

Prevalence and Associated Factors of Insomnia in Patients Undergoing Hemodialysis in Sulaymaniyah City/Iraq

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[Doi: 10.33899/mjn.2025.159455.1135](https://doi.org/10.33899/mjn.2025.159455.1135)

Received: April 23 2025; Revised: June 02 2025; Accepted: July 01 2025

Abstract

Background: Insomnia is a common sleep disturbance among patients undergoing hemodialysis, negatively impacting their quality of life and health outcomes. Understanding its prevalence and associated factors is essential for improving care in this vulnerable population.

Objectives: This study aimed to assess the prevalence and associated factors of insomnia in patients receiving hemodialysis in Sulaymaniyah City, Iraq.

Methods: A cross-sectional study was conducted from December 1, 2024, to February 1, 2025, at two hemodialysis centers in Sulaymaniyah City (Shar Hospital and Qrga Hemodialysis Center). A total of 133 patients aged ≥ 20 years with end-stage renal disease undergoing regular hemodialysis were included. Data were collected through face-to-face interviews using the Athens Insomnia Scale (AIS) and a structured questionnaire covering demographic and clinical characteristics.

Results: Of the 133 hemodialysis patients enrolled, 66.2% (n = 88) reported insomnia. Multivariate logistic regression identified three factors independently associated with insomnia: poor economic status (AOR = 1.978; 95% CI: 1.020–3.838; p = 0.044), pruritus (AOR = 0.300; 95% CI: 0.113–0.795; p = 0.015), and dyspnea (AOR = 0.252; 95% CI: 0.083–0.765; p = 0.017). Other variables such as occupation, anemia, fatigue, and sleep medication use were significant in bivariate analysis but not in the multivariate model.

Conclusion: Insomnia is highly prevalent among hemodialysis patients and is significantly associated with poor economic status, pruritus, and dyspnea. These findings highlight the need for targeted screening and management strategies to address insomnia in this population.

Keywords: *Insomnia Chronic Kidney Disease Renal Failure Hemodialysis*

Introduction

Chronic kidney disease (CKD) is a serious non-communicable condition that significantly contributes to global morbidity and mortality (Abbas, Elahi, and Manan 2023). It is characterized by a gradual, irreversible decline in renal function. The global rise in CKD is largely attributed to increasing rates of hypertension, diabetes, obesity, and aging populations (Abdulqader and Ali 2023). Accurate detection of CKD prevalence is challenging, as first stages frequently present no symptoms. The prevalence of end-stage renal disease (ESRD) in Sulaymaniyah Governorate is around 0.01%, predominantly impacting those over the age of 50 (Sharif, Awn et al. 2017). Research conducted in Iran determined the total prevalence of chronic kidney disease (CKD) to be 15.14%, above the global norm (Bouya, Balouchi et al. 2018). In 2017, chronic kidney disease (CKD) impacted 697.5 million individuals worldwide, with a prevalence of 9.1%, and has had a 29.3% rise since 1990 (Feng, Xu et al. 2023). In 2017, deaths associated to chronic kidney disease, including those from cardiovascular problems, were 4.6% of all global mortality, ranking as the 12th greatest cause of death (Cockwell and Fisher 2020). Globally, over 2 million individuals get dialysis or kidney transplants, with hemodialysis being the predominant treatment modality. (Strohmaier, Ye et al., 2023). Approximately 69% of patients with end-stage renal disease (ESRD) receive hemodialysis (Asmar, Chelala et al. 2023). Although life-sustaining, hemodialysis poses considerable psychological and physical challenges, necessitating rigorous compliance with treatment regimens, dietary limitations, and continuous physician supervision (Ibrahim and Ismael 2023). Sleep disorders are one of the most commonly reported complications in hemodialysis patients (Alshammari, Alkubati et al. 2023). Estimates indicate that 50–75% of persons with end-stage renal disease (ESRD) suffer from various sleep disorders, with insomnia being the most frequent (Orasan, Muresan et al. 2020). Insomnia affects 4% to 64% of the general population, but its frequency among hemodialysis patients varies from 69% to 80% (Al-Jahdali, Khogeer et al. 2010; Benetou, Alikari et al. 2022). Insomnia is diagnosed when symptoms show at least three nights per week for a duration of three months, and are not attributable to any other medical or psychiatric condition, as per the Diagnostic and Statistical Manual of Mental Disorders (5th edition) and the International Classification of Sleep Disorders (Bhaskar, Hemavathy, and Prasad 2016; Krystal, Prather, and Ashbrook 2019). Insomnia associated with diminished quality of life, lower productivity, higher accident risk, and increased healthcare utilization. It frequently coexists with chronic diseases and psychiatric disorders, and is more prevalent among older persons, women, those with lower educational levels or income, and those

