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Research Article

Factors Influencing Self-Management among Patients Receiving Maintenance Hemodialysis

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Abstract

Objective: To assess self-management and its influencing factors among patients receiving hemodialysis.

Method: Applying random sampling method, 180 patients receiving maintenance hemodialysis (MHD) were included from February 2022 to June 2022 from a hemodialysis center of the tertiary university-affiliated hospital in Southern China. The self-rating anxiety scale (SAS) and self -rating depression scale (SDS) were administered to evaluate anxiety and depression. A self-management questionnaire was applied to assess the capacity of self-management. Demographic data and laboratory tests were assessed to inform the influencing factors on self-management in the MHD patients.

Result: The incidences of anxiety and depression were 34.89% and 30.02%, respectively, and the mean score of self-management was (55.51±11.22) in the MHD patients. More than half (57.8%) of the patients had low score of self-management. Monthly income, education level, duration of dialysis, plasma albumin (ALB), anxiety and depression were significant factors influencing self-management among patients receiving MHD (P<0.05).

Conclusion: Self-management in MHD patients is at an intermediate level, especially among those who have low education level, poor economic status, disadvantaged nutritional condition, as well as unstable emotion. Tailored strategies should be developed to achieve better outcome for the patients undergoing MHD.

Keywords: Self-management; Maintenance hemodialysis; Depression; Anxiety.

Introduction

In recent years, prevalence of diabetes and hypertension is increasing, at the same time, the number of patients with chronic kidney disease (CKD) has also increased. Previous studies [1,2] showed that the global prevalence of CKD has been risen to 13.4% (11.7-15.1%). Hemodialysis is the predominant form of ESRD renal replacement therapy, about 89% of ESRD patients worldwide are treated with hemodialysis therapy [3,4]. The population of patients initiating and living with MHD is increasing each year in China. The Chinese National Renal Data System (CNRDS) disclosed that prevalent MHD patients in China, the number of MHD patients in China will far exceed 900,000, and the number of new patients will exceed 180,000 which increased from 174.1 PMP in 2011 to 635 PMP in 2023. MHD has the characteristics of high cost in healthcare, poor prognosis, and long duration. It has become a global public health problem that affects patient's physical and mental health and increases socio-economic burden [5]. The current alternative treatments for CKD mainly include peritoneal dialysis, hemodialysis and kidney transplantation. In China, about 88.2% of patients with end-stage renal disease (ESRD) are treated with maintenance hemodialysis (MHD). The patients need not only routine hemodialysis every week under certain management of vascular access, but also strictly diet control, regular medication. All of these practices require good self-management for the patients.

Self-management can be defined as the patient's active efforts to monitor and participate in the care process to optimize their health. Molnar [6] pointed out that individual activities are interacted and mutually influenced by three variables, e.g. cognition, behavior, and environment. They consist of four aspects: self-care, self-solving problems, cooperation with healthcare givers, and self-emotional management. Some studies [7,8] have demonstrated that good self-management has positive impact on the health status, such as improving clinical outcomes and quality of life, reducing the incidence of complications, and changing self-behavior in ESRD patients. Current studies have confirmed that the level of self-management of ESRD patients in China is still relatively low. However, for the special period during the epidemic, such as the restriction of patients' travel, irregular dialysis treatment and home isolation, the changes in patients' self-management ability and the influencing factors of patient self-management are still unacceptable, which is one of the important factors affecting the prognosis of patients.

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Many factors [9,10] affect the self-management of MHD patients, including age, income, education level, family support and complications. The worldwide pandemic of COVID-19 has been lasted for almost three years, to prevent the virus spreading and transmission, keeping social distance, limiting social activity, and avoiding people gathering are the suggestions in the prevention and control of COVID-19. Under this condition, MHD patients experienced the alteration in personal activities, income, dialysis environment and social support. It is unclear whether these changes would affect the capacity of self-management, and the incidence of anxiety and depression in the MHD patients. The study aimed to explore the association between anxiety, depression and self-management, as well as the factors affecting the capacity of self-management in the MHD patients. Hopefully, the study result could provide some suggestions in enhancing the capacity of self-management and improving the prognosis in the patients.

Subjects and Methods

Study Design

A cross-sectional survey.

Study Subjects

The subjects were the ESRD patients, who underwent maintenance hemodialysis (MHD) and received long-term dialysis from February 2022 to June 2022 in the Eighth Affiliated Hospital of Sun Yat-Sen University. A total of 180 patients were included in the study.

