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Assessment Sleep Pattern among Patients undergoing Hemodialysis in Al-Diwaniyah Teaching Hospital

Ismael Mohammed Alsaadi[1], Haider Abbas Hadi Al-Mhanaa[2], Widad Abd Aljabbar Mozzan[3,*], Fatima Kamil Salman[4], Saad Mardi Muhammad[5], Rusul Mushtaq Talib[6]

[1] *College of Nursing, Al-Mustaqbal University, Hillah, Babil 51001, Iraq.*
[2] *Laboratories Techniques Department, College of Health and Medical Techniques, Al-Mustaqbal University, Babylon 51001, Iraq.*
[3] *Department of Pharmacology, College of Pharmacy, Al-Mustaqbal University, Hillah, Iraq*
[4] *College of Nursing, Al-Mustaqbal University, Hillah, Babylon 51001, Iraq.*
[5] *School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang 11800, Malaysia*
[6] *Laboratories Techniques Department, College of Health and Medical Techniques, Al-Mustaqbal University, 51001, Babylon, Iraq*

Corresponding Author Email:
widad.abdaljabbar@uomus.edu.iq

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ABSTRACT

Background: Kidney failure is a condition in which one or both of the kidneys can no longer work on their own. Sometimes, kidney failure is temporary and comes on quickly. Other times, it is a chronic condition that can get worse slowly over a long time. **Objectives:** The aims of the existing study were to identify sleep patterns for patients undergoing hemodialysis and to find out the association between sleep patterns for patients undergoing hemodialysis and their socio demographic variables. **Methodology:** A descriptive cross-sectional study was conducted in in Al-Diwaniyah Teaching Hospital. Data were collected from (15 January to 15 February 2024) through the self-report questionnaire and analyzed through the descriptive and inferential statistical (SPSS) method.

Results: The study revealed that hemodialysis patients are predominantly middle-aged males, with many reporting poor sleep qualities, including daytime dysfunction, insufficient restoration after sleep, and difficulties falling or staying asleep. Despite these challenges, most patients expressed general satisfaction with their sleep pattern but experienced disruptions, such as noise and waking during sleep. The findings highlight the need for targeted interventions to improve sleep quality and overall health in this population.

Conclusions: 60% of participants were classified as having low overall sleep quality. This underscores the widespread nature of sleep disturbances within the hemodialysis population and highlights the critical need for targeted interventions to improve sleep quality, which may in turn enhance patients' overall health and well-being. **Recommendations:** Given the widespread impact of poor sleep on daily functioning, further clinical attention should be given to improving sleep hygiene, minimizing nocturnal disruptions, and addressing underlying health issues that contribute to poor sleep quality in hemodialysis patients

Keywords: Kidney failure, hemodialysis , poor sleep qualities.

1. Introduction

End-stage renal disease (ESRD) corresponds to a glomerular filtration rate (eGFR) of < 15 mL/min/1.73 m [1]. It showed variable-elevated incidence across the world where in the USA, the annual incidence rate is 355 per million [2]. In Europe, it reaches 135,000 per year [3]. Saudi Arabia reports a prevalence rate of

5.7% [4]. According to the 9th Annual Report of The Egyptian Renal Registry, the prevalence in Egypt raised to 483 patients per million [5]. At this stage, survival and quality of life are sustained by kidney replacement therapy, which includes hemodialysis (HD), peritoneal dialysis, and kidney transplantation [6]. Yet, most patients are treated with dialysis due to the scarcity of donor organs and contraindications to transplantation [7, 8]. A global survey was done on nephrologists in over 90 countries to assess the reimbursement for dialysis, suggesting the number of patients receiving HD worldwide was approximately 2,600,000 patients [6],and is expected to be doubled to 5·4 million by 2030 [9].

Hence, HD became the main and most widely used replacement treatment for ESRD patients. With advances in dialysis techniques and medical care, mortality and morbidity rates of patients on regular hemodialysis have markedly declined, yet this is not the only goal for those patient's further improvement of their quality of life has become the aim of medical practitioners. And in order to achieve that, both physical and mental health needs to be satisfied and maintained.

However, many patients on dialysis suffer from sleep disorders which undoubtedly affect both their physical and mental health status [10] and consequently worsen their quality of life, so this problem needs to be addressed. The progression to ESRD appeared to be correlated with the development of sleep disorders [11]. This can be explained by the ineffective glomerular filtration occurring at this stage leading to an inability to maintain normal homeostasis affecting various metabolic products including vital bio elements and proteins.