who are divorced, widowed, or separated (Jaisoorya, Dahale et al. 2018). If untreated, it may lead to diminished cognitive function, emotional instability, cardiovascular issues, and perhaps increased mortality (Lufiyani, Zahra, and Yona 2019). Despite its significant impact, sleep disorders such as insomnia are frequently underdiagnosed and undertreated in patients on hemodialysis. There is a notable lack of data on the prevalence and contributing factors of insomnia among hemodialysis patients in Sulaymaniyah City. This study was conducted to address this gap by assessing the prevalence of insomnia and identifying its associated factors among patients receiving maintenance hemodialysis in this region.

PATIENTS AND METHODS

Study Design and Duration:

A descriptive cross-sectional study was conducted over a two-month period, from December 1, 2024, to February 1, 2025.

Study Setting:

The study was carried out in two government-run hemodialysis centers in Sulaymaniyah City, Iraq: The Hemodialysis Center in Qrga and the Hemodialysis Unit at Shar Hospital. These centers provide free treatment and services to patients as part of the public healthcare system.

Sample of the Study

A non-probability convenience sampling technique was employed in this study. A total of 133 patients undergoing regular hemodialysis at two dialysis centers in Sulaymaniyah City (Shar Teaching Hospital and Qrga Dialysis Center) were recruited. Inclusion criteria were: patients aged 18 years or older, diagnosed with end-stage renal disease (ESRD), undergoing hemodialysis for at least three months, and capable of providing informed consent. Patients were excluded if they declined participation, were critically ill, or were cognitively impaired and unable to complete the interview.

Data Collection

Data were collected through face-to-face interviews conducted by the researcher using a structured questionnaire. Each patient was interviewed individually during their dialysis session.

Study Instruments:

The questionnaire was made up of three parts, and patients were interviewed one by one. A. Sociodemographic data: This part included the participants' demographic information such as age, gender, marital status, educational level, occupation, economic status, and residency. B. Clinical

characteristics: This part included comorbid conditions such as diabetes mellitus, hypertension, dyslipidemia, and cardiovascular disease. It also included anemia, use of sleep medications, chronic leg cramps, chronic pruritus, chronic fatigue, chronic dyspnea, and leg edema. C. Athens Insomnia Scale (AIS) questionnaire:

This is a self-assessment psychometric tool designed to assess sleep difficulty based on the international diagnostic criteria (ICD-10). It consists of eight questions. The first five questions refer to sleep initiation, awakenings during the night, final awakening, total sleep duration, and quality of sleep. The other three questions are related to well-being, functioning capability, and tiredness during the day. Each item is scored from 0 to 3, and the total score is calculated by summing the scores of all items, resulting in a total score ranging from 0 to 24. Higher scores indicate a higher level of insomnia. The insomnia severity is classified as follows: 0–5 = No clinically significant insomnia, 6–9 = Mild insomnia, 10–15 = Moderate insomnia, and 16–24 = Severe insomnia (Soldatos, Dikeos, and Paparrigopoulos 2000; Okajima, Miyamoto et al. 2020). The scale has high consistency, reliability, and validity, and is considered a useful tool in clinical practice. The original AIS has excellent reliability (Cronbach's $\alpha = 0.90$).

Although the AIS was originally developed in other populations, its reliability was confirmed for the current study population through a pilot test. A test–retest method was used on 10 patients from both dialysis centers. The results showed a high correlation ($r = 0.92$, $p < 0.05$) between the two test results, and the Cronbach's alpha was ($\alpha = 0.90$), which indicates that the questionnaire is highly reliable for use in this study setting.

Statistical Analysis:

Data were analyzed using SPSS version 27.0. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to summarize the data. Inferential statistics included chi-square test, Fisher's Exact Test, correlation test, and p-value. Multiple regression analysis was also performed to identify factors independently associated with insomnia. A p-value < 0.05 was considered statistically significant.

