

The Mediating Effect of Personal Sense of Control on Depression and Social Networks in Elderly Patients Receiving Maintenance Hemodialysis

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Abstract

Objective: To explore the mediating effect of personal sense of control on depression and social network in elderly maintenance hemodialysis patients (MHD). **Methods:** A general information questionnaire, Personal Mastery Scale, Geriatric Depression Scale 5 and Lubben Social Network Scale 6 were used to survey elderly MHD patients in two tertiary hospitals in Wuhan City, and a mediation effect model was established using Amos29.0. **Results:** The personal sense of control score of the 248 elderly MHD patients was (21.51 ± 4.95), the social network score was (9.64 ± 5.71) and depression score was (1.91 ± 1.69). The correlation results showed that depression was negatively correlated with social network and personal sense of control in elderly MHD patients ($r = -0.553$, $r = -0.707$, $P < 0.001$), and social network was positively correlated with personal sense of control ($r = 0.572$, $P < 0.001$). Social network played a mediating role in depression and personal sense of control, and the indirect effect accounted for 41.4% of the total effect. **Conclusions:** Elderly MHD patients' depression and personal sense of control were at an intermediate level, and the social network was at a low level, and depression not only directly affected the social network, but also indirectly affected the social network through the personal sense of control. Healthcare professionals should pay attention to the levels of depression, social network and personal sense of control in elderly MHD patients, and enhancement of person mastery is one

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of the effective ways to improve the social network.

Keywords

Maintenance Hemodialysis, Personal Control, Social Networks, Depression, Mediation

1. Introduction

With the acceleration of global aging and rising incidence of kidney disease, end-stage renal disease (ESRD) has become a significant public health concern worldwide. Maintenance hemodialysis (MHD) serves as the primary replacement therapy for ESRD [1]. Epidemiological data indicates that elderly patients constitute as much as 70% of China's MHD population [2], highlighting the urgent need to address their mental health challenges. Depressive symptoms are highly prevalent among MHD patients, with an incidence rate ranging from 40% to 53.4% [3]. As a modifiable factor, depression significantly influences the social network support of hemodialysis patients. Social network, also termed social isolation, refers to the intensity and frequency of an individual's connections and interactions with family members, friends, and neighbors [4]. Personal sense of control refers to an individual's perceived degree of control over their life and surroundings, representing their capacity to cope with and manage life events [5]. Related studies indicate that depression negatively predicts both social network strength and personal sense of control [6] [7]. However, the mutual influence among these three factors remains unreported, with a particular lack of empirical research in the elderly MHD population. This study aims to analyze the mediating effect of personal sense of control between depression and social networks among elderly MHD patients, based on understanding their characteristics of depression, social networks, and personal sense of control. This analysis will provide evidence for developing intervention measures to enhance the social networks of elderly MHD patients.

2. Participants and Methods

2.1. Participants

The study enrolled elderly MHD patients attending outpatient clinics at two tertiary hospitals in Wuhan from August to December 2024. Inclusion criteria were: (1) ESRD patients aged ≥ 60 years who had undergone dialysis for over three months; (2) Patients who were conscious, communicated effectively, and could complete the questionnaire independently or with researcher guidance; (3) Patients who provided informed consent and voluntarily participated in the study. Exclusion criteria: (1) Severe organ dysfunction or malignant tumors; (2) History of psychiatric disorders or cognitive impairment; (3) Recent receipt of psychological counseling. Kendall [8] recommends a sample size of 5 - 10 times the number of variables. This study includes 22 independent variables, requiring a sample size of approximately $N = 22 \times$

(5 - 10) = 110 - 220 cases. Accounting for a 10% attrition rate, the minimum sample size is 121 cases. This study has been approved by the Ethics Committee of Wuhan University People's Hospital (Approval No.: WDRY2024-K173).

2.2. Measures

2.2.1. General Information about the Patients

It was designed by the researcher and included gender, age, education level, marital status, personal monthly income, age on dialysis, frequency of dialysis, body mass index (BMI), and number of chronic diseases.

2.2.2. Personal Mastery Scale (PMS)

This scale was developed by Pearlin *et al.* [9] and adapted for Chinese use by Yu Yibing *et al.* [10]. It consists of a single dimension with seven items, using a 5-point Likert scale where 1 - 5 represent “completely disagree”, “somewhat disagree”, “somewhat agree”, “agree” and “completely agree”. The total score ranges from 7 to 35 points, with higher scores indicating greater individual sense of control over personal and life events. The Cronbach's α coefficient in this study was 0.926.

2.2.3. Geriatric Depression Scale 5 (GDS-5)

This scale was developed and validated by Hoyle *et al.* [11], comprising the five most suitable and closely related items selected from the GDS-15. It is primarily used to assess depression levels in older adults. Scores are assigned based on patients' responses of “yes” or “no” (0 or 1 point), with a total score ranging from 0 to 5 points. A total score ≥ 2 indicates the presence of depressive symptoms. Higher scores indicate more severe depressive symptoms. The Cronbach's α coefficient for this study was 0.74.

