Nature and Science of Sleep

Elevate Series

Open Access Full Text Article

ORIGINAL RESEARCH

Fatigue and Pruritus Impact Sleep Quality in Hemodialysis Patients

Hayfa Almutary

Medical/Surgical Nursing Department, Faculty of Nursing, King Abdulaziz University, Jeddah, Saudi Arabia

Correspondence: Hayfa Almutary, Email aalalmetere2@kau.edu.sa

Purpose: This study assesses sleep quality amongst hemodialysis (HD) patients and identifies contributing factors, which include demographic and clinical factors and significant symptoms associated with HD (ie, fatigue and pruritus).

Patients and Methods: In this cross-sectional design, 116 participants were recruited from HD units of two hospitals in Saudi Arabia. Three measures were used to identify predictors of sleep quality among HD patients, including the Pittsburgh Sleep Quality Index (PSQI), the Fatigue Severity Scale (FSS), and the 5-D itch scale. Demographic and clinical profiles were also obtained. Univariate and multiple regression analyses were used to determine significant factors associated with sleep quality during HD.

Results: The mean global PSQI score was 6.77±3.23, with 56.9% of participants scoring 5 or more, indicating poor sleep. Sleep latency achieved the highest mean PSQI score (1.70 ±0.94), and 'use of sleep medication components' the lowest (0.36 ±0.83). Increased age, lower educational status, higher fatigue, and pruritus were associated with poorer sleep. Controlling for status and age suggested that fatigue and pruritus independently influenced HD patients' sleep quality (F (4, 111) = 10.89, P = <0.001). There were positive relationships between increased levels of fatigue and pruritus and poor quality of sleep.

Conclusion: This is the first study to examine fatigue, pruritus, and sleep quality in HD patients. Findings will assist dialysis clinicians to develop appropriate management strategies to mitigate factors causing poor sleep for such patients. Intervention programs targeting self-management of fatigue and pruritus symptoms could potentially improve patients' sleep quality.

Keywords: end stage kidney disease, fatigue, hemodialysis, HD, predictors, pruritus, sleep quality

Introduction

End-stage kidney disease (ESKD) is a fast-growing worldwide health issue affecting more than 2.5 million people and placing significant strain on healthcare systems.[1] Hemodialysis (HD), the essential treatment for those patients,[2] can cause many physiological and psychological pressures, some of which significantly affect the quality of sleep. Sleep quality refers to a person's satisfaction with their sleep experience,[3,4] including how easily they fall asleep and whether they stay asleep for long enough to feel refreshed when they wake.[3,4]

Sleep quality, as a clinical measure, has grown in importance due to the rise in sleep disorders and other dialysis symptoms that impact daily functioning and quality of life. Patients undergoing maintenance HD report significantly more sleep disorders, including restless legs syndrome, sleep apnea, sleep-disordered breathing, and resulting excessive daytime sleepiness, compared with the general population or those who depend on other kidney replacement therapies.

Sleep disturbances were reported in 41.4% of HD patients in a recent study,[5] with another recording excessive daytime sleepiness in 27% to 74% of those surveyed.[6] Systematic review and meta-analysis studies have shown that 27.2% of HD patients suffer from restless legs syndrome,[7] and 49% of patients with ESKD have sleep apnea syndrome.[8] Moreover, prevalence of sleep-disordered breathing ranged from 70% to 82% of HD patients.[9–11] All these disorders negatively impact sleep quality.

Sleep is vital to the preservation of one's health and overall well-being.[12,13] Poor sleep quality negatively impacts quality of life,[13] and increases the likelihood of morbidity[12–14] and of death.[15–17] A recent study proposed that prompt identification of poor quality sleep patterns in ESKD patients, and diagnosis of sleep disturbance syndromes and associated risk factors, could potentially enhance survival rates in this population.[18]

Received: 19 September 2024
Accepted: 17 December 2024
Published: 31 December 2024

The poor-quality sleep patterns observed in HD patients are generally caused by some combination of physiological, psychosocial and environmental and lifestyle factors,[13] although there is no consensus on actual predictors, suggesting the need for more research. For example, studies have reported correlations between poor sleep and increased age,[12,19,20] male gender,[12] female gender,[21] unemployment,[20] retirement,[12] marital status,[12] duration of dialysis,[19] and higher number of comorbid conditions.[12] Other studies have reported no such correlations.[21,22]

Fatigue and pruritus are among the most common and debilitating symptoms reported by HD patients. Fatigue and pruritus can both independently and interactively influence sleep. Studies have investigated relationships between poor sleep, fatigue[23,24] and pruritus, common HD symptoms,[25–27] and have found positive correlations. However, in each case, they were studied separately, without controlling for their power to predict sleep quality. This gap in research makes it crucial to explore their interaction, as it could reveal important clinical implications for improving patient care. Therefore, it is necessary to evaluate the primary potential factors that influence sleep quality and identify the most robust predictors among them. This would assist in focusing efforts on managing the primary causes of poor sleep in HD patients. A better understanding of how fatigue and pruritus are linked to sleep disturbances could inform broader strategies to improve the quality of life and the clinical management of HD patients.

Additional studies are needed to better understand relationships between HD and sleep quality in Saudi Arabia. Such research will help healthcare professionals, especially nurses, to identify those at risk and to plan appropriate management to improve sleep quality, which will improve patients' outcomes.

