

FATIGUE LEVELS IN HEMODIALYSIS PATIENTS: AN ANALYSIS BASED ON SLEEP QUALITY

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ABSTRAK

This study aims to analyze the relationship between sleep quality and fatigue in Chronic Kidney Disease (CKD) patients undergoing hemodialysis therapy at Gatoel Hospital, Mojokerto. A quantitative correlational study with a cross-sectional design was conducted involving 68 respondents selected using consecutive sampling. Data were collected using the Pittsburgh Sleep Quality Index (PSQI) and the Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-F) questionnaires, and analyzed using the Spearman rank correlation test. The results showed that 50 respondents (73.5%) had poor sleep quality and 49 respondents (72.1%) experienced severe fatigue. The Spearman rank correlation test revealed a significant and strong negative correlation between sleep quality and fatigue ($p = 0.000$; $r = -0.617$). It can be concluded that poorer sleep quality is associated with more severe fatigue in CKD patients undergoing hemodialysis.

Keywords: *Chronic Kidney Disease, fatigue, hemodialysis, sleep quality*

INTRODUCTION

Chronic Kidney Disease (CKD) is a chronic condition characterized by a progressive and irreversible decline in renal function, rendering the kidneys unable to maintain fluid and electrolyte balance or adequately excrete metabolic waste products (Nafsiyah et al., 2025). In advanced stages, patients require renal replacement therapy, with hemodialysis being the most common modality utilized in Indonesia (Apriliana et al., 2024). Although hemodialysis prolongs patient survival, long-term treatment can lead to various physical and psychological complications, including poor sleep quality and fatigue, which negatively impact patients' quality of life (Putri et al., 2024).

According to the World Health Organization (WHO), approximately 674 million people worldwide, or about 9% of the global population, live with CKD (WHO, 2023). Furthermore, the International Society of Nephrology Global Kidney Health Atlas reported that approximately 850 million people globally are affected by CKD (Bello et al., 2023). In Indonesia, the 2018 Basic Health Research (Riskesdas) survey recorded 713,783 CKD cases, with West Java, East Java, and Central Java reporting the highest prevalence. In East Java, the Provincial Health Office reported 308 CKD cases during the first semester of 2024, mostly associated with uncontrolled hypertension and diabetes mellitus (Dinas Kesehatan Provinsi Jawa Timur, 2024). Meanwhile, data from Gatoel Hospital Mojokerto indicated that 210 patients underwent hemodialysis during the preceding three months.

Poor sleep quality is one of the most common issues experienced by patients undergoing hemodialysis. It is characterized by difficulty initiating sleep, frequent nocturnal awakenings, short sleep duration, and decreased sleep efficiency. Persistent sleep disturbances disrupt the body's energy recovery process, thereby increasing the risk of fatigue (Almutary et al., 2025). Fatigue is a persistent state of physical, mental, and emotional exhaustion that is not fully relieved by rest, thereby limiting patients' ability to perform daily

activities and reducing their overall quality of life (Ebrahimi et al., 2023). Previous studies have reported that the majority of patients undergoing hemodialysis experience poor sleep quality and moderate-to-severe fatigue (Khadija et al., 2024).

Although several studies have examined the relationship between sleep quality and fatigue in patients undergoing hemodialysis, findings remain inconsistent due to variations in participant characteristics and research settings. Furthermore, research investigating this relationship among CKD patients in the Hemodialysis Unit of Gatoel Hospital Mojokerto remains limited. Therefore, this study aims to analyze the relationship between sleep quality and fatigue in Chronic Kidney Disease patients undergoing hemodialysis at Gatoel Hospital Mojokerto. These findings are expected to provide scientific evidence regarding the link between sleep quality and fatigue, as well as serve as a reference for healthcare professionals, particularly nurses, in developing interventions to improve sleep quality and reduce fatigue in patients undergoing hemodialysis.

METHOD

This study employed a quantitative correlational design with a cross-sectional approach to analyze the relationship between sleep quality and fatigue in patients with Chronic Kidney Disease (CKD). A quantitative correlational design was selected as it allows the researcher to examine the relationship between two variables without manipulation.

