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Original Research Article

Assessment of Sleep Quality among Hemodialysis Patients Using the Pittsburgh Sleep Quality Index

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Conflict of interest: Nil

Abstract

Objective: To determine the prevalence of poor sleep quality among patients with end-stage renal disease undergoing maintenance hemodialysis and to examine its association with selected demographic, clinical, and biochemical factors.

Methodology: This hospital-based cross-sectional study was conducted over a period of six months in the Department of Physiology and M.D.M. Hospital attached to Dr. S. N. Medical College, Jodhpur, and Rajasthan. A total of 44 patients with end-stage renal disease (ESRD) undergoing maintenance hemodialysis were enrolled. Demographic, clinical, and laboratory data were collected using a predesigned proforma. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), which evaluates subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. A global PSQI score >5 was considered indicative of poor sleep quality. Associations between sleep quality and demographic, clinical, and biochemical parameters were analyzed using appropriate statistical methods.

Results: A total of 44 patients with end-stage renal disease undergoing maintenance hemodialysis were included in the study. Poor sleep quality (PSQI >5) was observed in 19 (43.2%) patients, while 25 (56.8%) had good sleep quality. Female patients showed a higher prevalence of poor sleep quality. Lower body weight was significantly associated with poor sleep quality (p=0.048), whereas no significant associations were observed with age, duration of dialysis, hemoglobin, biochemical parameters, blood pressure, or eGFR.

Conclusion: Poor sleep quality was common among patients with end-stage renal disease undergoing maintenance hemodialysis, affecting 43.2% of the study population. Female sex and lower body weight were associated with poor sleep quality, highlighting the need for routine assessment and early intervention for sleep disturbances in this population.

Keywords: ESRD, Sleep Quality, PSQI, Hemodialysis.

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Introduction

Chronic kidney disease (CKD) is a major global health problem associated with significant morbidity and mortality. As the disease progresses to end-stage renal disease (ESRD), patients require renal replacement therapy in the form of dialysis or kidney transplantation. Despite advances in hemodialysis, patients with ESRD continue to experience a wide range of physical and psychological complications that adversely affect their quality of life. [1,2]

Sleep disturbances are among the most common yet often uderrecognised problems in patients undergoing maintenance hemodialysis. These disturbances may manifest as difficulty initiating sleep, frequent nocturnal awakenings, reduced sleep duration, poor sleep efficiency, excessive daytime sleepiness, and impaired daytime functioning. [3,4,5,6] Multiple factors, including uremia, metabolic abnormalities, anemia, chronic inflammation, and psychosocial stress, have been implicated in the pathogenesis of sleep disorders in this population. [3,7,8]

Poor sleep quality has been associated with reduced quality of life, increased cardiovascular risk, impaired cognitive performance, and higher mortality among patients with ESRD. [2,8,9] Early

identification and management of sleep disturbances may therefore improve overall patient well-being and treatment outcomes. The Pittsburgh Sleep Quality Index (PSQI) is a widely used and validated instrument for assessing subjective sleep quality. [10] The present study was undertaken to determine the prevalence of poor sleep quality among patients with ESRD undergoing maintenance hemodialysis and to evaluate its association with selected demographic, clinical, and biochemical factors.

Materials and Methods

This hospital-based cross-sectional study was conducted over a period of six months in the Department of Physiology and M.D.M. Hospital attached to Dr. S. N. Medical College, Jodhpur, and Rajasthan. A total of 44 patients with end-stage renal disease (ESRD) undergoing maintenance hemodialysis were enrolled. Demographic, clinical, and laboratory data were collected and sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI).

Inclusion Criteria

- Patients diagnosed with ESRD.
- Patients undergoing maintenance hemodialysis.
- Age ≥18 years.
- Patients willing to provide informed consent.

Exclusion Criteria

- Patients with acute kidney injury.
- Critically ill patients.
- Patients unable to complete the questionnaire.
- Patients unwilling to participate.

Sample Size and Sampling Method: The required sample size was calculated using the single population proportion formula (95% confidence interval, 20% relative allowable error), assuming a prevalence of poor sleep quality of 67% from a previous study. The estimated sample size was 44 participants.