The aim of this study was to examine which demographic and clinical factors, and significant symptoms related to HD (ie fatigue and pruritus), could predict sleep quality in HD patients. The study will contribute to the body of knowledge regarding sleep quality among HD patients and enable comparison of findings across different cultures.

Material and Methods

This study used a cross-sectional design. Data were collected between January and June 2023 from dialysis centers at two public hospitals in the Western Region of Saudi Arabia. Both are governmental hospitals that offer similar medical services. Each hospital provides free medical care to over 70 hemodialysis patients and has three shifts of hemodialysis sessions during the day.

Adult HD patients aged 18 or older were invited to participate if they had ESKD for at least six months and were able to communicate in Arabic or English. Pre-dialysis patients and those with cognitive impairment were excluded, as were those undergoing peritoneal dialysis. Sample size estimation was informed by the Raosoft formula. Considering the total number of patients in both hospitals was 164. Using a margin of error of 5% and a confidence level of 95%, the power sample size was at least 116 participants. This sample size was found to be sufficient to identify associations and perform regression analyses, which is the aim of this study. Generally, conducting regression analysis requires a sample size of at least 50 participants.[28]

Measures

Demographic and clinical data collected included age, gender, marital status, occupation, educational level, dialysis vintage, primary cause of ESKD, and number of comorbid conditions. The Davies comorbidity index was used to measure the number of comorbid conditions.[29] Three groups classified the index, which ranged from 0 to 7.[29]

Sleep quality in people with HD was assessed using the Pittsburgh Sleep Quality Index (PSQI),[30,31] consisting of 19 self-rated questions. Responses were combined to form seven component scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medications, and daytime dysfunction, each rated on a 0 to 3 scale, with higher scores implying greater difficulties. PSQI < 5 indicates good sleep quality; PSQI ≥ 5 poor sleep quality. This study utilized the Arabic version of the PSQI.[32] The convergent validity and internal consistency for reliability of the Arabic PSQI were demonstrated previously among Arabic bilinguals who are in good health. Further, the Arabic version of the PSQI was validated among hemodialysis patients.[31]

HD patients' fatigue severity was assessed using the Arabic version of the Fatigue Severity Scale (FSS).[33,34] The FSS comprises 9 items, each evaluating different aspects of fatigue over the past week, using a scale from 1 to 7.[33] A score of 1 indicates strong disagreement, while a score of 7 indicates strong agreement. Item scores were averaged to give an overall FSS score, with high scores indicating more fatigue. The psychometric properties of the Arabic version of FSS

were established previously with a reported Cronbach's alpha of 0.84.[34] The Arabic version of the FSS was used to assess fatigue levels in different chronic conditions, including hemodialysis patients.[35–37]

The Arabic version of 5-D itch scale was utilized to assess patient pruritus caused by HD.[38,39] The scale captures five dimensions of itching experienced in the two weeks prior to the survey, including duration, degree, direction, disability and distribution, all on a scale of 1 to 5. The meaning of scores 1 and 5 varies according to the dimension. For example, a score of 1 in the duration dimension indicates the presence of itching less than 6 hours per day, while the degree dimension indicates that the intensity of itching is not present. Each dimension is ranged between 1 and 5. The higher score mean sever pruritus. The total score of 5-D itching scale ratings range from 5 (no pruritus) to 25 (most severe pruritus). In 2017, Lai et al equated the 5-D itch scale categories with the numeric rating scale (NRS), finding that scores of less than 9 indicate no pruritus, 9–11 indicate mild, 12–17 indicate moderate, and 18–21 indicate severe pruritus.[40] The validity and reliability of the Arabic version of 5-D itching have been demonstrated previously among patients with ESKD.[39] The Cronbach's alpha in the Arabic version of the scale was 0.85, which indicates good internal consistency.

Data Collection Procedure

Data were collected using a self-reported questionnaire. Participants were approached in the dialysis unit during their HD session. They were provided with verbal and written information about the study as well as a participant information sheet and asked to fill out the questionnaire, which was returned to the researcher at the end of the dialysis session.

Ethical Considerations

Ethical approvals were obtained from Jeddah Health Research Ethics Committee (IRB no. H-02-J-002) and Research Ethics Committee of the King Abdulaziz University Hospital (IRB no HA-02-J-008). The participants were given the right to withdraw from the study at any time without prejudicing their care. Confidentiality and anonymity were maintained throughout the entire data collection and analysis process. There is no information taken from the patients' records, and all are self-reported, so returning the questionnaires to the researcher is considered implied consent. The study adhered to the Helsinki standards.

Statistical Analysis

Data entry and analyses were carried out using the Statistical Package for the Social Sciences (SPSS version 29). Calculations included frequencies and percentages for categorical variables and means, and standard deviations for continuous variables. We examined differences between sample characteristics in relation to normal or poor sleep using Chi-square or Fisher's exact tests for categorical data and one-way ANOVA for continuous variables. Normality was assessed by inspection of histograms, the Shapiro–Wilk normality test and skewness and kurtosis indices. Variables were normally distributed, except sleep quality and itching score, which were normalised using a square-root transformation to comply with the assumptions of multiple regression analysis. Also, the results indicated multicollinearity assumptions for regression were met, as the level of collinearity ranged from 0.60 to 0.8. The scatterplots were evaluated to identify any potential outliers in the data. No points significantly deviated from the data, suggesting the absence of outliers.