This dysregulation in homeostasis might impact sleep in various ways [12]. HD patients report sleep problems more than twice as frequently as healthy control subjects [13]. Sleep disturbances, including insomnia, obstructive sleep apnea (OSA), restless legs syndrome, periodic limb movements disorder, and excessive daytime sleepiness, have been frequently reported in those patients, and they are associated with a negative effect on the quality of life and functional status [14].

A large number of data suggest a bidirectional relationship between OSA and CKD. That is, CKD likely confers an increased risk of OSA, which is related to declining kidney function status, being more prevalent in ESRD patients, compared to CKD patients not on dialysis, and OSA may in turn increase the risk of renal injury [15]. The prevalence of obstructive sleep apnea is higher than in the general population, as reported to occur in at least 50 to 60% of chronic kidney disease patients with ESRD [16, 17]. It affects them tremendously in various ways as the reduction in the airflow occurring during OSA episode leads to acute derangements in gas exchange and recurrent arousals from sleep.

This leads to excessive daytime sleepiness, cognitive impairment, decreased work performance, and fall in health-related quality of life. Also as evidenced by many studies that OSA may contribute to the development of systemic hypertension [18], cardiovascular disease [19], and abnormalities in glucose metabolism [20], as the repeated oxygen saturation drops occurring frequently during sleep, increases oxidative stress, and stimulates the sympathetic nervous system [21].

As a result, OSA may aggravate the medical condition of ESRD patients increasing their mortality rate as proved earlier that cardiovascular disease is the leading cause of death in dialysis patients, and occurrence of sudden death [22] , and the presence of diabetes mellitus and poor glycemic control are often associated with an increase of mortality [23]. So, it is not only affecting their quality of life but also poses a threat to their survival, yet it is undiagnosed in many cases.

Hence, the identification and treatment of OSA or other sleep disorders are of clinical significance, as early intervention can diminish daytime fatigue, enhance physical activity, and thus result in improved metabolic control including glycemic control. Diagnosing OSA is therefore important in the management of HD patients, since it is a treatable condition [24]. The purpose of the current study was to explore whether the patient's undergoing hemodialysis suffer from sleep disorders, aiming to raise awareness across medical disciplines especially nephrologists and providing them with sufficient knowledge to

identify those affected with sleep disorders and implement the treatment in place to enhance their quality of life and improve mortality among those groups of patients by preventing the metabolic derangements caused by OSA. Kidney failure is a condition in which one or both of the kidneys can no longer work on their own. Sometimes, kidney failure is temporary and comes on quickly. Other times, it is a chronic condition that can get worse slowly over a long time. Chronic kidney failure may sound serious, and it is. But treatments such as dialysis and kidney transplant help many people with limited kidney function continue to live fulfilling lives [1].

Dialysis disease statistics around the world. The prevalence of CKD increased from 12% to 14% between 1988 and 1994 and 1999 to 2004 but has remained relatively stable since 2004, and women (15.93%) are more likely to go through stages 1 to 4 of CKD than men (13.52 %)). Prevalence of chronic kidney disease 1-4 by sex. More than 661,000 Americans have kidney failure, of whom 468,000 are on dialysis, and about 193,000 live with an effective kidney transplant. Each year, kidney disease kills more people than breast or prostate cancer.

In 2013, more than 47,000 Americans died of kidney disease. Of these, 468,000 people are on dialysis, and about 193,000 live with an effective kidney transplant. Each year, kidney disease kills more people than breast or prostate cancer. In 2013, more than 47,000 Americans died from kidney disease. Aim of study; To identify sleep patterns for patients undergoing hemodialysis, and to find out the association between sleep patterns for patients undergoing hemodialysis and their socio demographic variables.

2. Methods

2.1. Design of the study

A descriptive (cross sectional) study design was conducted in in Al-Diwaniyah Teaching Hospital from 1 October 2023 until 1 May 2024.

2.2. Administrative Arrangement

This is one of the essential values before data collection; to preserve the participants' principles and self-esteem a researcher gets an agreement from the Nursing College - the University of Al Mustaqbal for conducting the study, other agreement is gotten from the participants patients.

