ORIGINAL RESEARCH

Enhancing the Quality of Life for Peritoneal Dialysis Patients: A Study of Influencing Factors

Zhihua Bu, MM; Chunmei Li, MM

ABSTRACT

Objective • The objective of this study was to examine the quality of life among peritoneal dialysis (PD) patients and identify the influencing factors.

Methods • The study was conducted between March 2021 and December 2021 at the Peritoneal Dialysis Center of the Second Hospital affiliated with Harbin Medical University. A total of 148 patients with end-stage renal disease (ESRD) undergoing PD were included. Demographic information, assessments of dialysis adequacy, biochemical evaluations, and the administration of the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) were carried out. The study analyzed the factors influencing the quality of life of these dialysis patients using the Spearman correlation coefficient and multiple linear regression.

Results • The KDQOL-36 score for PD patients was 69.78±15.62, with 15.6% experiencing anxiety and 59.7% reporting depression. Age (r = -0.209), residual renal creatinine clearance rate (residual Ccr, r=-0.261), SAS (r=-0.623), and SDS (r = -0.116) scores exhibited significant negative correlations with KDQOL-36 scores ($P < .05$), while serum albumin levels (r = 0.199) showed significant positive correlations with KDQOL-36 scores ($P < .05$). Advanced age, poor nutritional status, low serum albumin levels, reduced residual renal Ccr, and high SAS and SDS scores were identified as significant predictors of lower KDQOL-36 scores ($P < .05$).

Conclusions • The psychological state, age, nutritional status, serum albumin levels, and residual renal function significantly impacted the quality of life of PD patients. (*Altern Ther Health Med.* 2024;30(1):73-77).

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INTRODUCTION

End-stage renal disease (ESRD) is the advanced phase of various chronic kidney diseases, characterized by a range of uremic symptoms, including nausea, vomiting, poor appetite, pruritus (itchy skin), halitosis (foul-smelling mouth), ammonia odor, edema, and a constellation of complications, such as anemia.[1] Globally, the incidence of ESRD currently stands at approximately 1 in 100 000 people. In countries with substantial population sizes, like China, the annual count of new ESRD cases averages over 200 000.[2]

As a terminal manifestation of renal disease, ESRD carries a high mortality burden, with an in-hospital mortality rate ranging from 10% to 20% and a 3-year prognostic mortality rate exceeding 30%, contingent on the underlying primary disease.[3,4] On average, ESRD contributes to over 2.4 million deaths annually, ranking it fifth in mortality among all diseases.[5,6] Therefore, effective ESRD treatment remains a critical research focus. However, despite ongoing efforts, no significant breakthrough has been achieved.

Currently, clinical treatment of ESRD primarily relies on peritoneal dialysis (PD).[7] PD is an established, cost-effective home-care modality of renal replacement therapy (RRT) for patients with ESRD. While prescribed to a relatively small cohort of dialysis patients, PD offers several advantages over hemodialysis, including a more gradual and continuous clearance of solutes and fluids, minimal cardiac stress, better preservation of residual renal function, and comparable survival rates.[8]

As the global prevalence of ESRD necessitating RRT continues to rise, coupled with its substantial economic burden on healthcare systems, the cost-effectiveness of PD is poised to make it a more frequently employed treatment option in the coming years.[9] Recent studies have identified that PD patients often experience more pronounced negative psychological effects due to the harm and pain associated with their condition.[10] For instance, anxiety and depression are prevalent psychological challenges among individuals

with ESRD and significantly impact both the quality of life and adherence of dialysis patients.[9] Research has also highlighted that anxiety and depression independently present a risk to the survival of dialysis patients.[11]

However, most studies focusing on anxiety, depression, and the quality of life among PD patients, especially within the context of Chinese PD patients, have been single-center studies with limited sample sizes. This situation represents a significant limitation in the existing research.[12-14] Considering the growing risks of morbidity and mortality linked to ESRD, this study aims to bridge this gap by conducting a multicenter cross-sectional study. This study examined the quality of life among Chinese PD patients and identified the various influencing factors. The objective was to provide more robust and reliable insights for the future clinical treatment of PD patients, enhancing their overall safety and well-being.