Results:

A total of 133 hemodialysis (HD) patients participated in the study. As shown in Table 1, the mean age \pm standard deviation (SD) of participants was 56.53 ± 14.284 years, ranging from 20 to 83 years. The largest proportion belonged to the >60 age group (45.1%), followed by the 51–60 age

group (22.6%). More than half of the participants were male ($n = 68$, 51.1%). Most of the patients ($n = 110$, 82.7%) resided within the city where the HD center was located. Regarding marital status, the majority were married ($n = 99$, 74.4%). A considerable portion had low educational attainment, with 33.1% ($n = 44$) reporting informal education, and 26.3% ($n = 35$) having completed primary school. Concerning employment, 36.1% were housewives, followed by unemployed individuals and retirees. Economically, 42.9% ($n = 57$) reported their financial situation as barely sufficient.

As depicted in Figure 1, the overall prevalence of insomnia among participants was 66.2% ($n = 88$), while 33.8% ($n = 45$) reported no insomnia. Among those affected, 12.0% ($n = 16$) had mild insomnia, 33.8% ($n = 45$) had moderate insomnia, and 20.3% ($n = 27$) had severe insomnia.

Table 2 illustrates the clinical characteristics of the participants. Hypertension was the most prevalent condition (94.7%), followed by feel weak or tired (75.2%) and anemia (72.9%). Nearly half had diabetes mellitus (47.4%) and cardiovascular disease (49.6%). Pruritus and dyslipidemia were reported by 39.1% and 31.6% of patients, respectively, while 29.3% experienced dyspnea. A small subset (10.5%) used sleep medications.

Table 3 presents the distribution of insomnia according to sociodemographic variables. Insomnia prevalence was highest among individuals aged 20–30 years (85.7%) and lowest among those older than 60 years (55.0%), though the difference was not statistically significant ($p = 0.152$). Females reported a higher rate of insomnia (72.3%) than males (60.3%) ($p = 0.143$). Single participants reported more insomnia (80.0%) than married ones (64.6%), but the difference did not reach statistical significance ($p = 0.512$). Education level did not show a significant association ($p = 0.066$), although higher rates of insomnia were seen among those with informal education (77.3%) and high school graduates (77.8%).

A statistically significant association was observed between occupation and insomnia ($p = 0.008$). Self-employed individuals (83.3%) and housewives (81.3%) reported higher prevalence compared to government employees (40%). Economic status showed a significant relationship ($p = 0.004$), with a markedly higher prevalence among those with insufficient income (81.8%) compared to those with adequate income (50%).

Table 4 summarizes the relationship between insomnia and clinical variables. Anemia was significantly associated with insomnia ($p = 0.016$), as 72.2% of anemic patients reported insomnia compared to 50% of non-anemic ones. Weakness or fatigue, pruritus, and dyspnea each had statistically significant associations with insomnia ($p < 0.001$ for all). Sleep medication use was also associated with higher insomnia prevalence (92.9%, $p = 0.026$). Although not statistically significant, those on hemodialysis for more than three years had higher insomnia prevalence (86.4%–86.7%, $p = 0.010$). Variables such as diabetes mellitus, dyslipidemia, cardiovascular disease, leg cramps, leg edema, and hypertension showed no significant associations with insomnia in bivariate analysis.

In the multiple logistic regression analysis (Table 5), three factors were independently associated with insomnia. Patients with poor economic status had nearly twice the odds of experiencing insomnia compared to those with better financial status ((Adjusted Odds Ratios) AOR = 1.978; 95% CI: 1.020–3.838; $p = 0.044$). The presence of pruritus was also significantly associated with insomnia (AOR = 0.300; 95% CI: 0.113–0.795; $p = 0.015$), as was dyspnea, which showed a strong inverse association (AOR = 0.252; 95% CI: 0.083–0.765; $p = 0.017$). Other variables found significant in bivariate analysis such as occupation, anemia, fatigue, and sleep medication use did not retain statistical significance in the multivariate model..