2.3. The Study Sample

Non-probability (convenient) sampling technic used to select 100 patients in dialysis unit in Al-Diwaniyah Teaching Hospital, from 15 January to 15 February 2024.

2.4. The Study Instrument Content

Part1. Socio-demographic and clinical data structured interview:

This includes the following data as age, area of residence, sex, patient's level of education, job, income, social status, number of children, medication used, date of disease diagnosis.

Part1 II: Pittsburg Sleep Quality Index:

The Pittsburg Sleep Quality Index (PSQI) was developed by Buysse and Reynolds (2000) to assess sleep quality and patterns of sleep in the adult over the last month .and reliability of the scale was tested by Reynolds and it was equal to be 0.83.

This tool contains 24 questions; 19 self-rated questions and 5 questions rated by the bed partner or roommate. It differentiates “poor” from “good” sleep by measuring seven domains: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep

medication, and daytime dysfunction over the last month in clinical and nonclinical populations.

In scoring of (PSQI), seven component scores are derived, each scored 0 (no difficulty) to 3 (severe difficulty), the higher scores indicate worse sleep quality. The seven component scores are then added to yield one "global" score, with a range of 0-21 points, "0" indicating no difficulty and 21 indicating severe difficulties in all areas.

2.5. Pilot Study

The pilot study applied on 10 patients from general of sample is excluded from of the present study, it is a mini-study that we do so to know the time required to collect the sample, are the questions and information clear or not, and how much time does it take to interview with the nurse, the aims of pilot study:

- To identify whether respondents comprehend the study tool's questions and their directions throughout the data collection process.
- To ensure the reliability and increase the dependability of questionnaires.
- To determine the time needed to gather the data for every subject.

The findings are obtained from the pilot study show the following:

- The content of the questions is clear and comprehensible for the nurses.
- The study instrument reliability was determined.
- The questionnaire can be completed with (10-15 minutes). All these purposes are accomplished.

2.6. The Study Reliability

Reliability deals with the dependability and consistency of the research instrument to check the variable of interest by use test retest. The reliability of the present study personal correlation coefficient

r = 0.87, determination of reliability of the questionnaire.

The study findings of the questions are displayed, the study instrument is reliable to study a phenomenon on a similar population and in any time of study in the future.

2.7. Data Management and Statistical Analysis:

The data of the study participants were examined for inconsistencies and data entry errors and analysis using the statistical package for social sciences, SPSS, version 25, for windows, Epicalc® 2000 statistical software and Microsoft Excel software version 2013.

Before performing the statistical analysis, all continuous variables including the age, years of service in hospitals, number of working hours /day, daily hours of sleep and hazard scores were tested for normal distribution using the histogram and normal distribution curve plot and all of these variables appeared to follow the statistical normal distribution curve.

2.8. Descriptive Data Analysis and Statistics:

The descriptive statistics were presented as frequencies, percentages, mean, standard deviation and ranges. This analysis was conducted through the following statistical procedures and methods:

1. Frequency distribution tables; using the frequencies and simple percentages, mean and standard deviation and were calculated according to the following equations:
2. Hazard Score Calculation; The hazard scored as one for the presence of hazardous factor and zero for none of each hazard item then the mean total hazard score was calculated out of one;

the higher score value out of one indicated the higher hazardous factor. According to the mean of score, the hazard level evaluated as none (no hazard at all), low hazard level when the mean score was (45-60) or below out of one, moderate hazard (61-75) and high hazard level when the mean score was (76-90).

2.9. Inferential Data Analysis

To assess the association between work related health hazards and other variables of the participated nursing staff, the following statistical tests and procedures were applied: Bivariate Pearson's correlation test was used to test the correlation between hazard score and other continuous variable, while Spearman's test was used to assess the correlation between hazard score and other categorical variables. Level of significance set at (0.05) as cutoff below which the difference or correlation are significant. Finally, the results and findings presented in tables and figures with an explanatory paragraph for each using the Microsoft Word Software 2013.