Multiple linear regression analyses were used to assess associations between patient's demographic and clinical characteristics, dialysis-associated symptoms (ie fatigue and pruritus) and sleep quality in HD patients. The dependent variable was the sleep quality. The statistical relevance of the bivariate correlations guided the selection of the independent variables to be included into the regression model. Accordingly, four variables (age, education, fatigue, and pruritus) were included in the initial model. Age was subsequently removed after carrying out stepwise multiple regression analysis to select the best sleep quality prediction models. Statistical significance was set at $p \leq 0.05$.

Results

Sample Characteristics

A total of 116 hD patients participated in this study. Table 1 presents demographic and clinical characteristics for the whole sample. The mean age of participants was 50.66 ± 12.73, and almost half of them were female and married. Eighty percent were unemployed and 71.6% had no more than a high-school education.

Table 1 Sample Characteristics for the Study, Stratified by Sleep Quality (N = 116)

Variables	All Patients N= 116	Sleep Quality		*p*-value
		Normal (PSQI < 5) n = 50	Poor (PSQI ≥5) n = 66	
Age, mean, SD	50.66±12.73	45.88 ± 11.51	54.29 ± 12.48	**< 0.001***
Gender, n (%)				0.148
Male	53 (45.7%)	19 (38.0%)	34 (51.5%)	
Female	63 (54.3%)	31 (62.0%)	32 (48.5%)	
Marital status, n (%)				0.318§
Single	29 (25.0%)	14 (28.0%)	15 (22.7%)	
Married	64 (55.2%)	30 (60.0%)	34 (51.5%)	
Divorced	6 (5.2%)	2 (4.0%)	4 (6.1%)	
Widowed	17 (14.7%)	4 (8.0%)	13 (19.7%)	
Occupation, n (%)				0.644
Employee	21 (18.1%)	10 (20.0%)	11 (16.7%)	
Unemployed	95 (81.9%)	40 (80.0%)	55 (83.3%)	
Education, n (%)				**0.038***
Illiterate	18 (15.5%)	3 (6.0%)	15 (22.7%)	
High school or less	83 (71.6%)	41 (82.0%)	42 (63.6%)	
Higher education	15 (12.9%)	6 (12.0%)	9 (13.6%)	
Primary cause of ESKD, n (%)				0.701
Hypertension	50 (43.1%)	23 (46.0%)	27 (40.9%)	
Diabetes	48 (41.4%)	18 (36.0%)	30 (45.5%)	
Heart disease	7 (6.0%)	3 (6.0%)	4 (6.1%)	
Others	11 (9.5%)	–	5 (7.6%)	
Dialysis vintage, n (%)				0.436
<1 year	18 (15.5%)	8 (16.0%)	10 (15.2%)	
1-5 years	47 (40.5%)	17 (34.0%)	30 (45.5%)	
> 5 years	51 (44.0%)	25 (50.0%)	26 (39.4%)	
Number of Comorbid conditions, n (%)				0.759§
0	41 (35.3%)	19 (38.0%)	22 (33.3%)	
1-2	67 (57.8%)	27 (54.0%)	40 (60.6%)	
≥ 3	8 (6.9%)	4 (8.0%)	4 (6.1%)	

Note: For categorical variables, p -value has been calculated using the χ^2 = Pearson Chi-square. § P-value has been calculated using Fischer Exact test. One-way ANOVA used for continues variables. *Significant at $p \leq 0.05$ level. The table displays statistically significant values in bold.

Within the sample, the primary causes of ESKD were hypertension (43.1%) and diabetes (41.4%), and 44% of the participants had been on HD for more than 5 years. Few participants (6.9%) had at least three comorbid conditions.

Table 2 shows that the mean fatigue level was 4.58 ± 1.74, and the mean pruritus level was 14.16 ± 5.12, indicating a high level of fatigue and a moderate level of pruritus in HD patients.

Characteristics of Quality of Sleep in HD Patients

Mean global PSQI score was 6.77 ± 3.23 (Range 1–14, Table 3), with 56.9% of participants scoring 5 or more, indicating poor sleep. Sleep latency achieved the highest mean PSQI score (1.70 ±0.94), and "use of sleep medication components" the lowest (0.36 ±0.83).

Correlations Between the Sample Characteristics and Sleep Quality

Sample characteristic stratification by sleep quality (Table 1) showed that poor sleepers were significantly older (54.29 yrs ± 12.48, $P< 0.001$) than those with normal sleep patterns (45.88 yrs ± 11.51) and that participants with high school or lower education did not sleep as well ($P = 0.038$) as those in other groups. Table 2 illustrates the positive correlations between fatigue and pruritus and poor sleep quality. Fatigue and pruritus also significantly impacted sleep quality (m = 5.26±1.76, 3.68± 1.27, respectively, $P < 0.001$).

Predictors of Quality of Sleep in HD Patients

Parameters shown to significantly associated with sleep quality were then selected for additional multiple regression analysis. Fatigue and pruritus independently impacted sleep quality in HD patients, F (4, 111) = 10.89, P = <0.001.

Table 2 Fatigue and Pruritus Levels Stratified by Sleep Quality (N = 116)

Variables	All patients N= 116	Sleep quality		*p*-value
		Normal (PSQI < 5) n = 50	Poor (PSQI ≥ 5) n = 66	
FSS, mean, SD	4.58 ± 1.74	3.68± 1.27	5.259±1.76	**< 0.001***
5-D itch scale, mean, SD	14.16 ± 5.12	12.22± 5.29	15.62± 4.51	**< 0.001***

Note: *Significant at $p \leq 0.05$ level. The table displays statistically significant values in bold.
Abbreviations: SD, Standard deviation; PSQI, Pittsburgh Sleep Quality Index; FSS, Fatigue Severity Scale.