Table (1): Distribution of Participants Socio-Demographics

	Variables	Frequency	Percentage%
Age	20-30 years	7	5.3%
	31-40 years	16	12.0%
	41-50 years	20	15.0%
	51-60 years	30	22.6%
	>60 years	60	45.1%
	Mean \pm SD	56.53 \pm 14.284	
Gender	Male	68	51.1%
	Female	65	48.9%
Marital status	Single	10	7.5%
	Married	99	74.4%
	Divorced	7	5.3%
	Widowed	17	12.8%
Education level	Informal education	44	33.1%
	Can read and write	18	13.5%
	Primary school graduate	35	26.3%
	High school graduate	18	13.5%
	Institute graduate	9	6.8%

	College & postgraduate	9	6.8%
Occupation	Government employed	15	11.3%
	Self-employed	12	9.0%
	Unemployed	24	18.0%
	Housewife	48	36.1%
	Retired	34	25.6%
Economic status	Sufficient	54	40.6%
	Barely sufficient	57	42.9%
	Insufficient	22	16.5%
Residency	Inside city exists HD center	110	82.7%
	Outside city exists HD center	23	17.3%

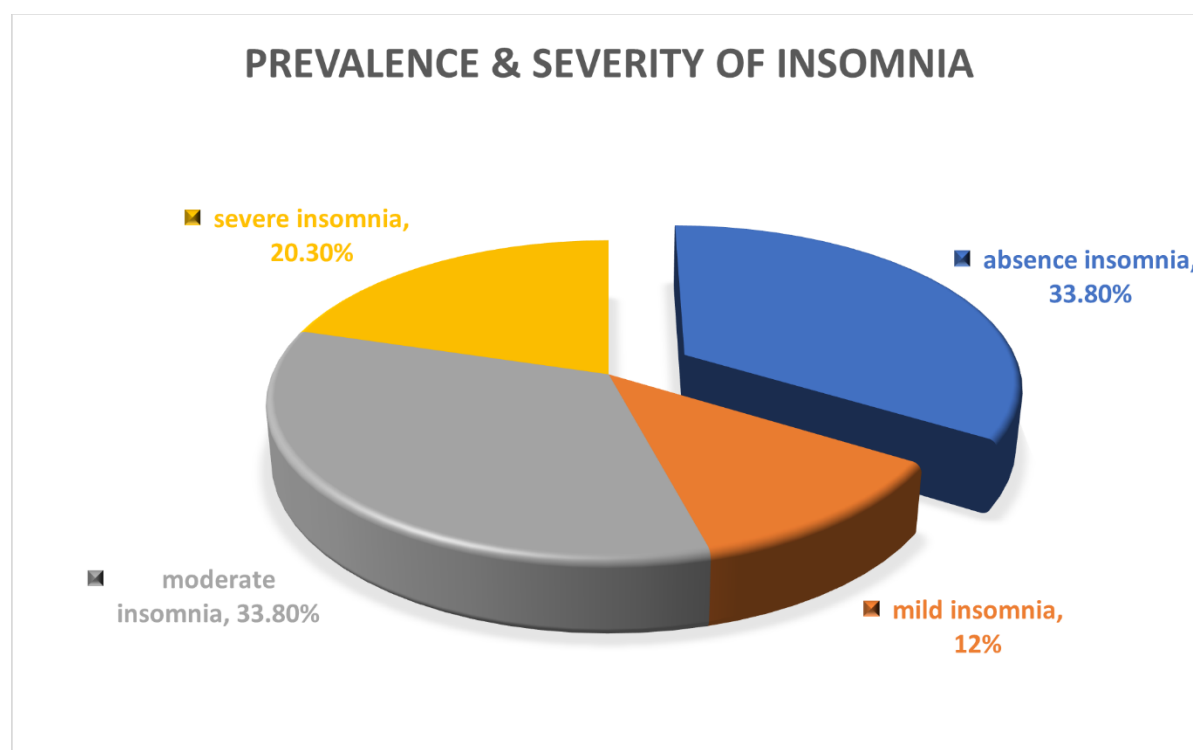


Figure (1): Prevalence and Severity of Insomnia Among Participants

Table (2): Distribution of Participants Clinical Characteristics.