The study was conducted at the Hemodialysis Unit of Gatoel Hospital, Mojokerto, in April 2026. The population comprised 210 patients undergoing routine hemodialysis during the preceding three months. The sample consisted of 68 respondents selected using a consecutive sampling technique based on predetermined inclusion and exclusion criteria.

The research instruments included the Pittsburgh Sleep Quality Index (PSQI) questionnaire to measure sleep quality and the Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-F) Version 4 questionnaire to evaluate fatigue. Data were collected after respondents provided informed consent and completed both questionnaires. The collected data were coded and analyzed using the Statistical Package for the Social Sciences (SPSS). Descriptive statistics were used to depict respondent characteristics and research variables, while the Spearman rank correlation test was utilized to analyze the relationship between sleep quality and fatigue, with a significance level set at $p < 0.05$. This study received ethical approval from the Health Research Ethics Committee of Universitas Bina Sehat PPNI Mojokerto (Approval No. 141/KEP/UBS-PPNI/IV/2026).

FINDING AND DISCUSSION

RESEARCH RESULT

Data collection was conducted from May 4 to May 6, 2026, at the Hemodialysis Unit of Gatoel Hospital, Mojokerto, involving 68 respondents who met the inclusion criteria. The general characteristics of the respondents and the distribution of the variables are presented below:

Characteristics of Respondents

Tabel 1. Frequency Distribution of Respondent Characteristics Based on Age, Gender, Education, Occupation, and Hemodialysis Duration

Characteristics	Frequency (<i>f</i>)	(%)
Age		
26-35 years	7	10,3
36-45 years	12	17,6
46-59 years	49	72,1
Gender		
Male	37	54,4
Female	31	45,6
Educational Level		
Primary School	5	7,4
Junior High School	12	17,6
Senior High School	34	50,0
Higher Education	17	25,0
Employment Status		
Employed	15	22,1
Unemployed	53	77,9
Hemodialysis Duration		
3-12 months	12	17,6
>12 months	56	82,4
Kadar hemoglobin		
Mild Anemia(9,9-10,0 g/dL)	8	11,8
Moderate Anemia (8,0-9,9 g/dL)	26	38,2
Severe Anemia (< 8,0 g/dL)	34	50,0
Total	68	100.000

Source: Primary Data (2026)

Based on Table 1, the majority of respondents were aged between 46 and 59 years, accounting for 49 respondents (72.1%). Most respondents were male, totaling 37 respondents (54.4%), and had completed senior high school or equivalent, comprising 34 respondents (50.0%). Regarding employment status, the majority of respondents were unemployed, accounting for 53 respondents (77.9%). Furthermore, most respondents had been undergoing hemodialysis for more than 12 months, totaling 56 respondents (82.4%). Based on hemoglobin levels, the majority of respondents experienced severe anemia, comprising 34 respondents (50.0%).

Kualitas Tidur dan Distribusi Kelelahan

Tabel 2. Frequency Distribution of Sleep Quality

Sleep Quality	Frequency (<i>f</i>)	(%)
Good (Score < 5)	18	26,5
Poor (Score > 5)	50	73,5
Total	68	100.000

Source: Primary Data (2026)

Based on Table 2, the univariate distribution shows that out of 68 respondents, 18 respondents (26.5%) demonstrated good sleep quality, whereas the majority, comprising 50 respondents (73.5%), experienced poor sleep quality.

Tabel 3. Frequency Distribution of Fatigue

Fatigue	Frekuensi (<i>f</i>)	(%)
Mild (Score > 30)	19	27,9
Severe (Score < 30)	49	72,1
Total	68	100.000

Source: Primary Data (2026)

Based on Table 3, the results show that among the 68 respondents, 19 patients (27.9%) experienced mild fatigue, whereas the majority, comprising 49 patients (72.1%), experienced severe fatigue.