Methodology: Demographic, clinical, and biochemical data were collected using a predesigned proforma. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated questionnaire that evaluates subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. A global PSQI score >5 was considered indicative of poor sleep quality.

Quality of Sleep: Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a validated questionnaire comprising seven components: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep medication, and daytime dysfunction. A global PSQI score >5 was considered indicative of poor sleep quality.

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using SPSS Statistics version 20 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparisons between good and poor sleepers were performed using the independent t-test for continuous variables and the chi-square test for categorical variables. Potential confounding factors such as age, gender, and duration of hemodialysis were assessed through stratified analysis where appropriate. A p-value ≤0.05 was considered statistically significant.

Results

A total of 44 patients with end-stage renal disease undergoing maintenance hemodialysis were included in the study. The demographic characteristics of the study participants are presented in Table 1. The majority of patients were male (32, 72.7%), while females constituted 12 (27.3%) of the study population. The most common age group was 26–40 years (31.8%), followed by the 41–55 years and 56–70 years age groups, each accounting for 27.3% of the participants. Based on the Pittsburgh Sleep Quality Index (PSQI), 25 (56.8%) patients were classified as good sleepers, whereas 19 (43.2%) were classified as poor sleepers. [Table 1][Figure 1]

Comparison of demographic, clinical, and biochemical characteristics between good and poor sleepers is shown in Table 2. The parameters assessed included body weight, body mass index (BMI), duration of hemodialysis, hemoglobin, blood urea, serum creatinine, serum sodium, serum potassium, serum chloride, blood glucose, systolic blood pressure, diastolic blood pressure, and estimated glomerular filtration rate (eGFR). Poor sleep quality was more common among female patients, although the association was not statistically significant. [Figure 2] Body weight was the only parameter that showed a statistically significant difference between the two groups. Good sleepers had a significantly higher mean body weight than poor sleepers (61.07 ± 8.51 kg vs. 56.68 ± 4.46 kg, $p = 0.048$). No statistically significant differences were observed for BMI, duration of hemodialysis, hemoglobin concentration, blood urea levels, serum creatinine, electrolyte parameters (serum sodium, potassium, and chloride), blood glucose, systolic and diastolic blood pressure, or eGFR (all $p > 0.05$). [Table 2]

Although poor sleepers demonstrated relatively lower eGFR values and higher blood urea levels

compared to good sleepers, these differences did not achieve statistical significance. Overall, the findings indicate that sleep quality was not significantly associated with most clinical and biochemical characteristics evaluated in the study population, except for body weight.

Table 1: Demographic Characteristics and Sleep Quality of the Study Participants (n = 44)

Characteristic	n	%
Age group (years)		
19–25	4	9.09
26–40	14	31.82
41–55	12	27.27
56–70	12	27.27
71–85	2	4.55
Gender		
Male	32	72.73
Female	12	27.27
Sleep quality (PSQI)		
Good sleepers (PSQI ≤5)	25	56.82
Poor sleepers (PSQI >5)	19	43.18

Table 2: Comparison of Clinical and Biochemical Characteristics between Good and Poor Sleepers

Variable	Good Sleepers (n=25)	Poor Sleepers (n=19)	p-value
Body weight (kg)	61.07 ± 8.51	56.68 ± 4.46	0.048*
BMI (kg/m²)	22.86 ± 1.86	22.16 ± 1.13	0.155
Duration of hemodialysis (months)	7.56 ± 3.68	6.21 ± 2.35	0.170
Hemoglobin (g/dL)	9.51 ± 1.48	9.10 ± 1.03	0.307
Blood urea (mg/dL)	116.87 ± 57.64	134.94 ± 57.35	0.308
Serum creatinine (mg/dL)	8.23 ± 2.66	8.26 ± 2.42	0.968
Serum sodium (mmol/L)	137.40 ± 3.99	137.26 ± 7.26	0.937
Serum potassium (mmol/L)	4.53 ± 0.63	4.67 ± 0.79	0.521
Serum chloride (mmol/L)	100.91 ± 5.19	102.22 ± 5.96	0.442
Blood glucose (mg/dL)	105.38 ± 20.14	109.27 ± 11.65	0.457
Systolic blood pressure (mmHg)	133.12 ± 7.30	134.42 ± 7.04	0.556
Diastolic blood pressure (mmHg)	84.68 ± 4.89	86.60 ± 4.22	0.352
eGFR (mL/min/1.73 m²)	8.44 ± 3.14	6.99 ± 2.28	0.097