Clinical characteristics		Frequency	Percentage%
Diabetes Mellitus	Yes	63	47.4%
	No	70	52.6%
Hypertension	Yes	126	94.7%
	No	7	5.3%
Dyslipidemia	Yes	42	31.6%
	No	91	68.4%
Cardiovascular Disease	Yes	66	49.6%
	No	67	50.4%
Anemia	Yes	97	72.9%
	No	36	27.1%
Medication for sleep	Yes	14	10.5%
	No	119	89.5%
Leg cramp	Yes	47	35.3%
	No	86	64.7%
Feel weak or tired	Yes	100	75.2%
	No	33	24.8%
Pruritus	Yes	52	39.1%
	No	81	60.9%
Dyspnea	Yes	39	29.3%
	No	94	70.7%
Leg edema	Yes	33	24.8%
	No	100	75.2%

Table (3): Socio-Demographic Characteristics of The Participants in Relation to Insomnia

Variables	Insomnia prevalence: N=133			p.value
	Absent insomnia n (%)	Present insomnia n (%)	Total n (%)	
Age (yr)				
20-30	1 (14.3%)	6 (85.7%)	7 (5.3%)	0.152
31-40	4 (25.0%)	12 (75.0%)	16 (12.0%)	
41-50	6 (30.0%)	14 (70.0%)	20 (15.0%)	
51-60	7 (23.3%)	23 (76.7%)	30 (22.6%)	
>60	27 (45.0%)	33 (55%)	60 (45.1%)	
Total	45 (33.8%)	88 (66.2%)	133 (100%)	
Gender				
Male	27 (39.7%)	41 (60.3%)	68 (51.1%)	0.143
Female	18 (27.7%)	47 (72.3%)	65 (48.9%)	
Marital status				
Single	2 (20.0%)	8 (80.0%)	10 (7.5%)	0.512
Married	37 (37.4%)	62 (62.6%)	99 (74.4%)	
Divorced	2 (28.6%)	5 (71.4%)	7 (5.3%)	
Widowed	4 (23.5%)	13 (76.5%)	17 (12.8%)	
Level of education				
Informal education	10 (22.7%)	34 (77.3%)	44 (33.1%)	0.066
Can read and write	6 (33.3%)	12 (66.7%)	18 (13.5%)	
Primary school	14 (40.0%)	21 (60.0%)	35 (26.3%)	
High school	4 (22.2%)	14 (77.8%)	18 (13.5%)	
Institute graduate	5 (55.6%)	4 (44.4%)	9 (6.8%)	
College graduate	6 (66.7%)	3 (33.3%)	9 (6.8%)	
Occupation				
Government employed	9 (60.0%)	6 (40.0%)	15 (11.3%)	0.008
Self-employed	2 (16.7%)	10 (83.3%)	12 (9.0%)	
Unemployed	9 (37.5%)	15 (62.5%)	24 (18.0%)	
Housewife	9 (18.8%)	39 (81.3%)	48 (36.1%)	
Retired	16 (47.1%)	18 (52.9%)	34 (25.6%)	
Economic status				
Sufficient	27 (50.0%)	27 (50.0%)	54 (40.6%)	0.004
Barely sufficient	14 (24.6%)	43 (75.4%)	57 (42.9%)	
Insufficient	4 (18.2%)	18 (81.8%)	22 (16.5%)	
Residency				
Inside city exists HD	40 (36.4%)	70 (63.6%)	110 (82.7%)	0.178
Outside city exists HD	5 (21.7%)	18 (78.3%)	23 (17.3%)	
Note: p-values were calculated using Chi-square or Fisher's exact test, as appropriate. Fisher's exact test was used when expected cell counts were below 5.				