2.2.4. Lubben Social Network Scale 6 (LSNS-6)

This scale was developed by Lubben *et al.* [12] and adapted into Chinese by Chang *et al.* [13] to assess social isolation among older adults. It comprises two dimensions: family and friends, with a total of six items. Scores range from 0 to 5, indicating none, one, two, three to four, five to eight, or nine or more items, respectively. The total score ranges from 0 to 30 points. A total score < 12 indicates social isolation; a single-dimension score < 6 indicates isolation from family or friends. The Cronbach's α coefficient in this study was 0.84.

2.3. Data Collection

This study is a cross-sectional investigation. Researchers utilized Questionnaire Star for data collection, introducing the survey's purpose, significance, and completion instructions on the questionnaire's cover page. Patients completed the questionnaire independently. If unable to complete it themselves, researchers could assist with completion and submission. The questionnaire took approximately 20 minutes to complete. It was distributed and collected on-site immediately after completion. During collection, questionnaire quality was checked. If multiple selections or omissions occurred, corrections or additions were made promptly. Af-

ter a final review for accuracy, the questionnaires were retrieved to ensure their completeness and validity. A total of 260 questionnaires were distributed, with 248 returned, yielding an effective response rate of 95.40%.

2.4. Statistical Analyses

Statistical analysis was performed using SPSS 22.0 software. Count data are presented as case numbers and proportions (%). For bivariate normally distributed quantitative data, Pearson correlation analysis was used to assess variable correlations. Structural equation modeling was constructed using AMOS 29.0, with the bootstrapping method repeated 5000 times to test for mediating effects. $P < 0.05$ was considered statistically significant.

3. Results

3.1. Common Method Bias Test

The results showed that there were 5 factors with eigen roots greater than 1, and the amount of variance explained by the first factor was 26.37% (<40%), indicating that there was no serious problem of common method bias in this study.

3.2. General Information on Elderly MHD Patients

The study findings indicate that among 248 elderly MHD patients, females, those aged 60 - 69, and individuals with a junior high school education or below constituted the majority, accounting for 51.2%, 64.5%, and 58.1%, respectively. See **Table 1** for details.

Table 1. General information of elderly patients with MHD ($n = 248$).

Variable	Categories	<i>n</i>	%
Gender	Male	121	48.8
	Female	127	51.2
Age	60 - 69 years	160	64.5
	70 - 79 years	74	29.8
	≥80 years	14	5.7
Education	Junior high school or below	144	58.1
	High school or technical secondary school	71	28.6
	College or above	33	13.3
Marital status	Married	188	75.8
	Divorced/Widowed	60	24.2
Personal monthly income	<3000 RMB	94	37.9
	3000 - 5000 RMB	98	39.5
	≥5000 RMB	56	22.6

Continued

Dialysis duration	<1 year	30	12.1
	1 - 3 years	59	23.8
	>3 years	159	64.1
Dialysis frequency	Twice a week	61	24.6
	Three times a week	135	54.4
	Others	52	21.0
BMI	≤18.5	22	8.9
	18.5 - 23.9	136	54.8
	24 - 27.9	70	28.2
	≥28	20	8.1
Number of chronic diseases	1	25	10.1
	2 - 3	85	34.3
	>3	138	55.6

3.3. Depression, Sense of Personal Control, and Social Network Scores in Elderly MHD Patients

Research indicates that elderly MHD patients scored (1.91 ± 1.69) on depression scales, with 53.6% diagnosed with depression. Personal sense of control scores averaged (21.51 ± 4.95), with item-level averages at (3.07 ± 0.71). The lowest-scoring item was “When facing life’s challenges, I feel helpless”, with scoring (2.90 ± 0.88). The social network score was (9.64 ± 5.71), with an average item score of (1.61 ± 1.90). Scores for the two dimensions were family network (2.20 ± 0.97) and friend network (1.01 ± 1.51). The prevalence of social isolation was 68.5%.

3.4. Correlation Analysis of Personal Sense of Control in Elderly MHD Patients

Research findings indicate that depression in elderly MHD patients is negatively correlated with both social networks and personal sense of control ($r = -0.553$, $r = -0.707$, $P < 0.001$), while personal sense of control is positively correlated with social networks ($r = 0.572$, $P < 0.001$). The existence of correlations among depression, social networks, and personal sense of control is a prerequisite for testing mediating effects. See **Table 2**.

Table 2. Correlation analysis of depression, social networks, and sense of personal control in elderly MHD patients ($n = 248$).