Cross-Tabulation and Correlation Analysis

Tabel 4. Tabulation between Sleep Quality and Fatigue in Hemodialysis Patients

Sleep Quality	Fatigue				Total		P-value	Correlation Coefficient(r)
	Mild		Severe					
	F	%	F	%	F	%		
Good	17	94,4	1	5,6	18	100	0.000	-0,617
Poor	2	4,0	48	96,0	50	100		
Total	19	27,9	49	72,1	68	100		

Source: Primary Data (2026)

Table 4 shows that among the 18 respondents with good sleep quality, the majority experienced mild fatigue (94.4%). Conversely, of the 50 respondents with poor sleep quality, almost all suffered from severe fatigue (96.0%). Bivariate statistical analysis using the Spearman rank correlation test yielded a value of $p = 0.000$ ($p < 0.05$), indicating a significant relationship between sleep quality and fatigue. The correlation coefficient ($r = -0.617$) demonstrated a strong inverse relationship, indicating that poorer sleep quality correlates with higher levels of fatigue.

DISCUSSION

The results showed that the majority of respondents had poor sleep quality, accounting for 50 respondents (73.5%). This condition indicates that CKD patients undergoing hemodialysis are vulnerable to sleep disturbances due to physiological and psychological changes during therapy. The hemodialysis procedure, accumulation of uremic

toxins, pruritus, pain, muscle cramps, dyspnea, and impaired melatonin regulation contribute to difficulties in initiating and maintaining sleep (Winangun, 2021). This finding aligns with the study by Nafsiyah et al. (2025), which reported that most hemodialysis patients experienced poor sleep quality.

Based on respondent characteristics, poor sleep quality was more frequently found in the 46–59 age group, females, those with a senior high school education or equivalent, unemployed individuals, and patients undergoing hemodialysis for 3–12 months. Increasing age causes a decline in physiological function and an increase in comorbidities, thereby leading to further deterioration in sleep quality (Oktavia & Faizal, 2026). In females, fluctuations in reproductive hormones and higher levels of stress and anxiety increase the risk of sleep disturbances compared to males (Alosta et al., 2024). Furthermore, lower educational attainment may influence patients' ability to comprehend health education and implement proper sleep hygiene, whereas unemployment status is associated with heightened psychosocial stress and alterations in daily activity rhythms, both of which affect sleep quality (Prasetyawan et al., 2025). Patients newly initiating hemodialysis also tend to experience sleep disturbances as they remain in an adaptation phase regarding lifestyle changes, therapeutic procedures, and hemodialysis side effects (Natalia et al., 2020). Conversely, patients who have undergone hemodialysis for more than 12 months demonstrate better sleep quality, as they have adapted to therapy and developed superior coping mechanisms (Amal et al., 2026).

The findings also revealed that the majority of respondents experienced severe fatigue, totaling 49 respondents (72.1%), while 19 respondents (27.9%) experienced mild fatigue. Fatigue is one of the most common complaints reported by CKD patients undergoing hemodialysis, stemming from reduced renal function, uremic toxin accumulation, anemia, metabolic disturbances, poor sleep quality, and demographic factors such as age, gender, hemodialysis duration, and hemoglobin levels (Sukron, 2025). These conditions lead to diminished energy production, making patients easily exhausted and restricting their daily physical activities (Santoso et al., 2022).

Based on demographic profiles, severe fatigue was more prevalent among respondents aged 46–59 years, females, those with a senior high school education or equivalent, unemployed individuals, those undergoing hemodialysis for 3–12 months, and patients with low hemoglobin levels. Advancing age leads to physiological decline, thereby reducing the body's capacity to adapt to hemodialysis therapy (Alshammari et al., 2024). Additionally, females are more susceptible to fatigue due to hormonal differences and lower muscle mass compared to males (Patimah et al., 2024). Lower educational levels may also impair patients' capacity to understand disease management, ultimately contributing to the onset of fatigue (Santoso et al., 2022).