Table 3 Quality of Sleep Using Pittsburgh Sleep Quality Index (PSQI) Among Hemodialysis Patients

Components of the PSQI	Possible range	Mean	SD	Actual range	No.	%
Subjective sleep quality	0–3	0.85	0.78	0–3		
Sleep latency	0–3	1.70	0.94	0–3		
Sleep duration	0–3	0.74	0.88	0–3		
Habitual sleep efficiency	0–3	0.53	0.87	0–3		
Sleep disturbances	0–3	1.42	0.75	0–3		
Use of sleeping medication	0–3	0.36	0.83	0–3		
Daytime dysfunction	0–3	0.85	0.78	0–3		
Global PSQI	0–21	6.77	3.23	1–14		
Normal sleep, PSQI < 5					50	43.1
Poor sleep, PSQI ≥ 5					66	56.9

Abbreviations: SD, Standard deviation; PSQI, Pittsburgh Sleep Quality Index.

https://doi.org/10.2147/NSS.S496376

Table 4 Stepwise Multiple Regression Analysis Predicting the Sleep Quality in Hemodialysis Patients

Predictor	ß	SE	Beta	t	Sig.	95% CI	
						Lower	Upper
(Constant)	3.070	1.067		2.879	**0.005**	0.957	5.184
Graduate	References						
High school or less	−1.341	0.785	−0.188	−1.707	0.091	−2.897	0.215
Illiterate	0.318	1.007	0.036	0.316	0.753	−1.677	2.312
Fatigue	0.635	0.166	0.343	3.829	**<0.001**	0.307	0.964
Pruritus	0.120	0.056	0.190	2.127	**0.036**	0.008	0.232

Note: Global PSQI was the dependent variable. *ß* is the unstandardized coefficients; SE is the Standard error. Sig. is $p \leq 0.05$ R^2 =0.282; Adjusted R^2 =0.256 The table displays statistically significant values in bold.

Regression analysis showed that fatigue and pruritus significantly affected sleep quality (b = 0.635, p<0.001; b = 0.120, p = 0.036, respectively), with the model explaining 28.2% of the variance in quality of sleep (see Table 4). This indicates a strong positive relationship between increased levels of fatigue and poorer sleep quality and a weak positive relationship between increased levels of pruritus and poorer sleep quality.

Discussion

This study demonstrates the prevalence of poor sleep quality, the most bothersome symptom of HD, and identifies sleep quality predictors. Fatigue and pruritus had the greatest influence on sleep quality for HD patients, while demographic and clinical factors were not useful predictors. The research significantly expands upon earlier studies, with the multidimensional tools used to capture symptom severity adding additional value. Our determination of the relative contributions of individual or clinical factors, and dialysis-related symptoms, to sleep quality will serve as a foundation for future Saudi Arabian studies and contribute to existing global knowledge.

More than half our HD patients did not sleep well, echoing a recent systematic review, and meta-analysis, which reported that 68% of HD patients slept worse than those on peritoneal dialysis or in a kidney transplantation modality.[41] Sleep latency and sleep disturbances were the top two PSQI-dimensions affected by HD treatment, suggesting that HD patients took longer to fall asleep and were have trouble staying asleep, respectively. Approximately 40% of our patients experienced insomnia — having difficulty falling asleep within 30 minutes three or more times per week during the sampled period (one month). In addition, only 35.3% of them fell asleep within 15 minutes or less. "Normal" sleep latency in adults is 11.8 minutes.[42] Sleep latency consistently ranks among the most frequently abnormal sleep components in the few studies that have reported mean FSS component scores in HD.[43]

Among demographic and clinical factors, only age and educational level were significantly different between those with normal and poor sleep. Older HD patients had poorer sleep, a finding in common with several other studies,[12,20,44,45] although Saudi Arabian dialysis patients are generally younger than those in other countries.[46] Sleep quality generally declines with age,[40] due to physiological changes, chronic conditions, use of multiple medications, and psychosocial state.[47,48]

Poor sleep quality also correlated with illiteracy, a finding in common with Norozi et al,[48] who proposed that those with higher education levels would be more inclined to comply with dietary restrictions and utilize phosphate binders, thus diminishing the probability of pruritus and its sleep-quality effects.[41] Regression analysis, when controlled for educational level, revealed that pruritus, not education, was a sleep quality predictor. Given that individuals with poorer sleep quality were more likely to be older and have lower educational levels, these factors could potentially impact sleep quality by exacerbating existing symptoms.

Comorbidities did not appear to affect sleep quality, possibly because relatively few of this studies' participants (6.9%) were suffering from other conditions. Alshammari et al[12] did find such a relationship, but many more (33.2%) of their patients had been diagnosed with comorbidities. This discrepancy warrants further investigation.