Variable	Sense of personal control	Depression	Social networks
Sense of personal control	1	-	-
Depression	-0.707***	1	-
Social networks	0.572***	-0.553***	1

***: $P < 0.001$.

3.5. Mediating Effect of Personal Sense of Control on Depression and Social Networks in Elderly MHD Patients

An initial structural equation model was constructed with social networks as the dependent variable, depression as the independent variable, and personal sense of control as the mediating variable. Results indicated poor model fit, necessitating model modification. The modified model is shown in **Figure 1**. All fit parameters of the modified model met reference standards, indicating good model quality (see **Table 3**).

The mediation analysis results revealed that the 95% confidence intervals for both the direct effect and the mediation effect excluded zero, indicating a significant mediating effect of personal sense of control. The relative effect size for the direct effect was 58.6%, while the indirect effect size was 41.4%. See **Table 4** and **Figure 1**.

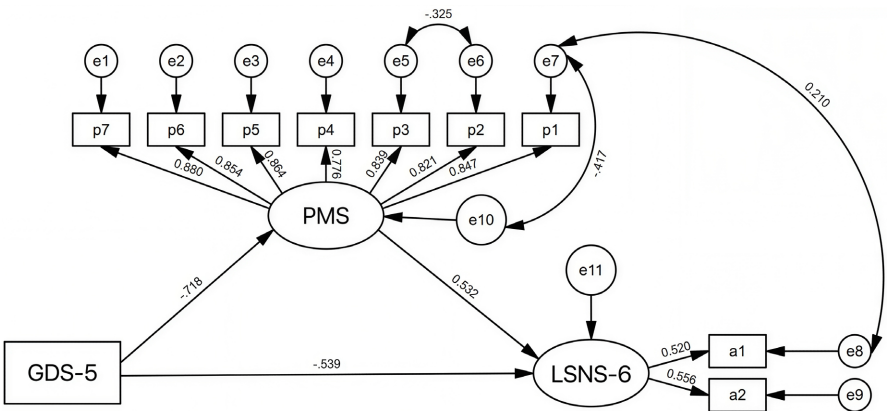


Figure 1. The path analysis model of social network in depression and personal mastery in elderly MHD patients.

Table 3. Mediating effect model fitting index.

Fitting standard	χ^2/df	RMSEA	GFI	AGFI	NFI	CFI	IFI
Compliance standards	<3.00	<0.08	>0.90	>0.90	>0.90	>0.90	>0.90
Initial model	3.587	0.102	0.913	0.856	0.930	0.948	0.948
Modified model	2.072	0.066	0.957	0.921	0.963	0.980	0.981

χ^2/df : Relative chi-square; RMSEA: Root mean square error of approximation; GFI: Goodness-of-fit index; AGFI: Adjusted goodness-of-fit index; NFI: Normative fit index; CFI: Comparative fit index; IFI: Inflated fit index.

Table 4. The results of the Bootstrapping mediating effect test.

Path	Standardized effect size	Standard error	95%CI	Relative effect size	<i>P</i>
Total effect	-0.920	0.022	-0.970 - -0.610	100%	<0.001
Direct effect	-0.539	0.098	-0.694 - -0.256	58.6%	<0.001
Indirect effects	-0.381	0.035	-0.475 - -0.194	41.4%	<0.001

4. Discussion

4.1. Among Elderly MHD Patients, Depression and Personal Sense of Control Are at Moderate Levels, While Social Networks Are at Low Levels

The results of this study indicate that the prevalence of depression among elderly MHD patients is 53.6%, consistent with previous research findings [14]. Patients with renal insufficiency exhibit a higher prevalence of depression, potentially associated with elevated inflammatory markers such as C-reactive protein and erythrocyte sedimentation rate. Chronic inflammation influences the development of depression through cytokine dysregulation. Secondly, nutritional losses during dialysis accelerate muscle protein breakdown, with most MHD patients experiencing malnutrition [15], potentially leading to reduced activity levels and negative emotions. Furthermore, the long-term economic burden of dialysis, severe pruritus, and cardiovascular complications increase the risk of depression [16]. Therefore, healthcare providers are advised to enhance psychological assessments for MHD patients, implement individualized health education, and promote mental well-being. Research findings indicate that elderly MHD patients exhibit low levels of social networks, lower than the results reported by Yin Yanru *et al.* [17] (12.56 ± 4.25), suggesting that social networks require further enhancement. Among the two-dimensional scores, the friend network score was significantly lower than the family network score, consistent with the findings of Liu Chengcheng *et al.* [18]. This may be attributed to the gradual weakening of the original friend network centered on colleagues after retirement in the elderly population [18], coupled with patients' perceived stigma associated with their condition [19], which further reduces interactions with friends. Conversely, family serves as the primary source of social support for patients, with filial obligations reinforcing the stability of family networks. Therefore, healthcare providers should prioritize elderly MHD patients with weak social networks, encouraging them to maintain connections with friends or family and engage in self-management behaviors. This approach aims to enhance patients' social network levels, ultimately strengthening their overall sense of control over their condition. This study found that elderly MHD patients exhibited moderate levels of personal control, consistent with Xiang *et al.*'s findings (20.20 ± 4.48) [20]. This may stem from ESRD patients' profound uncertainty about their disease trajectory, compounded by the relentless toll of weekly hospital visits (2 - 3 times) for long-term dialysis, which erodes their inner resolve and sense of environmental control. The lowest score was recorded for the statement "I feel helpless when dealing with life's difficulties," indicating that MHD patients are forced to endure disease-related suffering when confronting dialysis-related complications and medication side effects. Unable to alter this situation, they fear their physical condition will deteriorate further and harbor dread about their future, leading to feelings of helplessness. Therefore, it is recommended that healthcare providers identify patients with low perceived control early on and employ motivational interviewing or cognitive behavioral therapy to promote confidence in restoring health.

