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Relationship Between Frailty and Quality of Life and Pain Levels in Older Patients Undergoing Hemodialysis

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Abstract

Objective: Frailty is associated with poorer outcomes in dialysis patients, including higher mortality. The purpose of this study was to investigate the connection between pain levels, frailty, and quality of life in older hemodialysis (HD) patients with chronic kidney disease (CKD).

Materials and Methods: This cross-sectional study included 103 patients with CKD undergoing HD. Assessment tools included the Edmonton Frail Scale (EFS), the World Health Organization Quality of Life (WHOQOL-BREF) assessment, and the Geriatric Pain Measure (GPM). Patients who scored <24 on the Standardized Mini-Mental test and >7 on the Hamilton Depression Rating Scale were excluded.

Results: The patients' mean age was 68.9±2.4 years, with a male-to-female ratio of 54:49. Significant correlations were found between GPM and WHOQOL-BREF (p=0.01, r=-0.659), GPM and EFS (p=0.02, r=0.622), and EFS and WHOQOL-BREF (p=0.01, r=-0.475). In a generalized linear regression model adjusted for age, comorbid conditions, unemployment, body mass index and education level, GPM was associated with higher EFS scores (β=1.69±0.31, p<0.001) and lower WHOQOL-BREF scores (β=-0.456±0.059, p<0.001).

Conclusion: In older patients receiving HD, pain appears to contribute to worsening frailty and reduced quality of life. Effective pain management should be considered to mitigate frailty in this population.

Keywords: Frailty, hemodialysis, older adults, pain, quality of life

Introduction

An estimated glomerular filtration rate (eGFR), of less than 60 mL/minimum and ongoing kidney dysfunction for at least three months are hallmarks of chronic kidney disease (CKD).

It is more common in older adults and affects between 10% and 14% of the general population (1). Renal replacement therapies including hemodialysis (HD), peritoneal dialysis, and kidney transplantation, are essential for managing CKD. Among these, HD is the most widely used, particularly in emergency settings (2).

Older adults undergoing HD often face significant physical and psychosocial challenges due to age-related physiological decline and multiple comorbidities. According to the World Health Organization (WHO), a person's quality of life is determined by how they view their place in life in relation to their culture, values, and goals (3). The health-related quality of life of HD patients is substantially lower than that of the general population because continuous dialysis therapy exacerbates social barriers, emotional distress, and physical limitations (4,5). Given the increasing number of older adult individuals receiving HD, optimizing their quality of life has become a key clinical priority (6).

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Pain is a common issue among HD patients, particularly in older adults, and is associated with lower adherence to dialysis, poor sleep quality, and psychological distress, including depression and anxiety (7,8). The interaction between pain and mental health is complex, as mood disorders can lower the pain threshold, further worsening the patient's overall well-being. In addition, frailty-a syndrome commonly observed in geriatric patients-is an emerging concern in nephrology. Frailty is characterized by decreased physiological reserves, reduced strength and endurance, and heightened susceptibility to disease-related complications (9,10). It is linked to worse clinical outcomes, including higher mortality, and is much more common in CKD patients receiving HD (11). Multiple factors contribute to frailty, including chronic illness, environmental influences, and genetic predisposition (12).

Given the impact of frailty and pain on health outcomes, it is essential to explore their relationship in older adult HD patients. This study tested the hypothesis that pain contributes to increased frailty and reduced quality of life in this population. The aim was to assess the associations between frailty, pain levels, and quality of life in older adults undergoing HD, with the goal of identifying potential intervention targets to improve patient well-being.

Materials and Methods

Procedure and Participants

The required sample size was determined to be 103, using the G*Power program (α =0.05, test power (1-β) =0.95), as informed by the study by Santoro et al. (8).

To collect data, patients receiving dialysis for at least three months were interviewed individually in face-to-face sessions. This cross-sectional study included 103 patients with CKD treated at Ersin Arslan Research and Training Hospital Training and Research Hospital and Gaziantep University Şahinbey Research and Application Hospital Dialysis Unit between June 27, 2022, and August 31, 2022. Participants aged 65 years or older, who had been receiving dialysis for at least three months, were cognitively oriented, and had not undergone kidney transplantation were included in the study. Individuals who scored below 24 on the Standardized Mini-Mental State Examination (MMSE), scored above 7 on the Hamilton Depression Rating Scale (HDRS), or refused to participate after receiving information about the study were excluded.

All assessments, including MMSE, Edmonton Frail Scale (EFS), WHO Quality of Life (WHOQOL-BREF) and Geriatric Pain Measure (GPM), were conducted in a standardized environment. Tests were administered before dialysis sessions to minimize the impact of treatment-related fatigue and physiological fluctuations.