Fatigue and pruritus were significantly higher amongst those who did not sleep well. When all other factors were considered, fatigue and pruritus were found to be independent in determining the quality of sleep. Fatigue, common in HD patients, results in poor clinical outcomes and reduced quality of life.[23,24] It was among the most prevalent symptoms in HD patients, irrespective of their cultural backgrounds. Contributing factors may be physiological (eg advanced age), clinical (eg anemia, uremia, poor nutrition comorbidities), psychological (eg anxiety and depression) or other dialysis-associated symptoms such as pain or muscle soreness. This study found that fatigue was the strongest predictor of sleep quality, indicating the importance of identifying individuals at high risk of developing fatigue and providing them with early management.

The clustered and inter-related nature of HD symptoms makes fatigue complex.[23,49] These potential relationships require further sophisticated experimental designs to aid exploration of causes and to understand mediation effects between fatigue and poor quality of sleep.

Although the current study found moderate pruritus levels in HD patients, it was an important predictor of sleep quality. A distressing symptom that negatively impacts quality of life,[50] pruritus is correlated with poor clinical outcomes such as increased infection, morbidity and mortality rates.[51] Pruritus's pathogenesis is not entirely clear, but is thought to be complex, combining demographic, neuropathic, and psychogenic elements.[52] Often, uremic toxins or skin dryness trigger pruritus, with itching causing discomfort that disrupts sleep. Understanding the biological pathways, such as inflammatory or neurological mechanisms, could explain why pruritus leads to poor sleep quality. Investigating these mechanisms would help clarify how each symptom independently contributes to sleep disturbances and inform targeted treatment strategies. Moreover, screening for pruritus and other skin conditions may become a standard part of assessments for patients undergoing HD. Identifying patients with pruritus early could lead to timely interventions aimed at improving sleep quality.

A growing body of evidence, including this study, supports a correlation between poor quality of sleep and pruritus.[52–56] Rehman et al (2019) found that moderate to severe disease was five times more likely to affect sleep quality, among their 334 hD patients, than mild or no pruritus.[52]

However, symptoms of fatigue and pruritus were assessed in a single point of time. Thus, there is a need for longitudinal studies that could examine how changes in fatigue and pruritus over time impact sleep quality.

The model in this study explained almost one-third of the variance in sleep quality, mostly due to fatigue. Further exploration is necessary to identify other potential factors that influence sleep quality, such as psychological factors like depression and anxiety, as well as physical symptoms like breathing problems and pain.

Effective management of HD-related poor sleep quality requires a scientific approach to address the related underlying factors and effectively manage the associated symptoms, particularly fatigue and pruritus. Although this study does not stem from an intervention trial, it is possible that implementing preventive and intervention programs targeting self-management of symptoms, could potentially reduce sleep disturbance and other effects. Future studies may need to focus on intervention trials to determine whether treating fatigue and pruritus leads to measurable improvements in sleep quality in HD patients.

Nurses play a significant role in the management of symptoms such as fatigue and pruritus in HD patients, serving as both advocates and care providers. Their direct patient interactions allow them to assess symptoms effectively, educate patients about self-management strategies, and monitor treatment responses. However, the complexity of these symptoms often necessitates a multidisciplinary approach for optimal management.[57] Involving healthcare professionals such as dietitians, physiotherapists, and psychologists can significantly enhance the care provided to HD patients.[58] To enhance symptom management strategies, clinicians could consider a multifaceted approach, such as pharmacological treatments, cognitive-behavioral therapy (CBT), and physical activity and exercise programs. In addition, implementing educational programs focused on symptom self-management can empower patients by teaching them strategies to cope with their symptoms, such as energy conservation strategies, skin care routines, lifestyle modifications, and dietary adjustments.

The study has several limitations. Firstly, it was conducted in a single region of Saudi Arabia, potentially restricting the generalizability of the findings. While the healthcare system in Saudi Arabia is uniform and falls under the Ministry of Health's purview, various factors may influence study outcomes based on geographical location, whether within Saudi Arabia or globally. Different regions may have varying access to healthcare resources, such as the availability of dialysis centers, the quality of care, and the expertise of healthcare providers. For instance, urban areas may have more advanced healthcare facilities and specialized staff, while rural areas might face challenges related to access to care, availability of medications, or timely dialysis treatments. These differences could affect the severity of symptoms like fatigue and pruritus as well as the overall quality of care, impacting the findings' applicability to other regions. In addition, socioeconomic status could vary across regions, including factors like income, education, and employment, which can influence how patients access healthcare, manage their conditions, and adhere to treatment plans. Cultural and religious beliefs may also play a role in how patients perceive and report symptoms, their willingness to seek treatment, and the support systems available to them.[59] Regional differences in cultural attitudes toward healthcare, illness, and treatment adherence could affect the outcomes of the study.

Secondly, we used a cross-sectional design, which displayed the existence of relationships but not the causes of changes in sleep quality. While fatigue and pruritus are shown to be associated with poor sleep quality, it is not clear whether these symptoms directly cause sleep disturbances or are co-occurring due to another underlying factor. There is a need to study the mediation effects of these factors on sleep quality using sophisticated design and analysis methods, such as structural equation modeling.