MATERIALS AND METHODS

Research Design

A prospective analysis included 148 patients with ESRD who underwent PD at the Peritoneal Dialysis Center of the Second Hospital affiliated with Harbin Medical University between March 2021 and December 2021. The study adhered to the principles outlined in the Declaration of Helsinki and received approval from the hospital's ethics committee. All participating individuals provided informed consent.

Inclusion and Exclusion Criteria

Inclusion Criteria: (1) Age 18 years or older; (2) Patients diagnosed with ESRD at the Second Hospital affiliated with Harbin Medical University, who successfully completed treatment at the Peritoneal Dialysis Center; (3) Dialysis duration of at least 3 months; (4) Adequate PD and completion of biochemical indicators during dialysis; (5) High treatment compliance, demonstrated by a sense of autonomy and willingness to cooperate in completing the scoring questionnaires.

Exclusion Criteria: (1) Patients with a history of infection, acute cardiovascular events, active hepatitis, tumors, surgery, or trauma within the last month; (2) Patients with autoimmune defects or disorders; (3) 24-hour urine output less than 200 ml/day; (4) Use of oral bicarbonate within 2 weeks before enrollment.

Treatment and Data Collection Procedures

All patients received treatment with lactate-buffered glucose PD solution and a two-bag connection system (Ultrabag; Baxter Healthcare, Guangzhou, China). To ensure the data's completeness and accuracy, data collection was performed by two uniformly trained abdominal dialysis nurses, adhering to standardized test processes and requirements.

Surveyed Indices

Assessment of Routine Parameters. We collected essential patient information, including age, gender, dialysis history, height, and weight. Additionally, biochemical parameters such as albumin (ALB), hemoglobin (Hb), blood creatinine (Cr), and blood urea nitrogen (BUN) were measured. All relevant tests were conducted by the Laboratory Department of our hospital.

Subjective Global Assessment (SGA). Patients underwent an evaluation using SGA in five domains: (1) weight, (2) dietary changes, (3) gastrointestinal symptoms, (4) subcutaneous fat, and (5) degree of muscle wasting. Each component received a score ranging from 1 to 7, and the total SGA score was calculated. Patients were categorized into three groups based on their overall SGA scores: (1) Group A: SGA score 6-7 (indicating good nutrition); (2) Group B: SGA score 3-5 (suggesting mild to moderate malnutrition); (3) Group C: SGA score 1-2 (indicating severe malnutrition).

Anxiety and Depression Assessment. We evaluated patients' anxiety levels using the Self-Rating Anxiety Scale (SAS). Scores less than 50 indicated no anxiety, scores between 50-59 indicated mild anxiety, scores from 60-69 indicated moderate anxiety, and scores of 70 or higher indicated severe anxiety. For depression assessment, we employed the Self-Rating Depression Scale (SDS). Scores less than 0.5 signified no depression, scores ranging from 0.50-0.59 indicated slight to mild depression, scores from 0.6-0.69 indicated moderate to severe depression, and scores of 0.7 or higher signified severe depression.[15]

Quality of Life Assessment. We employed the Kidney Disease Quality of Life-36 instrument (KDQOL-36TM) to evaluate patients' quality of life. This instrument comprises five scales, including two generic Health-Related Quality of Life (HRQOL) scales from the SF-12 version 1 (a total of 12 items) and three kidney-specific scales (a total of 24 items). Each KDQOL-36 Kidney Goal Scale was scored by linearly converting all items into a range of 0-100 and then averaging the items within the scale. Higher KDQOL-36TM scores indicated a better quality of life.[16]

Nutritional Assessment. We conducted a comprehensive nutritional evaluation of patients, considering five factors: previous weight and dietary changes, gastrointestinal symptoms, and the extent of subcutaneous fat and muscle wasting. This assessment followed Young's method[17] and categorized patients as either well-nourished, mildly to moderately malnourished, or severely malnourished.

Statistical Methods

The data analysis was performed using SPSS 23.0 software (IBM, Armonk, NY, USA). Continuous variables with normal distributions are presented as mean ± standard deviation ($\bar{x} \pm s$), while continuous variables with non-normal distributions are described using the median and range of values (25th and 75th percentiles). Categorical variables are expressed as percentages or rates. To examine the correlation of each index with the KDQOL-36TM score, we conducted a Spearman correlation analysis. The impact of each variable on KDQOL-36 scores was assessed through multiple linear regression analysis. Statistically significant differences were defined at $P < .05$.