***Statistically significant (p < 0.05).**

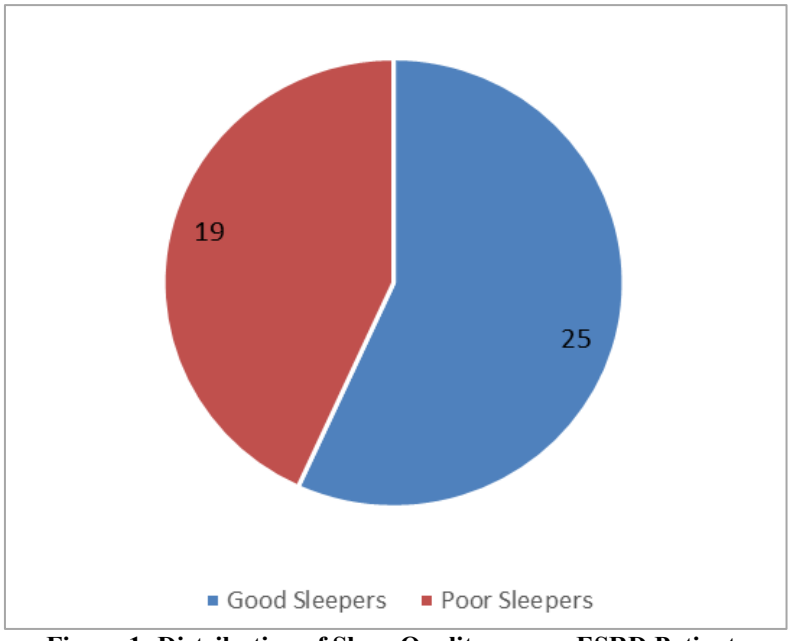

Figure 1: Distribution of Sleep Quality among ESRD Patients

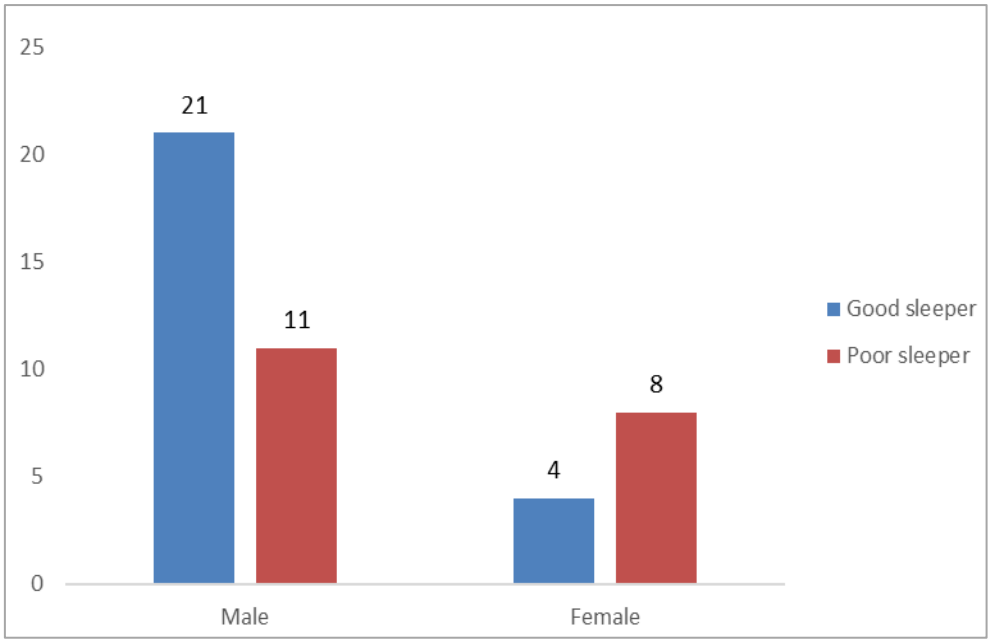

Figure 2: Gender-wise Distribution of Sleep Quality

Discussion

Sleep disturbances are increasingly recognized as an important yet underappreciated complication among patients with end-stage renal disease (ESRD) undergoing maintenance hemodialysis. In the present study, poor sleep quality, defined by a Pittsburgh Sleep Quality Index (PSQI) score >5, was observed in 43.2% of patients, indicating that sleep impairment is a common problem in this population.