Assessment Tools

Standardized Mini-Mental State Examination

The MMSE, first described by Folstein in 1975 and standardized by Molloy et al. (14) is used for the quantitative evaluation of cognitive impairment in older adults (13,14). Higher scores on this 11-question test, which has a total score range of 0 to 30, indicate stronger cognitive performance. The MMSE assesses orientation, short-term and immediate memory, computation, recall, and language. For both educated and unskilled Turkish populations, the questionnaire's validity and reliability have been verified (15).

Edmonton Frail Scale

The EFS was developed by Rolfson et al. (16). It evaluates 11 frailty parameters, including cognitive status, general health status, functional performance, functional independence, social support, medication use, nutrition, mood, and continence. The EFS incorporates performance-based items to assess cognitive and functional performance. Cognitive status is evaluated by the Clock test, whereas functional performance is evaluated by the Get-Up-and-Go test.

The EFS scoring system classifies individuals as not frail with scores between 0 and 4 points, apparently vulnerable with scores between 5 and 6 points, slightly frail with scores between 7 and 8 points, moderately frail with scores between 9 and 10 points, and severely frail with scores of 11 or more points. In Türkiye, an investigation into the EFS's validity and reliability was carried out (17).

World Health Organization Quality of Life Assessment

Better quality of life is indicated by higher scores on this scale, which is used to evaluate overall well-being and quality of life. In this study, a short-form version consisting of 26 questions, derived from the long-form version, was used. The short-form scale is divided into four domains, each scored between 20 and 100 points. The Turkish adaptation of the scale was performed by Eser et al. (18).

Geriatric Pain Measure

The GPM, a 24-item multidimensional scale, was developed by Ferrell et al. (19). It evaluates five dimensions: withdrawal due to pain, pain intensity, pain with movement, pain with strenuous activities, and pain with other activities. Among the 24 items, 22 are answered with "yes" or "no," while the remaining two are scored on a scale from 0 to 10. The total score is obtained by summing the "yes" responses, with a final score ranging from 0 to 42. Every item's score is converted to a 0-100 scale by multiplying it by 2.38. Pain severity is categorized as follows: mild pain for scores between 0 and 30, moderate pain for scores between 30 and 69, and severe pain for scores of 70 or higher.

Dursun et al. (20) conducted the validity and reliability analysis of the scale in Türkiye.

Statistics

The Shapiro-Wilk test was used to assess whether numerical variables followed a normal distribution. The Pearson correlation coefficient was applied to evaluate relationships between WHOQOL-BREF, GPM, and EFS. Categorical variables were analyzed using the chi-square test.

A generalized linear regression model was used to examine the associations among GPM, WHOQOL-BREF, and EFS. The normality of the dependent variable was tested using the Shapiro-Wilk test. Before conducting multivariate regression, univariate analyses were performed, and variables with $p<0.10$ were considered for inclusion in the model.

The variance inflation factor (VIF) was used to measure multicollinearity, and variables with a VIF greater than 10 were removed from the model. Comorbid conditions, unemployment, body mass index (BMI), and education level were included as covariates in all models. Statistical significance was set at $p<0.05$. All analyses were conducted using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY, USA).

Results

This study included 103 patients with a mean age of 68.9±2.4 years. The male-to-female ratio was 54:49, and the median duration since the onset of HD was 42 months. The sociodemographic and clinical data of the patient and control groups are summarized in Table 1. Significant correlations were observed between GPM and WHOQOL-BREF (p=0.01, r=-0.659), GPM and EFS (p=0.02, r=0.622), and EFS and WHOQOL-BREF (p=0.01, r=-0.475). Table 2 displays the findings of the correlation analysis.

Patients were classified based on frailty levels as follows: not frail (5 patients), apparently vulnerable (11 patients), slightly frail (13 patients), moderately frail (20 patients), and severely frail (54 patients).

In a generalized linear regression model, adjusted for age, comorbid conditions, unemployment, BMI, and education level, GPM was associated with higher EFS scores (β=1.69±0.31, $p<0.001$) and lower WHOQOL-BREF scores (β=-0.456±0.059, $p<0.001$).

No significant correlation was found between EFS/WHOQOL-BREF and duration since CKD diagnosis, duration since HD initiation, or age. However, BMI was significantly correlated with EFS (r=0.214) and WHOQOL-BREF (r=-0.475).

Discussion

The association between frailty, quality of life, and pain levels in CKD patients undergoing HD was examined in this study. A moderate correlation was found between pain and frailty, as well as between pain and quality of life. The increase in pain scores explained 38.7% and 42.4% of the variation in frailty and quality of life, respectively.

