, it is important for families to preserve and nourish their shared beliefs and positive outlook as a way to promote psychological resilience during the process of disease and hemodialysis treatment.

Our findings also support the hypothesis of a positive correlation between social support and psychological resilience. Social interaction support showed a positively predictive effect on psychological resilience, possibly due to the fact that individuals who reported greater support received in positive social interactions would have higher levels of self-efficacy (43) and more resources to cope with stress and the burden of illness (44). Qualitative studies found that positive social interactions gives hemodialysis patients a sense of meaning in life and hope for the future (45), as well as positive emotional experiences and self-worth (46). Thus, nursing interventions focused on promoting positive social interaction

TABLE 1 | Psychological resilience in relation to demographic, clinical, and SES characteristics ($N = 258$).

Variable	N (%)	Psychological resilience (Mean \pm SD)	t/F	p
Demographic and clinical variables				
Age			2.027	0.044
<60 years	130 (50.4%)	60.82 \pm 15.54		
\geq 60 years	128 (49.6%)	56.99 \pm 14.80		
Gender			1.355	0.177
Male	174 (67.4%)	59.82 \pm 15.27		
Female	84 (32.6%)	57.07 \pm 15.18		
Employment status			3.890	<0.001
Employed	45 (17.4%)	66.76 \pm 13.99		
Unemployed	213 (82.6%)	57.27 \pm 15.04		
Marital status			-2.122	0.035
Single/divorced/widow/separated	30 (11.6%)	53.40 \pm 12.44		
Married/cohabitating	228 (88.4%)	59.65 \pm 15.48		
Medical insurance				
Yes	253 (98.1%)	59.12 \pm 15.25	-1.471	0.143
No	5 (1.9%)	49.00 \pm 14.09		
Duration of disease			0.442	0.723
<1 year	13 (5.0%)	58.46 \pm 16.78		
1-<5 years	53 (20.5%)	60.98 \pm 15.28		
5-<10 years	55 (21.3%)	57.78 \pm 16.23		
\geq 10 years	137 (53.1%)	58.63 \pm 14.82		
Duration of hemodialysis			1.930	0.125
<1 year	48 (18.6%)	58.48 \pm 16.03		
1-<5 years	109 (42.2%)	61.44 \pm 15.46		
5-<10 years	65 (25.2%)	56.37 \pm 15.15		
\geq 10 years	36 (14.0%)	56.50 \pm 13.08		
Comorbidities			0.377	0.686
No	77 (29.8%)	58.22 \pm 17.00		
One	119 (46.1%)	59.82 \pm 13.85		
Two or more	62 (24.0%)	58.08 \pm 15.76		
SES variables				
Education level			11.379	<0.001
Primary School and below	70 (27.1%)	52.29 \pm 13.54		
Middle School	97 (37.6%)	58.01 \pm 14.73		
High School/secondary school	59 (22.9%)	63.15 \pm 13.40		
College or higher	32 (12.4%)	68.41 \pm 16.97		
Monthly household income per capita			9.667	<0.001
<2,000 RMB	38 (14.7%)	51.74 \pm 14.01		
2,000-4,000 RMB	93 (36.0%)	57.75 \pm 14.78		
4,001-6,000 RMB	76 (29.5%)	58.01 \pm 13.95		
>6,000 RMB	51 (19.8%)	67.76 \pm 15.37		

support as appropriate and directly or indirectly mobilizing or expanding the social network of the patient may be an effective strategy to improve the psychological resilience of patients. In contrast to our hypothesis, tangible support was negatively predictive of psychological resilience after controlling for other kinds of social support in this study. High tangible support with activities for daily living may threaten self-esteem and the sense of competence and mastery (47). Patients

who perceived high tangible support without affectionate supportive communication may view such favors as expressions of obligation rather than a manifestation of love, thereby reducing psychological resilience (48). Therefore, it is important for nurses and caregivers to strike a balance between providing help and maintaining the patient's sense of self-esteem and self-worth, despite the patient's reliance on others for care and support (49).

TABLE 2 | Correlation analysis between social support, family resilience, and psychological resilience (*N* = 258).

	Mean ± SD	1	2	3	4	5	6	7	8	9	10	11
1. Tangible support	16.74 ± 3.40											
2. Informational/emotional support	24.85 ± 6.05	0.554**										
3. Positive social interaction support	12.71 ± 3.37	0.465**	0.767**									
4. Affectionate support	11.26 ± 2.40	0.688**	0.749**	0.644**								
5. FCPS	81.79 ± 7.85	0.308**	0.496**	0.443**	0.459**							
6. USER	21.89 ± 2.58	0.165**	0.343**	0.316**	0.216**	0.630**						
7. MPO	17.74 ± 2.12	0.276**	0.467**	0.439**	0.425**	0.825**	0.560**					
8. AMMA	9.03 ± 0.89	0.308**	0.432**	0.393**	0.370**	0.790**	0.565**	0.609**				
9. Tenacity	29.61 ± 8.41	0.141*	0.450**	0.484**	0.359**	0.531**	0.373**	0.545**	0.400**			
10. Strength	20.42 ± 5.23	0.209**	0.484**	0.540**	0.403**	0.519**	0.354**	0.557**	0.373**	0.892**		
11. Optimism	8.89 ± 2.67	0.331**	0.539**	0.526**	0.455**	0.480**	0.362**	0.482**	0.439**	0.677**	0.682**	
12. Psychological resilience	58.92 ± 15.27	0.207**	0.508**	0.543**	0.415**	0.554**	0.390**	0.575**	0.425**	0.975**	0.953**	0.781**

FCPS, Family Communication and Problem Solving; USER, Utilizing Social and Economic Resources; MPO, Maintaining a Positive Outlook; AMMA, Ability to Make Meaning of Adversity; **p* < 0.05, ***p* < 0.01.