Unemployment status and low hemoglobin levels further contributed to elevated fatigue levels. A lack of physical activity can induce a decline in functional capacity, whereas anemia impairs the blood's oxygen-carrying capacity, reducing energy production and escalating exhaustion (Akhdiyat, 2019). Furthermore, patients new to hemodialysis are typically still adjusting to physical and psychological changes, making them more prone to fatigue than those who have been on long-term therapy (Amal et al., 2026).

Based on the Spearman rank test, a value of $p = 0.000$ with $r = -0.617$ was obtained, indicating a strong negative correlation between sleep quality and fatigue. This

finding demonstrates that poorer sleep quality corresponds to more severe fatigue. This result is consistent with the study by Santoso et al. (2022), which stated that impaired sleep quality contributes to increased fatigue among CKD patients undergoing hemodialysis.

Poor sleep quality prevents the body from achieving optimal energy restoration. In CKD patients, sleep disruptions are frequently exacerbated by uremic toxin buildup, pruritus, pain, muscle cramps, dyspnea, and physiological changes secondary to hemodialysis. These issues impede attainment of deep sleep, thereby disrupting energy recovery and ultimately exacerbating fatigue (Saraswati & Lestari, 2023). Nevertheless, this study identified a few data points that deviated from the general pattern: one respondent with good sleep quality experienced severe fatigue, and two respondents with poor sleep quality experienced mild fatigue. These deviations highlight that fatigue in CKD patients is multifactorial and influenced not only by sleep quality, but also by additional factors such as hemoglobin levels, hemodialysis duration, physiological adaptability, and individual clinical status (Amal et al., 2026).

This study has several limitations that should be considered when interpreting the findings. Data were gathered using self-reported questionnaires—the Pittsburgh Sleep Quality Index (PSQI) and the Functional Assessment of Chronic Illness Therapy–Fatigue (FACIT-F)—which rely on respondents' memory and perception rather than objective measurement tools. Moreover, this study utilized a cross-sectional design and was restricted to the Hemodialysis Unit of Gatoel Hospital Mojokerto, thereby limiting the ability to capture long-term changes in sleep quality and fatigue or represent the broader CKD population. These findings underscore the importance of routine sleep quality assessments using validated instruments like the PSQI, alongside non-pharmacological interventions such as sleep hygiene education, relaxation techniques, light exercise programs, and collaborative anemia management to help alleviate fatigue. Future research should employ longitudinal designs and objective sleep measuring tools to evaluate fluctuations in sleep quality and fatigue more accurately over time.

CONCLUSION

Based on data obtained from all respondents, the independent variable of sleep quality among Chronic Kidney Disease (CKD) patients undergoing routine hemodialysis at Gatoel Hospital Mojokerto was categorized as predominantly poor, with the majority (73.5%) of the 68 respondents falling into the poor sleep quality category. This reflects that a significant proportion of end-stage renal disease patients suffer from severe nocturnal sleep architecture disruption and reduced sleep efficiency during dialysis therapy. Secondly, the dependent variable of fatigue also yielded severe outcomes, wherein the majority (72.1%) of patients experienced severe fatigue levels. This high prevalence indicates that patients endure persistent physical, emotional, and cognitive exhaustion that significantly restricts their daily functional capacity.

Furthermore, bivariate analysis demonstrated a statistically significant and strong inverse relationship ($p = 0.000$; $r = -0.617$) between sleep quality and fatigue levels. Cross-tabulation results revealed that among the 50 patients with poor sleep quality, almost all (96.0%) suffered from severe fatigue. Conversely, among the 18 patients with good sleep quality, the vast majority (94.4%) experienced only mild fatigue. This inverse relationship

indicates that poorer nocturnal sleep quality directly exacerbates fatigue severity, rendering sleep deprivation a primary predictor of physical bioenergetic depletion in the hemodialysis unit. For practical application, nephrology nurses are advised to integrate routine sleep quality screening and implement nurse-led non-pharmacological interventions, while future researchers are encouraged to conduct prospective longitudinal studies incorporating objective sleep-tracking devices.

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