The inclusion criteria: (1) were maintenance hemodialysis patients; (2) agreed to participate in the research; (3) were able to read or understand the content of the survey questionnaire, and communicate orally or in writing. The exclusion criteria: (1) had history of mental and neurological diseases, long-term alcohol or drug abuse; (2) had cognitive impairment or severe visual impairment; (3) were unable to answer the questions of questionnaire; (4) had critical illnesses.

Outcome Assessments

Demographic and Clinical Parameters: The general demographic information was obtained through a self-designed questionnaire filled up by the subjects. The content of questionnaire included gender, age, monthly income, education level, medical insurance, whether have feeling of pain, duration of dialysis, vascular access of dialysis, and whether worried about being infected by COVID-19.

Self-management Ability: Questionnaire of self-management ability was designed by Li [12] and applied to evaluate the capacity of self-management in the subjects. The Cronbach's α coefficient was 0.87, each question was divided into four levels, ranging from 1 (never) to 4 (always), and the Cronbach's α coefficients of the four subscales were 0.76, 0.79, 0.78, and 0.70, respectively. The scores of >80, 60-80, and <60 represented as high, medium, and low capacity levels of the subjects respectively.

Anxiety: self-rating anxiety scale (SAS) designed by Zung [11] was used to assess anxiety status of the subjects. Cronbach's α coefficient was 0.823. The scale contained 20 items (15 items positive points and 5 negative points) that reflected the anxiety status of the patients. Each question was divided into four levels. Respondents rated how they felt about the past week on a scale of 1 (none or little) to 4 (most or all of the time). The total score of the scale was 80 points, while scores of <50, 50-59, 60-69, and >69 represented as none, mild, moderate and severe anxiety respectively.

Depression: Self-rating depression scale (SDS) designed by Zung [11] was used to evaluate the depression status of the subjects. This scale also consisted of 20 items (10 positive points and 10 negative points) with a 4-point-scales ranging from 1 (none or few times) to 4 (most or all times). The total score of the scale was also 80 points, while scores of <50, 50-59, 60-69, and >69 represented as none, mild, moderate and severe depression respectively.

Each participant completed the questionnaire through We Chat, a widely used social media APP in China. The questionnaire was anonymous to ensure the confidentiality and reliability of the data.

Data Analysis

The SPSS 22.0 was used to analyze all of the data. Continuous variables were presented as mean ± SD. Differences between sub-groups were compared using one-way ANOVA. Significantly different variables were further analyzed through multivariate logistic regression analysis. Estimates of association strength were demonstrated by odds ratios (ORs) with 95% confidence intervals (CIs). Spearman's correlation coefficient (r) was used to assess the association between demographic data and clinical parameters and levels of anxiety, depression, and self-management of the subjects. A *P*-value less than 0.05 was considered as statistically significant.

Ethical Considerations

This cross-section study was approved by the Biomedical Ethics Committee of the eighth affiliated hospital of Sun Yat-Sen university (IRB No. 2022-08-03). And the informed consent was obtained for all patients.

Results

Demographic and Clinical Parameters

Among the 180 participants, there were 96 men (53.3%) and 84 women (46.7%), of which, 62.8% (113) were older than 50 years, 46.7% (84) had less than 10,000 RMB monthly income, 49.4% (89) had been undergone dialysis for more than three years, 58.3% (105) of the subjects worried about being infected by COVID-19, 48.3% (87) complained pain, more than two thirds (130, 72.2%) had health insurance, 70.6% (127) of the patients were using arteriovenous fistula (AVF) as their vascular access for dialysis (Table 1).

The blood test results demonstrated that the average hemoglobin (Hb) was (111.49±15.58) g/L, plasma albumin (ALB) was (38.06±4.13) g/L, parathyroid hormone (PTH) was (243.73±190.62) pg/mL, and phosphorus (P) was (1.98±0.64) mmol/L (Table 2).

Association of Self-Management Capacity with Demographic/Clinical Characteristics of the Subjects

The monthly incomes, vascular access of dialysis, duration of dialysis, symptom of pain, worried about being infected by COVID-19, education level, anxiety, and depression were factors impacting the capacity of self-management of the patients, for details, please see Table 1.

Table 1: Distribution of the characteristics of patients under low and high self-management scare categories (N=180).