Furthermore, this study is based on self-reporting, with no objective measures or clinical diagnostic interviews applied to assess the quality of sleep in HD patients. Since the study likely relies on patients' self-reported symptoms, there is a risk that patients may underreport or overreport their experiences due to factors such as recall bias and social desirability or misunderstanding of survey questions. This could affect the accuracy of the findings regarding fatigue, pruritus, and sleep quality. However, this study employed several methods to mitigate potential bias, including the use of validated and reliable tools to prevent misinterpretation of the questions, the use of an anonymous survey to reduce social desirability bias, and an explanation of the study's importance to encourage the provision of accurate information. Future studies may benefit from adding objective measures such as polysomnography to examine sleep patterns and quality. Polysomnography is a comprehensive diagnostic tool used to evaluate sleep disorders. It involves monitoring and recording various physiological parameters during sleep, providing an objective assessment of sleep quality, and identifying potential disturbances. Thus, incorporating such objective tools like polysomnography in future studies could strengthen the evaluation of sleep quality by offering objective metrics that complement subjective self-reports, improving the reliability of findings.

Conclusion

This is the first study to examine fatigue, pruritus, and sleep quality in HD patients. Our findings will enable dialysis clinicians to recognize factors associated with increased risk of poor sleep in HD patients, and to develop appropriate management strategies. HD dialysis nurses work closely with their patients, often seeing them three times a week. This frequent interaction allows them to collect essential initial information about the most troublesome symptoms and assess the effectiveness of their treatment strategies. Intervention programs that target self-management of fatigue and pruritus symptoms could potentially reduce the total burden of symptoms and improve sleep quality in HD. Future research may benefit from focusing on a longitudinal study design and interventional trials to assess the effectiveness of treating fatigue and pruritus in enhancing sleep quality in HD patients.

Acknowledgments

The authors would like to thank all patients who participated in this study.

Disclosure

The authors does not have any interests that might be interpreted as influencing the research.