Table (4): Clinical Characteristics in Relation to Insomnia

Variables		N=133			p.value
		Absent insomnia n (%)	Present insomnia n (%)	Total n (%)	
Diabetes mellitus	Yes	22 (34.9%)	41 (65.1%)	63 (47.4%)	0.802
	No	23 (32.9%)	47 (67.1%)	70 (52.6%)	
Hypertension	Yes	44 (34.9%)	82 (65.1%)	126 (94.7%)	0.261
	No	1 (14.3%)	6 (85.7%)	7 (5.3%)	
Dyslipidemia	Yes	12 (28.6%)	30 (71.4%)	42 (31.6%)	0.383
	No	33 (36.3%)	58 (63.7%)	91 (68.4%)	
Cardiovascular disease (CVD)	Yes	18 (27.3%)	48 (72.7%)	66 (49.6%)	0.112
	No	27 (40.3%)	40 (59.7%)	67 (50.4%)	
Anemia=Hb < 11gm/dl	Yes	27 (27.8%)	70 (72.2%)	97 (72.9%)	0.016
	No	18 (50.0%)	18 (50.0%)	36 (27.1%)	
Medication for Sleep	Yes	1 (7.1%)	13 (92.9%)	14 (10.5%)	0.026
	No	44 (37.0%)	75 (63.0%)	119 (89.5%)	
Leg cramp	Yes	13 (27.7%)	34 (72.3%)	47 (35.3%)	0.266
	No	32 (37.2%)	54 (62.8%)	86 (64.7%)	
Feel weak or tired	Yes	26 (26.0%)	74 (74.0%)	100 (75.2%)	<0.001
	No	19 (57.6%)	14 (42.4%)	33 (24.8%)	
Pruritus	Yes	8 (15.4%)	44 (84.6%)	52 (39.1%)	<0.001
	No	37 (45.7%)	44 (54.3%)	81 (60.9%)	
Dyspnea	Yes	5 (12.8%)	34 (87.2%)	39 (29.3%)	<0.001
	No	40 (42.6%)	54 (57.4%)	94 (70.7%)	
Leg edema	Yes	11 (33.3%)	22 (66.7%)	33 (24.8%)	0.944
	No	34 (34.0%)	66 (66.0%)	100 (75.2%)	
Duration of hemodialysis	< 1 year	14 (34.1%)	27 (65.9%)	41 (30.8%)	0.010
	1-3 years	26 (47.3%)	29 (52.7%)	55 (41.4%)	
	>3-5years	3 (13.6%)	19 (86.4%)	22 (16.5%)	
	> 5 years	2 (13.3%)	13 (86.7%)	15 (11.3%)	
Note: p-values were calculated using Chi-square or Fisher's exact test, as appropriate. Fisher's exact test was used when expected cell counts were below 5.					

Table 5: Multivariate Logistic Regression Analysis of Factors Associated with Insomnia Among Hemodialysis Patients (N = 133)

Variable	Adjusted Odds Ratio (AOR)	95% Confidence Interval (CI)	p-value
Economic status	1.978	1.020 – 3.838	0.044*
Pruritus	0.300	0.113 – 0.795	0.015*
Dyspnea	0.252	0.083 – 0.765	0.017*
Occupation	1.425	0.753 – 2.694	0.274
Anemia	1.156	0.514 – 2.600	0.727
Fatigue/Weakness	1.604	0.643 – 4.002	0.308
Sleep medication use	2.423	0.504 – 11.650	0.267
Duration of HD (months)	1.593	0.971 – 2.612	0.065

Discussion

This study aimed to examine the prevalence of insomnia and its associated factors among patients with end-stage renal disease receiving hemodialysis. The patient population predominantly consisted of individuals over 60 years of age, males, married persons, housewives, those with informal education, and those reporting inadequate income. Most resided within the city and presented with various comorbidities; additionally, many were anemic, hypertensive, and reported feelings of weakness.

The findings revealed that more than half of the respondents (66.2%) experienced insomnia. Similar results were observed in prior studies, such as those conducted by Sabry, Abo-Zenah et al. (2010), Al-Jahdali, Khogeer et al. (2010), and Lufiyani, Zahra, and Yona (2019), who reported insomnia rates of 65.9%, 60.8%, and 56%, respectively, among individuals with ESRD. However, the prevalence found in this study was higher than that reported by Rehman, Rauf et al. (2020) and Rosdiana (2011). Insomnia is commonly observed among hemodialysis patients due to uremia, excessive fluid intake, electrolyte imbalances, and hypoalbuminemia. These complications are frequently accompanied by sleep disorders such as restless leg syndrome, obstructive sleep apnea, and shift-work sleep disorder (Szentkirályi, Madarász, and Novák, 2009). Difficulty maintaining sleep or obtaining adequate rest often leads to early morning awakening, which subsequently contributes to daytime sleepiness,

fatigue, cognitive impairments, and reduced quality of life (Szentkiralyi et al., 2009; Unruh et al., 2011).