The prevalence of poor sleep quality observed in our study was 43.2%. Previous studies have reported a high prevalence of sleep disturbances among patients undergoing maintenance hemodialysis. Shafi and Shafi [11], Mehrabi et al. [12], Tel et al. [13], Čengić et al. [14], and Menon et al. [15] similarly documented a substantial burden of poor sleep quality in dialysis patients, with reported prevalence rates ranging from approximately 40% to 80%. The findings of the present study are therefore consistent with the existing literature. Sleep disorders in ESRD are multifactorial and may result from uremic toxins, metabolic abnormalities, anemia, chronic inflammation, psychological stress, and dialysis-related factors. [3,4,8] These disturbances can adversely affect quality of life, cognitive performance, treatment adherence, and overall health outcomes. In the present study, female patients demonstrated a higher prevalence of poor sleep quality compared to male patients, although the association did not reach statistical significance. Similar observations have been reported in previous studies like Irwin MR et. Al., where female sex was associated with poorer subjective sleep quality and greater vulnerability to sleep disturbances. [16] Possible explanations include hormonal influences, increased prevalence of anxiety and depression, and differences in the perception and reporting of sleep-related symptoms. However, the relatively small sample size of the present study warrants cautious interpretation of this finding.

A significant association was observed between lower body weight and poor sleep quality. Poor sleep may contribute to reduced appetite, altered metabolic regulation, and nutritional impairment, while malnutrition itself may adversely affect sleep patterns. [9,17] Although body weight has not been consistently identified as a determinant of sleep quality in hemodialysis patients, our findings suggest that nutritional status may influence sleep and warrant further investigation. This relationship highlights the potential interaction between nutritional status and sleep quality in patients undergoing maintenance hemodialysis.

Although poor sleepers had higher mean levels of blood urea, serum creatinine, blood glucose, and blood pressure than good sleepers, these differences did not reach statistical significance. Similarly, no significant associations were observed between sleep quality and age, duration of hemodialysis, hemoglobin level, serum electrolytes, or eGFR. [12,13,15] Comparable findings have been reported by Mehrabi et al. [12], Tel et al. [13], and Menon et al. [15], who also observed that several clinical and biochemical parameters were not significantly associated with sleep quality. These findings suggest that sleep quality in ESRD patients is likely influenced by multiple interacting factors rather than a single biochemical or clinical parameter. Among the

factors evaluated in the present study, female sex and lower body weight showed an association with poor sleep quality, whereas age, duration of hemodialysis, hemoglobin, biochemical parameters, blood pressure, and eGFR did not demonstrate statistically significant associations.

The findings of this study emphasize the importance of routine assessment of sleep quality in patients undergoing maintenance hemodialysis. Previous studies have demonstrated that poor sleep quality is associated with impaired quality of life, adverse cardiovascular outcomes, and increased mortality among dialysis patients. [4,18,9] Early identification of sleep disturbances may therefore facilitate timely interventions and improve overall patient well-being and quality of life.

The present study has certain limitations. The study was conducted at a single center with a relatively small sample size, which may limit the generalizability of the findings. In addition, sleep quality was assessed using a subjective questionnaire rather than objective sleep studies such as polysomnography. The cross-sectional design also precludes the establishment of causal relationships.

Despite these limitations, the study provides valuable insight into the burden of sleep disturbances among ESRD patients undergoing maintenance hemodialysis and highlights the need for greater attention to sleep-related issues in routine clinical practice.

Conclusion

Poor sleep quality was a common finding among patients with end-stage renal disease undergoing maintenance hemodialysis, affecting 43.2% of the study population. Female patients were more likely to experience poor sleep quality, and lower body weight showed a significant association with impaired sleep. No significant relationship was observed between sleep quality and most clinical or biochemical parameters.

These findings highlight the substantial burden of sleep disturbances in patients on hemodialysis and underscore the importance of routine screening for sleep-related problems. Early recognition and appropriate interventions may contribute to improved quality of life and overall patient care.

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