TABLE 3 | Hierarchical regression analysis of factors influencing psychological resilience.

Variables	Model 1		Model 2		Model 3		Model 4	
	β	SE	β	SE	β	SE	β	SE
Demographic variables								
Age	-0.104	1.970	-0.063	1.890	-0.090	1.609	-0.061	1.564
Employment status	-0.233*	2.533	-0.178*	2.394	-0.120*	2.304	-0.071	1.989
Marital status	0.194*	2.952	0.221*	2.793	0.181*	2.385	0.134*	2.454
SES								
Education level			0.286*	0.987	0.179*	0.858	0.127*	0.836
Monthly household income per capita			0.151*	0.966	0.104*	0.825	0.096	0.790
Family resilience								
FCPS					0.171	0.219	0.142	0.212
USER					0.058	0.366	0.043	0.357
MPO					0.325*	0.618	0.269*	0.599
AMMA					-0.011	1.367	-0.030	1.322
Social support								
Tangible support							-0.135*	0.289
Informational/emotional support							0.087	0.214
Positive social interaction support							0.233*	0.331
Affectionate support							0.037	0.531
<i>F</i>	8.753		14.336		22.982		19.486	
<i>R</i> ²	0.094		0.221		0.455		0.509	
Adjusted <i>R</i> ²	0.083		0.206		0.435		0.483	
<i>R</i> ² -change	0.094		0.128		0.233		0.055	

β , Standardized estimate; FCPS, Family Communication and Problem Solving; USER, Utilizing Social and Economic Resources; MPO, Maintaining a Positive Outlook; AMMA, Ability to Make Meaning of Adversity.

Implications for Practice

From a clinical perspective, this study highlights the practical importance of assessing the SES, family resilience, and social support to screen patients with a risk of low psychological resilience, and provides evidence for tailoring family resilience and social support-oriented intervention to improve the psychological resilience of maintenance hemodialysis

patients. Specifically, clinical practitioners can conduct family interventions that focus on promoting the shared family belief of a positive outlook toward the disease and treatment to foster individual resilience. Clinical practitioners should also evaluate the sources of social support during treatment and provide appropriate help to guide maintenance hemodialysis patients to seek effective support and enhance their resilience.

Limitations

There are several limitations of the present study. First, causal relationships cannot be inferred due to the cross-sectional design of this study. Therefore, longitudinal study designs should be used to further explore the complicated dynamic effect of SES, family resilience, and social support on psychological resilience. Secondly, the subjective nature of self-reported questionnaires can lead to reporting bias, especially since psychiatric pathologies and psychological disorders in the participants were not evaluated through specific and structured interviews. However, we initially reviewed the medical records and inquired about the psychiatric history of the patients. Thirdly, family SES was measured only based on the family income and education level in this study. Multiple indices of family SES should be used in future studies. Fourthly, although we adjusted for demographic factors in the analysis, there may be residual confounding factors present, such as the mood of the day and comorbidities. Finally, the generalizability of the results of this study may be limited by convenience sampling. It is necessary to conduct multi-center investigations in future studies.

CONCLUSION

Our study showed a low level of psychological resilience among Chinese maintenance hemodialysis patients. The present study demonstrated that SES, represented by education level and family income, is an important predictor of psychological resilience. Maintaining a positive outlook as the most important aspect of family resilience and positive social interactive support positively predicted the patient's level of psychological resilience, while tangible support served as a negative predictor of psychological resilience. Therefore, an approach that focuses on psychological resilience, which patients with lower SES can apply to deal with stress, may reduce the health disparity. In

addition, family interventions tailored to maintaining the family's positive outlook or interventions that promote appropriate social support are needed to improve the psychological resilience of maintenance hemodialysis patients.

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 First Affiliated Hospital of Wenzhou Medical University Ethics Committee (No. 2020198). The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

YQ: data collection, writing-original draft, writing review, and editing. YH, YW, LR, and HJ: data collection, data curation, writing review, and editing. LZ: conceptualization, writing review, and editing. CD: conceptualization, writing-original draft, writing review, and editing. All listed authors meet the authorship criteria and that all authors are in agreement with the content of the manuscript.

FUNDING

This work was supported by The National Natural Science Foundation of China (Grant No.72004167) and The Research Projects of the Social Science and Humanity of the Ministry of Education (No. 20YJJCZH018).

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