References

1. Freedberg DE, Segall L, Liu B, et al. International Variability in the Epidemiology, Management, and Outcomes of CKD and ESKD: a Systematic Review. *Kidney*. 2024;5(1):22–32. doi:10.34067/KID.0000000000000335
2. Thurlow JS, Joshi M, Yan G, et al. Global epidemiology of end-stage kidney disease and disparities in kidney replacement therapy. *Am J Nephrol*. 2021;52(2):98–107. doi:10.1159/000514550
3. Kline C. Sleep Quality. *Encycl Behl Med*. 2013;1811–1813. doi:10.1007/978-1-4419-1005-9_849
4. Nelson KL, Davis JE, Corbett CF. Sleep quality: an evolutionary concept analysis. *Nurs Forum*. 2022;57(1):144–151.
5. Kir S, İ K, Dilek M. Prevalence of sleep disorders and related factors in individuals undergoing hemodialysis. *Cogn Behav Neurol*. 2021;34 (3):161–169. doi:10.1097/WNN.0000000000000278
6. Almutary H. Depression, sleep disturbance, and quality of life in patients undergoing dialysis therapy. *Appl Nurs Res*. 2022;67:151610. doi:10.1016/j.apnr.2022.151610
7. Zhou XH, Liu Y, Zhang XR, Wang C, Liu SS, Jiang Y. Global prevalence of restless legs syndrome among hemodialysis patients: a systematic review and meta-analysis. *Brain Behav*. 2024;14(1):e3378. doi:10.1002/brb3.3378
8. Pisano A, Zoccali C, Bolignano D, D'Arrigo G, Mallamaci F. Sleep apnoea syndrome prevalence in chronic kidney disease and end-stage kidney disease patients: a systematic review and meta-analysis. *Clin Kidney J*. 2024;17(1):sfad179. doi:10.1093/ckj/sfad179
9. Chu G, Suthers B, Moore L, et al. Risk factors of sleep-disordered breathing in haemodialysis patients. *PLoS One*. 2019;14(8):e0220932. doi:10.1371/journal.pone.0220932
10. Abd El-Aatty H, Abd El-Aziz A, Aora M, El-Helbawy R, El-Refaey R. Sleep disordered breathing in patients with chronic kidney diseases: how far the problem? *Egypt J Chest Dis Tuberc*. 2015;64(1):115–127. doi:10.1016/j.ejcdt.2014.11.018
11. Elyazid HA, Basiony FS, Ayoub HS, Hwary AA. Sleep Disordered Breathing in Patients with Chronic Kidney Diseases. *Al-Azhar Intern Med J*. 2023;4(11):22. doi:10.58675/2682-339X.2112
12. Alshammari B, Alkubati SA, Pasay-An E, et al. Sleep quality and its affecting factors among Hemodialysis patients: a Multicenter cross-sectional study. *Healthcare*. 2023;11(18):2536. doi:10.3390/healthcare11182536
13. Medic G, Wille M, Hemels ME. Short-and long-term health consequences of sleep disruption. *Nat Sci Sleep*. 2017;19:151–161.
14. De Santo RM, Lucidi F, Violani C, Di Iorio BR. Sleep disorders in hemodialyzed patients–the role of comorbidities. *Int J Artif Organs*. 2005;28 (6):557–565. doi:10.1177/039139880502800604
15. Brekke FB, Waldum B, Amro A, et al. Self-perceived quality of sleep and mortality in Norwegian dialysis patients. *Hemodial Int*. 2014;18 (1):87–94. doi:10.1111/hdi.12066
16. Elder SJ, Pisoni RL, Akizawa T, et al. Sleep quality predicts quality of life and mortality risk in haemodialysis patients: results from the Dialysis Outcomes and Practice Patterns Study (DOPPS). *Nephrol Dial Transplant*. 2008;23(3):998–1004. doi:10.1093/ndt/gfm630
17. Ricardo AC, Goh V, Chen J, et al. Association of sleep duration, symptoms, and disorders with mortality in adults with chronic kidney disease. *Kidney Int Rep*. 2017;2(5):866–873. doi:10.1016/j.ekir.2017.05.002
18. Mixson A, Waller JL, Bollag WB, et al. The effect of sleep disorder diagnosis on mortality in end-stage renal disease patients. *Appl Sci*. 2023;13 (9):5354. doi:10.3390/app13095354
19. Einollahi B, Motalebi M, Rostami Z, Nemati E, Salesi M. Sleep quality among Iranian hemodialysis patients: a multicenter study. *Nephrourol Mon*. 2015;7(1): doi:10.5812/numonthly.23849.
20. Cox KJ, Parshall MB, Hernandez SHA, Parvez SZ, Unruh ML. Symptoms among patients receiving in-center hemodialysis: a qualitative study. *Hemodial Int*. 2017;21(4):524–533. doi:10.1111/hdi.12521
21. Liao JL, van den Broek-Best O, Smyth B, et al. The effect of extended hours dialysis on sleep quality in a randomised trial. *Nephrol*. 2019;24 (4):430–437. doi:10.1111/nep.13236
22. Samara AM, Sweileh MW, Omari AM, et al. An assessment of sleep quality and daytime sleepiness in hemodialysis patients: a cross-sectional study from Palestine. *Sleep Sci Pract*. 2019;3:1–8. doi:10.1186/s41606-019-0036-4
23. Al Naamani Z, Gormley K, Noble H, Santin O, Al Maqbali M. Fatigue, anxiety, depression and sleep quality in patients undergoing haemodialysis. *BMC Nephrol*. 2021;22(1):157. doi:10.1186/s12882-021-02349-3
24. Tsirigotis S, Polikandrioti M, Alikari V, et al. Factors associated with fatigue in patients undergoing hemodialysis. *Cureus*. 2022;14(3):doi:10.7759/cureus.22994.
25. Aybek N, Fö T. Effect of pruritus on sleep quality in individuals undergoing hemodialysis effect of pruritus on sleep quality. *Clin. Exp Health Sci*. 2022;12(2):541–547. doi:10.33808/clinexphealthsci.1008971
26. Daraghmeh M, Badran M, Janajreh A, et al. Prevalence of pruritus associated with hemodialysis and its association with sleep quality among hemodialysis patients: a multicenter study. *BMC Nephrol*. 2022;23(1):213. doi:10.1186/s12882-022-02838-z
27. van der Willik EM, Lengton R, Hemmelder MH, et al. Itching in dialysis patients: impact on health-related quality of life and interactions with sleep problems and psychological symptoms—results from the RENINE/PROMs registry. *Nephrol Dial Transplant*. 2022;37(9):1731–1741. doi:10.1093/ndt/gfac022
28. VanVoorhis CW, Morgan BL. Understanding power and rules of thumb for determining sample sizes. *Tutor Quant Methods Psychol*. 2007;3 (2):43–50.
29. Davies SJ, Phillips L, Naish PF, Russell GI. Quantifying comorbidity in peritoneal dialysis patients and its relationship to other predictors of survival. *Nephrol Dial Transplant*. 2002;17(6):1085–1092. doi:10.1093/ndt/17.6.1085
30. Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry Res*. 1989;28(2):193–213. doi:10.1016/0165-1781(89)90047-4
31. Albatineh AN, Al-Taiar A, Al-Sabah R, Zogheib B. Psychometric properties of the Arabic version of the Pittsburgh Sleep Quality Index in hemodialysis patients. *Sleep Vigil*. 2022;6(2):323–333. doi:10.1007/s41782-022-00211-6
32. Suleiman KH, Yates BC, Berger AM, Pozehl B, Meza J. Translating the Pittsburgh Sleep Quality Index into Arabic. *West J Nurs Res*. 2010;32 (2):250–268. doi:10.1177/0193945909348230
33. Krupp LB, LaRocca NG, Muir-Nash J, Steinberg AD. The fatigue severity scales. Application to patients with multiple sclerosis and systemic lupus erythematosus. *Arch Neurol*. 1989;46:1121–1123.doi:10.1001/archneur.1989.00520460115022.