Our findings indicated that insomnia was more frequently reported among early adult patients (85.7%), which is consistent with the study conducted by Lufiyani, Zahra, and Yona (2019). In contrast, several other studies reported a higher prevalence of insomnia among elderly individuals (Benetou, Alikari et al., 2022; Saridi, Batziogiorgos et al., 2024). Despite this observed pattern in our bivariate analysis, age was not identified as an independent predictor of insomnia in the multivariate model. This aligns with previous studies that also found no significant correlation between age and insomnia among hemodialysis patients (Al-Jahdali, Khogeer et al., 2010; Rehman, Rauf et al., 2020). However, it is worth noting that some researchers, such as Merlino, Piani et al. (2006), have identified age as a major independent predictor of insomnia in patients with end-stage renal disease, indicating that the relationship between age and insomnia may be influenced by additional contextual or methodological factors.

The findings of this study indicated that insomnia was more prevalent among female respondents (72.3%). This observation aligns with previous research, such as that of Al-Jahdali, Khogeer et al. (2010), who reported that female patients had a 1.5-fold increased risk of developing insomnia compared to males. Similarly, Hamzi, Hassani et al. (2017) documented a comparable trend. Such outcomes may be attributed to the heightened emotional responsiveness often observed among female patients, as well as the multiple roles and responsibilities they typically assume in daily life. Upon being diagnosed with end-stage renal disease (ESRD) and commencing dialysis, many female patients experience a significant decline in functional status (Pai, Hsu et al., 2007; Elder, Pisoni et al., 2008), which may further exacerbate sleep disturbances. However, in the present study, gender did not remain a statistically significant predictor of insomnia in the multivariate analysis. This suggests that while gender differences exist at a descriptive level, the observed disparities may be better explained by underlying psychosocial stressors or contextual variables rather than gender alone.

Insomnia was more prevalent among single respondents, consistent with findings by Paparrigopoulos, Tzavara et al. (2010), who reported a higher risk among unmarried patients. However, marital status did not show a significant association with insomnia in the multivariate analysis, aligning with the results of Saridi, Batziogiorgos et al. (2024). Although insomnia was more prevalent among respondents with informal education, educational level was not significantly

associated with insomnia in the multivariate analysis. This finding aligns with studies by Rosdiana (2011) and Paparrigopoulos, Tzavara et al. (2010), which also found no significant link in dialysis patients. While education is often linked to better coping and self-care practices (Notoatmojo, 2014), such a correlation was not evident in this patient population.

Notably, this study identified economic status as a significant independent factor. Participants with poor income levels had nearly double the odds of developing insomnia (AOR = 1.978; $p = 0.044$). Economic stress may exacerbate psychological burden and limit access to proper healthcare or sleep-promoting environments, which, in turn, increases susceptibility to sleep disturbances (Paparrigopoulos, Tzavara et al., 2010).

Insomnia was more frequently observed among housewives and self-employed respondents (81.3% and 83.3%, respectively), and employment status showed a significant association in the bivariate analysis ($p = 0.008$). However, this association was not retained in the multivariate model ($p = 0.274$), suggesting other factors may underlie this relationship. These findings contrast with Rosdiana (2011), who reported no significant link between occupation and insomnia, though the observed pattern may reflect the added emotional and functional strain of managing household or informal work in the context of chronic illness (Elder, Pisoni et al., 2008).

Insomnia was more prevalent among respondents with comorbid conditions, likely due to the added burden of chronic symptoms, pain, and functional impairment—an association supported by Benetou, Alikari et al. (2022). Nearly half of the participants (47.4%) had diabetes mellitus, a known contributor to sleep disturbances, aligning with findings by Alkhuwaiter, Alsudais, and Ismail (2020). However, comorbidities, including diabetes and hypertension, did not remain significant predictors of insomnia in the multivariate analysis, suggesting that their impact may be mediated by other factors.

Anemia was highly prevalent among respondents (72.9%), consistent with previous studies reporting similar rates among dialysis patients (Chen, Lim et al., 2006; Pai, Hsu et al., 2007; Sabry, Abo-Zenah et al., 2010; Ishak, Bagot et al., 2012). This condition is common in end-stage renal disease due to reduced erythropoietin production. Although anemia showed a significant association with insomnia in the bivariate analysis, it did not retain significance in the multivariate model. This contrasts with findings by Orasan, Muresan et al. (2020), who reported a link between low hemoglobin levels and sleep disturbances.