Variables	n (%)	Self-management score		F(t)	P
		Low n (%)	High n (%)		
Age（year）				2.726	0.099
≥ 50	113(67.8)	60(53.1)	53(46.9)		
< 50	67(37.2)	44(65.7)	23(34.3)		
Gender				0.197	0.762
Male	96(53.3)	54(56.3)	42(43.7)		
Female	84(46.7)	50(59.5)	34(40.5)		
Educational level				23.531	0.001
College and above	59(32.8)	19(32.2)	40(67.8)		
High school and below	121(67.2)	85(70.2)	36(29.8)		
Duration of dialysis (years)				6.703	0.007
≥ 3	89(49.4)	60(67.4)	29(32.6)		
< 3	91(50.6)	44(48.4)	47(51.6)		
Worried about being infected by COVID-19				3.758	0.037
Yes	105(58.3)	67(63.8)	38(38.2)		
No	75(41.7)	37(49.3)	38(50.7)		
Pain				10.506	0.001
Yes	87(48.3)	61(70.1)	26(29.9)		
No	93(51.7)	43(46.2)	50(53.8)		
Vascular access				11.806	<0.001
AVF	127(70.6)	63(49.6)	64(50.4)		
Other vascular access	53(29.4)	41(77.4)	12(22.6)		
Monthly income (RMB)				21.888	<0.001
< 10,000/ month	84(46.7)	64(76.2)	20(23.8)		
≧10,000/ month	96(53.3)	40(41.7)	56(58.3)		
Health insurance				5.740	0.012
Yes	130(72.2)	68(52.3)	62(47.7)		
No	50(27.8)	36(72.0)	14(28.0)		
Anxiety				67.301	<0.001
Yes	64(35.6)	63(98.4)	1(1.6)		
No	116(64.4)	41(35.3)	75(64.7)		
Depression				72.761	<0.001
Yes	70(38.9)	68(97.1)	2(2.9)		
No	110(61.1)	36(32.7)	74(67.3)		

Table 2: Association of SMS with scores of SAS and SDA and lab tests (n=180).

Variables	Mean ± SD	r	P
PTH (pg/mL)	243.73±190.62	-0.173	0.02
P (mmol/L)	1.98±0.64	-0.480	<0.001
Hb (g/L)	111.49±15.58	0.293	<0.001
ALB (g/L)	36.06±4.13	0.087	0.246
SAS	48.03±5.02	-0.719	<0.001
SDA	48.12±5.42	-0.699	<0.001

Notes: SMS: Self-Management Score; SD: Standard Deviation; Hb: Hemoglobin; PTH: Parathyroid Hormone; P: Phosphorus; SDS: Self-Rating Depression Scale; SAS: Self-Rating Anxiety Scale.

Association of Self-Management Capacity with SAS/SDS Scores and Laboratory Tests in the MHD Patients

The Pearson correlation analysis results showed that the self-management scores (SMS) were positively correlated with levels of Hb and ALB; SMS were negatively correlated with levels of PTH, P, and scores of SAS and SDS (all $P<0.05$) in the MHD patients, as shown in Table 2 and Figure 1.

Association of Self-Management Capacity with Status of Anxiety and Depression in the MHD Patients

The average scores of SAS and SDS in the MHD patients were (48.03±5.02) and (48.12±5.42), respectively. The incidences of anxiety and depression were 35.60% (64) and 38.90% (70) respectively in the subjects, of which, 63 were mild anxiety and 66 were mild depression. The mean score of self-management was (55.51±11.22) in the MHD patients, of which, close to two thirds (65%) and one third of the subjects showed low and medium levels of self-management capacity respectively, only minor (1.1%) showed high capacity (due to the very small quantity, which was combined to medium level group named as high capacity vs low capacity). The scores of self-managements (SMS) were significantly lower in the patients with depression (Figure 2 A) and anxiety (Figure 2 B), while the SMS was positively associated with the scores of SDS (Figure 2 C) and SAS (Figure 2 D).

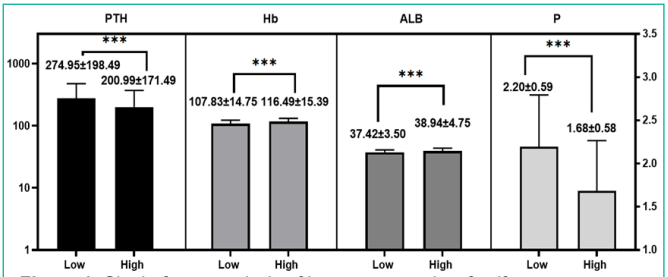

Figure 1: Single-factor analysis of between capacity of self-management and laboratory tests in the MHD patients.
PTH: Parathyroid Hormone; Hb: Hemoglobin; Alb: Albumin; P: Phosphorus. The low and high presented the capacity of self-management at different levels. *** $p < 0.001$.