34. Al-Sobayel HI, Al-Hugail HA, AlSaif RM, et al. Validation of an Arabic version of fatigue severity scale. *Saudi Med J*. 2016;37(1):73–78. doi:10.15537/smj.2016.1.13055
35. Albadr AH, Azer SZ, Abd Elhamed N, Mostafa NM. Effect of intradialytic hemodialysis exercises on fatigue and leg cramps. *Assiut Sci Nurs J*. 2020;8(20):132–141. doi:10.21608/asnj.2020.80746
36. Ali HH, Taha NM. Fatigue, depression and sleep disturbance among hemodialysis patients. *IOSR-JNHS*. 2017;6(3):61–69. doi:10.9790/1959-0603016169
37. Khan TM, Wu DB, Goh BH, Lee LH, Alhafez AA, Syed Sulaiman SA An observational longitudinal study investigating the effectiveness of 75 mg pregabalin post-hemodialysis among uremic pruritus patients. *Sci Rep*. 2016;6(1):36555. doi:10.1038/srep36555
38. Elman S, Hynan LS, Gabriel V, Mayo MJ The 5-D itch scale: a new measure of pruritus. *Br J Dermatol*. 2010;162(3):587–593. doi:10.1111/j.1365-2133.2009.09586.x
39. Khan TM, Al-Haider I, Syed Sulaiman SA, Hassali MA Linguistic validation of the 5D itching scale to Arabic in patients with end-stage kidney disease. *J Ren Care*. 2013;39(4):222–227. doi:10.1111/j.1755-6686.2013.12038.x
40. Lai JW, Chen HC, Chou CY, et al. Transformation of 5-D itch scale and numerical rating scale in chronic hemodialysis patients. *BMC Nephrol*. 2017;18:1–5. doi:10.1186/s12882-017-0475-z
41. Tan LH, Chen PS, Chiang HY, et al. Insomnia and poor sleep in CKD: a systematic review and meta-analysis. *Kidney Med*. 2022;4(5):100458. doi:10.1016/j.xkme.2022.100458
42. Iskander A, Jairam T, Wang C, Murray BJ, Boulos MI. Normal multiple sleep latency test values in adults: a systematic review and meta-analysis. Sleep Med. 2023;109:143–148. doi:10.1016/j.sleep.2023.06.019
43. Parvan K, Roshangar F, Mostofi M Quality of sleep and its relationship to quality of life in hemodialysis patients. *J Caring Sci*. 2013;2(4):295–304. doi:10.5681/jcs.2013.035
44. Caballero-Castañeda L, Flores-Méndez YL, Juárez-Sánchez JO, Nieves-Ruiz ER Sleep quality in patients with chronic kidney disease on hemodialysis. *Rev Med Inst Mex Seguro Soc Social*. 2023;61(Suppl 2):S213–9.
45. Velu S, Rajagopalan A, Arunachalam J, Prasath A, Durai R Subjective assessment of sleep quality and excessive daytime sleepiness in conventional hemodialysis population: a single-center experience. *Int J Nephrol and Renovascular Disease*. 2022;15.
46. Saudi Center for Organ Transplantation (SCOT). Annual report 2020. Availabe From: https://www.scot.gov.sa/en/knowledge-center/data-management/open-data. Accessed September 2, 2024.
47. Kim M, Um YH, Kim TW, et al. Association between age and sleep quality: findings from a community health survey. *Sleep Med Res*. 2021;12(2):155–160. doi:10.17241/smr.2021.01158
48. Norozi Firoz M, Shafipour V, Jafari H, Hosseini SH, Yazdani-Charati J Relationship of hemodialysis shift with sleep quality and depression in hemodialysis patients. *Clin Nurs Res*. 2019;28(3):356–373. doi:10.1177/1054773817731852
49. Almutary H, Douglas C, Bonner A Multidimensional symptom clusters: an exploratory factor analysis in advanced chronic kidney disease. *J Adv Nurs*. 2016;72(10):2389–2400. doi:10.1111/jan.12997
50. Agarwal R, Burton J, Gallieni M, et al. Alleviating symptoms in patients undergoing long-term hemodialysis: a focus on chronic kidney disease-associated pruritus. *Clin Kidney J*. 2023;16(1):30–40. doi:10.1093/ckj/sfac187
51. Sukul N, Karaboyas A, Csomor PA, et al. Self-reported pruritus and clinical, dialysis-related, and patient-reported outcomes in hemodialysis patients. *Kidney Med*. 2021;3(1):42–53. doi:10.1016/j.xkme.2020.08.011
52. Rehman IU, Lai PS, Lim SK, Lee LH, Khan TM Sleep disturbance among Malaysian patients with end-stage renal disease with pruritus. *BMC Nephrol*. 2019;20:1–8. doi:10.1186/s12882-019-1294-1
53. Heisig M, Reich A, Szepietowski JC Is uremic pruritus still an important clinical problem in maintenance hemodialysis patients?. *J Eur Acad Dermatol Venereol*. 2016;30(12):e198–9.
54. Mathur VS, Lindberg J, Germain M, et al. A longitudinal study of uremic pruritus in hemodialysis patients. *Clin J Am Soc of Nephrol*. 2010;5(8):1410–1419. doi:10.2215/CJN.00100110
55. Pisoni RL, Wikström B, Elder SJ, et al. Pruritus in haemodialysis patients: international results from the dialysis outcomes and practice patterns study (DOPPS). *Nephrol Dial Transpl*. 2006;21(12):3495–3505. doi:10.1093/ndt/gfl461
56. Rehman IU, Munib S, Ramadas A, Khan TM Prevalence of chronic kidney disease-associated pruritus, and association with sleep quality among hemodialysis patients in Pakistan. *PloS One*. 2018;13(11). doi:10.1371/journal.pone.0207758
57. Baragar B, Schick-Makaroff K, Manns B, et al. "You need a team": perspectives on interdisciplinary symptom management using patient-reported outcome measures in hemodialysis care—a qualitative study. J Patient Rep Outcomes. 2023;7(1):3. doi:10.1186/s41687-022-00538-858
58. Mehrotra R, Davison SN, Farrington K, et al. Managing the symptom burden associated with maintenance dialysis: conclusions from a Kidney Disease: improving Global Outcomes (KDIGO) controversies conference. Kidney Int. 2023;104(3):441–454. doi:10.1016/j.kint.2023.05.019
59. Shahin W, Kennedy GA, Stupans I. The impact of personal and cultural beliefs on medication adherence of patients with chronic illnesses:a systematic review. Patient Prefer Adherence. 2019;13:1019–1035. doi:10.2147/PPA.S212046