Table 1. Basic Clinical Data of Patients

Items	Results
Gender (male/female)	78/70
Age (year)	57.49±13.90
Dialysis age (month)	27 (13-49)
Serum albumin (g/L)	36.81±4.46
Hemoglobin (g/L)	110.72±16.08
Residual Kidney Ccr (L/week/1.73m²)	13.87 (0-33.94)
Serum Creatinine (umol/L)	864.68±308.09
Serum Urea Nitrogen (mmol/L)	20.46±5.76
SAS Score	41.25±9.36
SDS Score	0.52±0.08
KDQOL-36 Score	69.78±15.62

Note: Data presented as mean ± standard deviation unless otherwise specified.

Abbreviations: SAS score, Mean Self-Rating Anxiety Scale score; SDS score, Self-Rating Depression Scale score; KDQOL-36 score, Kidney Disease Quality of Life-36 score; Ccr, creatinine clearance rate.

Table 2. Anxiety and Depression Assessment

Grade	Anxiety	Depression
None	125 (84.5)	61 (42.2)
Mild	17 (11.5)	61 (42.2)
Moderate	4 (2.7)	23 (15.5)
Severe	2 (1.4)	3 (2.0)

Note: Anxiety and depression levels were assessed using the Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS), respectively. The percentages represent the proportion of patients in each anxiety or depression category. None: Number (Percentage) of patients with no anxiety or depression; Mild: Number (Percentage) of patients with mild anxiety or depression; Moderate: Number (Percentage) of patients with moderate anxiety or depression; Severe: Number (Percentage) of patients with severe anxiety or depression.

RESULTS

Patient Demographics and Clinical Characteristics

The clinical data of 148 patients, comprising 78 males and 70 females, were subjected to statistical analysis. The mean age was 57.49±13.90 years, and the median duration of dialysis was 27 months (ranging from 13 to 49 months). The average SAS score was 41.25±9.36, the SDS score was 0.52±0.08, and the KDQOL-36 score was 69.78±15.62, refer to Table 1.

Anxiety and Depression Assessment Results

Anxiety levels among patients were assessed in accordance with SAS scoring criteria, revealing that 84.5% of patients had no anxiety, 11.5% exhibited mild anxiety, 2.7% showed moderate anxiety, and 1.4% experienced severe anxiety. Depression levels were rated using SDS scoring criteria, indicating that 42.2% were not depressed, 42.2% had slight to mild depression, 15.5% exhibited moderate to severe depression, and 2.0% suffered from major depression ($P < .05$), as presented in Table 2.

Correlation between Clinical Data and Quality of Life

Spearman's correlation coefficient analysis revealed significant negative correlations between age, residual renal creatinine clearance rate (residual renal Ccr), and KDQOL-36 scores (r = -0.209, -0.261, $P < .05$), as represented in Figure 1A and 1B. Conversely, serum albumin levels exhibited a notable positive correlation with KDQOL-36 scores (r = 0.199, $P < .05$), as illustrated in Figure 1C.

Figure 1. Correlation between Clinical Data and Quality of Life. (A) Shows the linear relationship between age and Kidney Disease Quality of Life-36 (KDQOL-36) scores. (B) Depicts the linear relationship between residual renal creatinine clearance rate (Ccr) and KDQOL-36 scores. (C) Illustrates the linear relationship between serum albumin levels and KDQOL-36 scores. These correlations highlight the influence of these clinical factors on the quality of life of the study participants.

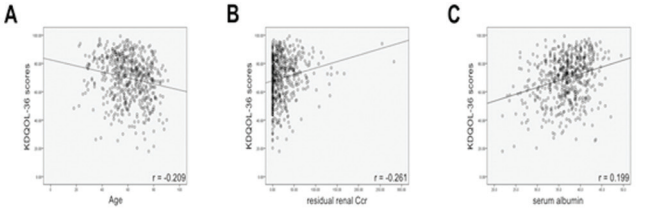

Figure 2. Correlation of Quality of Life with Anxiety and Depression. (A) Demonstrates the linear relationship between Self-Rating Anxiety Scale (SAS) scores and Kidney Disease Quality of Life-36 (KDQOL-36) scores. (B) Shows the linear relationship between Self-Rating Depression Scale (SDS) scores and KDQOL-36 scores. These correlations help illustrate the impact of anxiety and depression on the quality of life of the study participants.