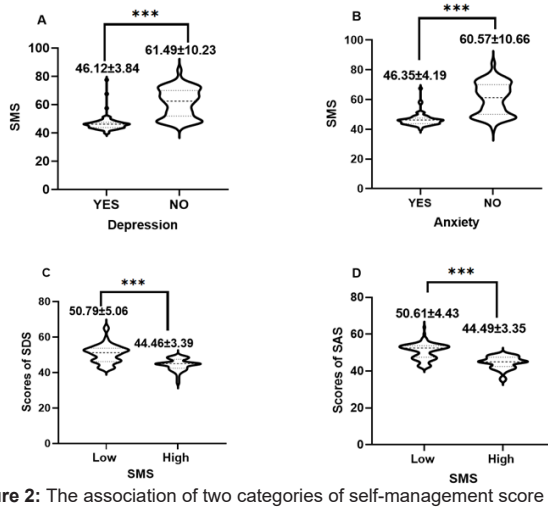

Figure 2: The association of two categories of self-management score at low and high levels and status of anxiety and depression in the MHD patients.
SDS: Self-Rating Depression Scale; Sas: Self-Rating Anxiety Scale; Sms: Self-Management Score. *** $p < 0.001$.

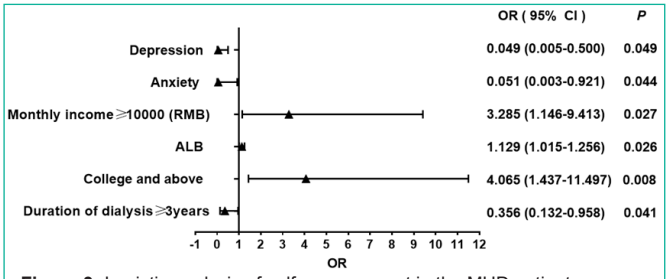

Figure 3: Logistic analysis of self-management in the MHD patients.

Analysis of Multiple Factors Influencing the SMS

The above significantly different parameters were taken as independent variables, and score of self-management was set as dependent variables for stepwise regression analysis. The results showed that dialysis duration, monthly income, ALB, education level, anxiety, and depression were factors that influence the capacity of self-management in the MHD patients (P<0.05) (Table 1). Low income was a risk factor for poor self-management (OR=3.285, 95% CI: 1.146-9.413). The longer dialysis duration, the lower score of self-management. The risk of poor self-management in the patients underwent dialysis for shorter than three years was 0.356 times of those underwent dialysis for longer than three years (OR=0.356, 95% CI: 0.132-0.958). Furthermore, the lower education level, the poorer self-management capacity. The patients who had high school or lower education were 4.065 times risk of poor self-management compared with those had college and above education level (OR=4.065, 95% CI:1.437-11.497). The lower ALB was the risk factor of poor self-management of the patients. The risk of poor self-management was decreased by 12.9% (OR=1.129, 95% CI:1.015-1.256) for each unit increase of ALB. Anxiety and depression were also the risk factors of self-management. The risk of poor self-management among patients without anxiety was 0.051 times that of patients with anxiety (OR= 0.051, 95% CI: 0.003-0.921), while the risk of poor self-management among patients without depression was 0.049 times that of patients with depression (OR=0.049, 95% CI: 0.005-0.500) (Figure 3).

Discussion

Public health emergencies have negative impact of psychology in human beings, especially those with diseases, e.g. ESRD patients underwent dialysis. As a chronic disease, the most common therapy of ESRD is dialysis, while the capacity of self-management of the patients experiencing frequent and long-term dialysis largely affects the treatment effectiveness and the clinical prognosis. COVID-19 has been spread worldwide for almost three years, no matter at its outbreak time or regular prevention and control period, the negative influence on psychology always exists. The present study demonstrated that the MHD patients had low self-management scores (55.51±11.22) at the regular preventive and control period of COVID-19, which even lower than the other study report from China [13], but similar to a recent report from Indonesia regarding MHD patients during COVID-19 epidemic periods.

With the development and improvement of technology and equipment for hemodialysis, the MHD treatment method has greatly increased the survival rate of patients, but it is still difficult to completely replace the patient's renal function and achieve the goal of curing the disease. Therefore, the MHD patients could not rely solely on this treatment. Lai et al [14] pointed out that the compliance of the patients to the clinical measures plays crucial role in the control of chronic kidney disease. Failure to adhere the dietary restrictions (including limiting fluid intake) and medication regimens might increase the risk of complications, longer hospitalizations, and overall health care costs.