Frailty is associated with poorer outcomes in dialysis patients, including higher mortality, falls, hospitalizations, a lower rate of transplantation, cognitive deficits, and vascular access failure (21,22). Identifying frailty early and taking necessary precautions can improve the quality of life. We could not find a longitudinal study identifying factors that predict frailty among patients with CKD. However, one potential factor predictive of frailty is in older adults and patients undergoing HD (23,24). Therefore, we excluded patients who scored <24 on the standardized MMSE to

Table 1. Descriptive features of the patients		**Means ± SD, median (25/75 quartiles)**
Age		**68.9±2.4**
Duration since the onset of diagnosis (CKD) (months)		61.4±5.8
Duration since the onset of hemodialysis (months)		42 (24/69)
BMI		27.3±4.2
Sex	Female	49 (47.6%)
	Male	54 (52.4%)
Marital status	Single	5 (4.9%)
	Maried	98 (95.1%)
Level of education	Not literate	23 (22.3 %)
	Literate	13 (12.6 %)
	Primary school	50 (48.5 %)
	High school	11 (10.7 %)
	University	6 (5.8 %)
The caregiver	Wife or husband	67 (65 %)
	Daughter or son	20 (19.4 %)
	Other	16 (15.5 %)
Comorbidity	Diabetes mellitus	25 (24.3 %)
	Hypertantion	17 (16.5 %)
	COPD	1 (1 %)
Smoking status	Yes	13 (12.6 %)
	No	90 (87.4 %)

CKD: Chronic kidney disease, BMI: Body mass index, COPD: Chronic obstructive pulmonary disease, SD: Standard deviation

Table 2. Correlations between assessment tools			
	EFS	**WHOQOL-BREF**	**GPM**
EFS		-0.475**	0.622**
WHOQOL-BREF	*		-0.659**

**p<0.01
EFS: Edmonton Frail Scale, WHOQOL-BREF: World Health Organization Quality of Life, GPM: Geriatric pain measure

eliminate this confounding factor. A cross-sectional study also reported that frailty increases as eGFR decreases before dialysis initiation (25). Lee et al. (26) found that nutritional markers, such as blood urea nitrogen, serum creatinine, and total iron-binding capacity, were negatively associated with frailty status. Other predictors of frailty include age, comorbid conditions, disability, unemployment, higher BMI, and lower education level. In this study, BMI positively correlated with pain but not with age, as all patients were >65 years old. Meanwhile, some studies have found that delayed initiation of dialysis is significantly associated with a lower quality of life (27,28). However, no significant association was found between quality of life and time elapsed since HD initiation. A possible reason for this is that our study population consists of older people who have already been on dialysis for an extended period. After adjusting for age, comorbid conditions, unemployment, BMI, and education level, frailty continued to be associated with higher pain scores. Therefore, pain management in patients undergoing HD should be emphasized further. Pain is the most common symptom that impairs activities of daily living in later life (29) and affects the frailty status of patients receiving dialysis.

We found that pain is not only related to frailty but also has a significant relationship with quality of life in these older patients. Similarly, Samoudi et al. (27) showed that pain has a significant negative effect on the quality of life in patients with end-stage renal disease undergoing HD who had a mean age of 54 years ($r=-0.590$, $p<0.001$) (27). Dantas et al. (30) reported that the prevalence of pain, which significantly interferes with general activities such as sleep and walking, is higher in the HD group than in the control group.

Frailty is associated with a lower quality of life (31). Similar to previous studies, a significantly positive correlation was found between frailty and quality of life in the present study. This is an expected result, as physical inactivity, diminished strength, and impaired biological functions affect both factors.

Study Limitations

The sample size and cross-sectional design are limitations of this study. Depression and anxiety are also common in patients undergoing HD (32). Therefore, not excluding depressive disorders with a structured interview is another limitation. However, patients who had an HDRS score of <7 were excluded. Additionally, the scale used to assess quality of life is a limitation, applying a scale specifically for older individuals and the HD population would have strengthened the results. Another limitation is the exclusion of patients with cognitive impairment, which may have introduced bias by limiting the sample to only fit or mildly frail individuals, as cognitive decline is commonly associated with frailty in HD patients.

Conclusion

In older patients receiving HD, the effect of pain goes beyond simple discomfort, often contributing to a worsening quality of life and eventual frailty. The findings support an association between pain and frailty/quality of life, independent of confounders. Further prospective studies are needed to elucidate the mechanisms underlying the relationship among pain, frailty, and quality of life. Effective management and treatment strategies must be developed immediately.

Ethics

Ethics Committee Approval: The study was approved by the ethics committee of the Gaziantep University Ethics Committee Presidency (decision number: 2021/272, date: 15.09.2021).

Informed Consent: Informed consent was obtained from all participants.

Footnotes

Authorship Contributions

Surgical and Medical Practices: A.Z.Ş., N.Ö., Ş.K.Ş., Concept: A.Z.Ş., N.Ö., Ş.K.Ş., Design: A.Z.Ş., N.Ö., Data Collection or Processing: N.Ö., Ç.Ö., Analysis or Interpretation: A.Z.Ş., Ş.K.Ş., Literature Search: A.Z.Ş., N.Ö., Ş.K.Ş., Writing: A.Z.Ş., N.Ö., Ş.K.Ş.

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