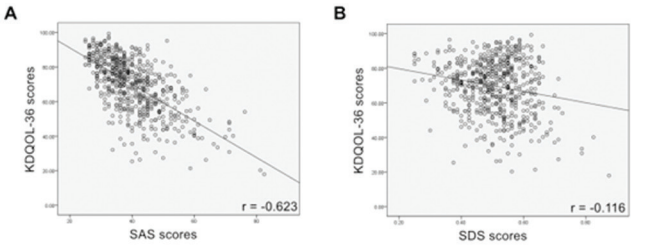

Table 3. Multiple Linear Regression Analysis of Clinical Data, Anxiety, Depression, and Quality of Life Scores

	KDQOL-36 Scores		
Variables	β	95%CI	*P* value
Age	-0.213	-0.303~ -0.124	<.001
Hemoglobin	0.062	-0.016~0.14	.122
SGA	-5.659	-9.203~ -2.115	.002
Serum Albumin	0.964	0.691~1.238	<.001
Serum Urea Nitrogen	0.219	0.000~0.438	.05
Residual Kidney Ccr	0.091	0.049~0.132	<.001
SAS Scores	-1.057	-1.16~ -0.953	<.001
SDS Scores	-32.709	-45.858~ -19.559	<.001

Note: Multiple linear regression analysis was performed to assess the impact of various factors on KDQOL-36 scores. Age, SGA (Subjective Global Assessment), Serum Albumin, Residual Kidney Ccr (Creatinine Clearance Rate), SAS (Self-Rating Anxiety Scale) scores, and SDS (Self-Rating Depression Scale) scores were included as independent variables in the analysis. The beta coefficient (β) represents the change in KDQOL-36 scores associated with a one-unit change in each independent variable, and the 95% confidence interval (CI) provides a range of likely values for β. The *P* value indicates the statistical significance of each variable's influence on KDQOL-36 scores.

Correlation between Anxiety, Depression, and Quality of Life

Spearman correlation coefficients were calculated to gather a deeper insight into the relationships between anxiety, depression, and quality of life. The analysis revealed that patients' SAS and SDS scores displayed negative correlations with KDQOL-36 scores (r = -0.623, -0.116, $P < .05$), as represented in Figure 2A and 2B.

Multiple Linear Regression Analysis of Clinical Data, Anxiety, Depression, and Quality of Life Scores

In the multiple linear regression analysis, it was evident that age, SGA, serum albumin, residual kidney Ccr, SAS, and SDS scores all emerged as significant predictors of KDQOL-36 scores ($P < .05$), as outlined in Table 3.

DISCUSSION

The KDQOL-36 questionnaire is a well-established and effective health-related quality-of-life assessment tool, encompassing both general and kidney-specific components. It is widely utilized in evaluating the quality of life among dialysis patients.[18] Our study observed that the mean KDQOL-36 score among PD patients was 69.78±15.62. Furthermore, we found that 15.6% of patients experienced anxiety, and 59.7% exhibited varying degrees of depression.

Notably, age (r = -0.209), residual renal creatinine clearance rate (residual Ccr, r = -0.261), SAS (r = -0.623), and SDS (r = -0.116) scores demonstrated significant negative correlations with KDQOL-36 scores ($P < .05$). Conversely, serum albumin levels (r = 0.199) exhibited a notable positive correlation with KDQOL-36 scores ($P < .05$). These findings collectively suggest the significance of age, SGA level, serum albumin level, residual kidney Ccr, SAS, and SDS scores as substantial predictors of the quality of life, as established through multiple linear regression analysis ($P < .05$).

Previous research has identified several factors that negatively impact the quality of life in dialysis patients, including anemia, malnutrition, reduced residual kidney function, and psychological factors.[19,20] Among these, depression has been consistently reported as a significant contributor to reduced quality of life in dialysis patients.[21,22] Therefore, our study found that 59.7% of patients exhibited varying degrees of depression, a prevalence significantly higher than that reported in other studies.[23,24]

The studied literature indicates a notably high prevalence of depression among Chinese PD patients, and it is worth noting that depression has been established as an independent risk factor for survival in dialysis patients.[12] Furthermore, our study observed a prevalence rate of 15.6% for both anxiety and depression. Our findings align with previous research, which has consistently shown that psychological symptoms, particularly depression, can significantly influence the overall quality of life in PD patients.[25]

The results also indicated that anxiety and depression significantly predicted a lower quality of life among patients. As a result, in our routine clinical practice, it is crucial to emphasize the psychological assessment of PD patients and provide appropriate interventions to enhance psychological care. This strategy can contribute to the enhancement of their quality of life, prognosis, and survival rates. However, the specific impact of depression interventions on patients' quality of life and survival warrants further clarification through subsequent cohort or case-control studies.