4.2. Correlation between Depression, Social Networks, and Sense of Personal Control in Elderly MHD Patients

The findings of this study indicate that depression is negatively correlated with personal sense of control, consistent with the research by Jianana *et al.* [21]. From a positive psychology perspective, personal sense of control serves as a vital psychological resource [22]. Depressive moods erode one's capacity for disease management and life control. Patients with a high sense of control not only process negative emotions effectively but also navigate hemodialysis-related stressors with greater ease. They exhibit heightened confidence in managing their lives, resulting in significantly reduced depressive symptoms. Research indicates that personal sense of control is positively correlated with social networks. Social network support helps MHD patients proactively confront illness by providing emotional assistance and informational resources, thereby enhancing confidence in recovery, self-control, and adaptation to disease-related changes. This study shows a negative correlation between depression and social networks, consistent with findings by Wang *et al.* [23]. Depressed individuals experience diminished interest and reduced motivation, leading to reluctance to maintain social relationships and resulting in social withdrawal [24]. Furthermore, based on the stress coping model theory [25], family and friends serve as primary coping resources that can buffer negative life events and maintain mental health. Therefore, healthcare providers should encourage elderly MHD patients to actively express their emotions, strengthen psychological education to reduce negative emotions, enhance social support networks, and improve personal sense of control. These measures can help alleviate depression and improve their mental health status.

4.3. The Mediating Effect of Personal Sense of Control on Depression and Social Networks in Elderly MHD Patients

This study demonstrates that personal sense of control partially mediates the relationship between depression and social networks in elderly patients with MHD. Depression can enhance social network support through the sense of control. Related research indicates that depression, characterized by feelings of helplessness and despair regarding illness and life, makes it more difficult to actively engage in treatment. Consequently, self-management levels decline, making it harder to maintain or utilize social relationship networks, thus forming a vicious cycle. Roy *et al.* [26] propose that individuals achieve dynamic equilibrium with their environment through psychological and behavioral adjustments when confronting life challenges and stressors. Social networks provide social resources, while perceived control determines internal regulatory motivation, jointly influencing depression severity. Social network support facilitates the accumulation of psychological resources. Emotional support from friends and family, along with household assistance, enhances patients' capacity to cope with illness, reduces fear of the disease, and alleviates depressive symptoms in elderly MHD patients. Elderly MHD patients with high perceived control possess confidence and ability to manage their condition. Even when experiencing depressive symptoms, they receive emotional

and material support from family and friends, adopt proactive coping strategies, actively participate in social activities, and consequently enhance their social network quality. For elderly patients, this mediating effect may be more pronounced than in the general population due to disease burden and age factors. Depression is merely a state of low mood, but it is also a condition of psychological energy depletion. Patients with MHD often experience negative perceptions regarding their body image and the burden of treatment, which to some extent erodes their sense of personal control. And the sense of personal control plays a crucial psychological mediating role here. As a psychological resource, individuals are more likely to believe that they have the ability to confront depressive emotions and social fears. Secondly, they can actively choose to participate in social activities to meet their own needs. This belief will prompt individuals to actively expand their social networks, thereby promoting social interaction. Therefore, healthcare providers should pay attention to depressive symptoms in elderly MHD patients and help them gain a greater sense of control by providing internal and external resources, thereby enhancing their social network levels.

In summary, elderly MHD patients exhibit moderate levels of depressive symptoms and personal sense of control, coupled with below-average social networks. Correlations exist between these variables. Personal sense of control mediates the relationship between depression and social networks; enhancing this sense can improve depression's predictive value for social network quality. This study has certain limitations. It was conducted only in two tertiary hospitals in Wuhan, with a small sample size and regional bias. Future research could expand the sample size and adopt a multi-center approach to enhance the generalizability of results. Additionally, this study explored only single mediation; future research could investigate multiple chained mediating variables.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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