As a renal replacement therapy, hemodialysis could effectively extend the life span of the ESRD patients at relatively limited period, but it would bring about high health care expense and high chance of dialysis complications, which gives rise to the psychological stress in the patients [15-17]. It is not uncommon to see the status of depression, anxiety, disappointment, even giving up the treatment in the MHD patients. Compared with the patients having other chronic diseases, MHD patients have higher incidence of negative emotions, especially anxiety and depression [18]. During the pandemic of COVID-19, almost all of the hospitals and clinics are the high risk places. For the purpose of epidemic prevention and control, patient's activity was restricted, even some dialysis center had to been shut down temporally, which largely affected patient routine treatment. During the regular prevention and control period of COVID-19, the patients in China are able to get the dialysis as planned, but most of them need to take public transportation to the hospitals [19]. The high risk to be infected on the way to hospital and the time staying in the hospital made them more anxiety or depression, which might further reduce the capacity of self-management in the MHD patients. The patients with psychological disorders are prone to problems, such as non-compliance with treatment, malnutrition, and disturbances of physiological and immune function, which result insufficient dialysis [20] and high chance to develop complications.

The results of this study showed that educational level was the main influencing factor on the capacity of self-management in the MHD patients. The higher the level of education, the higher the score of self-management. Some studies demonstrated that the patients with high educational level have better cognitive behaviors [21,22]. The patients with higher education level might have higher self-recognition capacity and tend to actively learn disease-related knowledge, and face pressure from disease and life crisis more optimistically. At the same time, they could make full use of social resources to seek help. However, those with low educational level generally have poor cognitive ability and poorer capacity in seeking social resources for help. Therefore, the health care staffs should provide more support and assistant to the patients with low education level.

The MHD patients received AVF (low risk of infection) during the process of dialysis showed less anxiety and depression than those using catheterization (high risk of infection). The changes brought about by catheter dialysis, such as inconvenience, change in appearance, high risk of infection, increased treatment costs and long-term complications were increased the psychological burden of patients. The patients had longer than three years of dialysis showed lower score of self-management than those had shorter period. Previous studies have reported that patients with longer dialysis duration often have more comorbidities [23-25]. It was reported that more dialysis comorbidities may lead to negative emotions and low adherence in MHD Patients, resulting in low self-management ability [26,27].

Moreover, previous studies showed that psychological factors

(anxiety and depression) were also good predictors of self-management capacity. Many studies [28-30] indicated that anxiety and depression were negatively related to the capacity of self-management among MHD patients, which is similar to our study findings. The negative emotion might make the patients feel helplessness, cognitive impairment, and fatigue, which would decrease their treatment compliance [31,32]. Hence, finding out the sighs of anxiety and depression at early stage and taking action could enhance the capacity of self-management in the MDH patients and result in better clinical consequence.

Previous studies [33] have shown that ALB is one of the important indicators of nutrition in hemodialysis patients, and it is also the important manifestations of self-management ability in the MHD patients. ALB is the main component of serum protein and often a reflective parameter of nutritional status of patient [34]. Low level of ALB is a risk factor for mortality in some patients. Malnutrition and inflammatory state will affect immunity system and the quality of life of the patients [35,36]. Therefore, the healthcare givers should pay attention to the nutritional status of patients and carry out clinical nutrition intervention for the needed individuals.

The study has several limitations. (1) The study is cross-sectional design and could not provide cause and effect relationship; (2) The study subjects were not followed up, the capacity of self-management in the patients might change over time, it is not available currently; (3) The sample size was relatively small and the subjects were selected from single dialysis center, which might have sampling bias. Therefore, large sample size and multiple centered subjects are needed for the future study.

Conclusion

The capacity of self-management level is relatively low in the MHD patients and is negatively correlated with anxiety and depression. Other factors impacting on self-management behavior of the MHD patients include education level, monthly income and ALB level. More attention should be paid to the MHD patients who have low education level, low income and malnutrition status to enhance their self-management ability and clinical outcome.

Data Statements

Availability of data and materials. The datasets used or analysed in the current study are available from the corresponding author on reasonable request.

Statement of Ethics

This cross-section study was approved by the Biomedical Ethics Committee of the eighth affiliated hospital of Sun Yat-Sen University (IRB No. 2022-08-03). And the informed consent was obtained for all patients.

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Author Contributions

D.J., L.S., and Y.C. contributed to the design of the questionnaire. SZ.L and ZL.H. contributed to the data collection. Y.C., and L.S. contributed to the data analysis, interpretation, and manuscript preparation of this study. YH.H., and CX. L. contributed to the concept, design, data analysis, interpretation, and manuscript preparation and supervision of this study. All authors have read and approved the final manuscript.

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