One of the most significant findings from the multivariate analysis was the strong association between pruritus and insomnia (AOR = 0.300; $p = 0.015$). Pruritus is a common complication in ESRD,

contributing to poor sleep quality and overall decreased well-being. This finding supports previous work by Soleymanian, Alidadiani, and Mahdavi (2018), who identified uremic pruritus as a major predictor of insomnia. The underlying mechanisms may involve chronic inflammation and increased cytokine activity, which disrupt normal sleep architecture (Weng, Hu et al., 2018).

Another important predictor of insomnia was dyspnea, which showed a significant independent association (AOR = 0.252; $p = 0.017$). Dyspnea may interfere with nocturnal breathing patterns and cause frequent awakenings, ultimately diminishing sleep quality. This result aligns with clinical observations of fluid overload and cardiovascular dysfunction in hemodialysis patients, which can present as dyspnea and impact sleep.

Although sleep medication use was linked to insomnia in the unadjusted analysis, it was not a significant predictor in the multivariate model. It is possible that medication use reflects a response to preexisting insomnia rather than being a cause of it. Similarly, fatigue and weakness, which were frequently reported, lost significance in the adjusted analysis, although prior studies such as Benetou, Alikari et al. (2022) highlighted a strong relationship between fatigue and sleep disturbance.

The duration of hemodialysis also showed no independent effect on insomnia in the final model, despite previous reports indicating higher rates of insomnia among long-term dialysis patients (Sabbatini, Minale et al., 2002; Rosdiana 2011; Hamzi, Hassani et al., 2017).

In conclusion, while many demographic and clinical variables appeared to be associated with insomnia in the bivariate analysis, the multivariate regression revealed that poor economic status, pruritus, and dyspnea were the only significant independent predictors. These findings underscore the need for healthcare providers to incorporate sleep assessments into routine dialysis care, especially for patients presenting with these symptoms. Targeted interventions aimed at managing pruritus and dyspnea, and providing psychosocial support for financially stressed patients, may contribute to improved sleep quality and overall outcomes in this vulnerable population.

LIMITATIONS: This study has several limitations. First, the use of convenience sampling from only two hemodialysis centers in Sulaymaniyah limits the generalizability of the findings to the broader hemodialysis population. Second, the cross-sectional and observational design restricts the ability to establish causal relationships between variables. Third, the relatively small sample size may have limited the statistical power to detect weaker associations. Additionally, we did not assess other specific sleep disorders such as obstructive sleep apnea or parasomnia, which may coexist with insomnia and influence sleep quality. While multivariate analysis was conducted to control for

potential confounding factors, unmeasured variables may still have influenced the results. Finally, although the Athens Insomnia Scale demonstrated good reliability in this study, it has not been formally validated for use in the Iraqi population, which may affect the cultural applicability of the findings.

CONCLUSION:

This study demonstrated a high prevalence of insomnia (66.2%) among patients with end-stage renal disease undergoing hemodialysis in Sulaymaniyah City. Although many socio-demographic and clinical variables were initially associated with insomnia, multivariate regression analysis identified only three significant independent predictors: poor economic status, pruritus, and dyspnea. These findings suggest that both physical symptoms and socioeconomic hardship play a critical role in the development of sleep disturbances among this vulnerable population. Therefore, addressing these specific factors may significantly reduce the burden of insomnia and improve the overall well-being of hemodialysis patients.

RECOMMENDATIONS:

- Routine Screening: Introduce regular insomnia screening in dialysis centers using the Athens Insomnia Scale (AIS).
- Symptom Management: Develop clear clinical protocols to manage contributing symptoms such as pruritus, anemia, and dyspnea.
- Targeted Education: Provide short, structured education sessions on sleep hygiene and stress reduction strategies during dialysis visits.
- Staff Awareness: Train dialysis staff to identify and respond to signs of insomnia and refer patients for appropriate care.
- Socioeconomic Support: Offer psychosocial support or referral services for patients facing financial challenges.

Source of Funding

The authors did not receive any specific funding to carry out the work presented in this article. The study was self-funded by the research team.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this work.

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