Albumin and total iron-binding capacity (TIBC) stand as dependable objective indicators for evaluating the nutritional status of dialysis patients. Consequently, some studies have proposed incorporating these variables into SGA as an enhancement to assess the nutritional status more effectively in individuals with ESRD.[26] Additionally, our study revealed that both patients' SGA levels and serum albumin levels emerged as significant predictors of quality of life in PD patients, a finding consistent with previous research.[27-29]

These results highlight the relationship between the quality of life in PD patients and their nutritional status. The evaluation of patients using SGA encompassed five domains: weight and dietary changes, gastrointestinal symptoms, subcutaneous fat, and the extent of muscle wasting. These symptoms serve as objective indicators that patients can readily perceive, while the KDQOL-36 scale relies on subjective self-assessment. Therefore, SGA levels emerged as predictors of patients' quality-of-life scores.

However, it is noteworthy that hemoglobin, a key nutritional indicator, exhibited no significant correlation with KDQOL-36 scores and did not predict these scores. This observation aligns with findings from prior studies [30, 31]. The use of erythropoietin for managing anemia in ESRD patients has become a common and established practice. As a result, the prevalence of anemia among the patients in this study was relatively low, with a mean hemoglobin level of 110.72 g/L, which indicates that the treatment objective was achieved. Therefore, the impact of anemia on the quality of life of these patients was not evident in our study.

Our study also identified a significant positive correlation between residual kidney creatinine clearance rate and the quality of life in PD patients, with Ccr serving as a notable predictor of KDQOL-36 scores. This observation aligns with findings from previous studies.[32,33] This association may be attributed to the manifold benefits of preserved kidney function in sustaining adequate nutrition among dialysis patients,[34] ensuring appropriate volume regulation,[35] and playing a vital role in phosphorus excretion, thus contributing to the maintenance of calcium and phosphorus metabolism in PD patients.[36]

Studies have also demonstrated that residual renal function exerts a more significant influence on the quality of life and prognosis of PD patients when compared to peritoneal clearance.[37] Therefore, drawing upon insights from previous research and the outcomes of our study, we can infer that protecting the residual renal function of patients can effectively enhance their quality of life and contribute to an improved prognosis.

Study Limitations

We acknowledge a few limitations in this study. Firstly, it is essential to recognize that this research employed a cross-sectional design, which inherently restricts our ability to establish causal relationships between variables. While we have identified associations between factors like anxiety, depression, nutritional status, and quality of life in peritoneal dialysis patients, the direction of causality remains unclear. Secondly, the use of subjective self-rating scales, such as the

SAS, SDS, and KDQOL-36, introduces potential bias, as these scores may be influenced by various external factors beyond those examined in the study, such as social support and economic factors.

Our study was conducted within a specific population of Chinese peritoneal dialysis patients, which may limit the generalizability of our findings to broader populations. To address these limitations and gain a more comprehensive understanding of the relationships observed, future research should consider longitudinal designs and incorporate a wider range of potential confounding variables.

CONCLUSION

In conclusion, this study sheds light on various factors influencing the quality of life among peritoneal dialysis patients. The research reveals the pivotal roles played by psychological well-being, patient age, nutritional status, serum albumin levels, and residual renal function in shaping the overall quality of life in this patient population. Notably, the high prevalence of depression underscores the importance of addressing mental health in PD care. These findings collectively emphasize the need for holistic and targeted interventions to enhance the well-being of PD patients. Moreover, further research and clinical efforts should be directed toward improving these aspects to ultimately enhance the quality of life and long-term outcomes of individuals undergoing peritoneal dialysis.

CONFLICT OF INTEREST

The authors declared no conflict of interest.

CONSENT FOR PUBLICATION

All authors consent for publication.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this article can be obtained from the corresponding author upon request.

FUNDING STATEMENT

The study did not receive any funding support.

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