3. Result

Table 1. Socio-demographic and Clinical Characteristics of Hemodialysis Patients (n = 50)

Variable	Category	N	%
Gender	Male	37	74%
	Female	17	26%
Age (Years)	18 – 39	7	14%
	40 – 60	43	86%
Residency	Province centers	26	52%
	District	14	28%
	Village	10	20%
Living Situation	Alone	3	6%
	Living with family	47	94%
	Living with roommate	0	0%
Marital Status	Single	5	10%
	Married	36	72%
	Widowed / Separated / Divorced	9	18%
Education	Illiterate	13	26%
	Educated	37	74%
Duration of Disease Diagnosis	≤ 5 years	36	72%
	> 5 years	14	28%
Dialysis Duration	< 2 years	37	74%
	2 – 4 years	10	20%
	> 4 years	3	6%
Income Status	Sufficient	23	46%
	Insufficient	27	54%
Self-Classification of Health Condition	Good	6	12%
	Moderate	13	26%
	Bad	31	62%
Other Diseases Present	Yes	30	60%
	No	20	40%

The study included 50 hemodialysis patients from Al-Diwaniyah Teaching Hospital. The majority

were male (74%), and most (86%) were aged between 40–60 years, suggesting that middle-aged adults represent the largest proportion of the hemodialysis population. Regarding residency, 28% lived in district areas, 52% in provincial centers, and only 8% in villages. All participants lived with their families, indicating strong social support, with none reporting living alone or with roommates. In terms of marital status, 72% were married and 10% single, 18% with cases of widowed, separated, or divorced individuals. Educationally, 74% were educated while 26% were illiterate.

The duration since diagnosis showed that 72% had been diagnosed for 5 years or less, and 28% for more than 5 years. In terms of dialysis duration, 6% had been on dialysis for more than 4 years, 74% for less than 2 years, and 20% for 2–4 years. Income status revealed that 46% had a Sufficient income while 54% insufficient income. When asked to classify their health condition, 26% described it as moderate, 62% as bad, and 12% as good. Lastly, 60% of participants reported suffering from other comorbid diseases, highlighting the high burden of additional health conditions in this population.

Table 2. Distribution of the Sample According to Their Responses on the "Daytime Dysfunction"

No.	Item	Rarely F (%)	Sometimes F (%)	Often F (%)	Almost F (%)
1	Difficulty in thinking due to poor sleep	14 (28.0%)	12 (24.0%)	9 (18.0%)	15 (30.0%)
2	Difficulty in concentrating due to poor sleep	19 (38.0%)	11 (22.0%)	12 (24.0%)	8 (16.0%)
3	Increase of mistakes due to poor sleep	28 (56.0%)	10 (20.0%)	9 (18.0%)	3 (6.0%)
4	Irritated feeling due to poor sleep	16 (32.0%)	7 (14.0%)	9 (18.0%)	18 (36.0%)
5	Decrease of interest in work or others due to poor sleep	19 (38.0%)	16 (32.0%)	8 (16.0%)	7 (14.0%)
6	Getting tired easily at work due to poor sleep	23 (46.0%)	5 (10.0%)	13 (26.0%)	9 (18.0%)
7	Sleepiness that interferes with daily life	18 (36.0%)	11 (22.0%)	14 (28.0%)	7 (14.0%)
8	Painful life due to poor sleep	12 (24.0%)	15 (30.0%)	15 (30.0%)	8 (16.0%)
9	Decrease of desire due to poor sleep	22 (44.0%)	9 (18.0%)	11 (22.0%)	8 (16.0%)
10	Increase of forgetfulness due to poor sleep	29 (58.0%)	4 (8.0%)	9 (18.0%)	8 (16.0%)
11	Headache due to poor sleep	21 (42.0%)	13 (26.0%)	7 (14.0%)	9 (18.0%)
12	Decrease of appetite due to poor sleep	21 (42.0%)	11 (22.0%)	14 (28.0%)	4 (8.0%)

Table 2 represents the distribution of patients in the study according to their responses in the "Daytime Dysfunction" domain. The findings indicate that the majority of responses were concentrated under the "Rarely" category, suggesting that many patients experienced only occasional daytime dysfunction related to poor sleep. Specifically, 56% of patients reported a few instances of increased mistakes due to poor sleep, and an equal percentage (56%) reported a few instances of increased forgetfulness. Additionally, 46% of respondents reported getting tired easily at work as occurring rarely, while 44% noted a few instances of decreased desire in daily activities. These results suggest that, although patients undergoing hemodialysis do experience daytime dysfunction due to poor sleep, the frequency is

relatively low in most cases.

Table 3. Distribution of the Sample According to Their Answers on the "Restoration After Sleep" Domain (n = 50)

No.	Item	Few F (%)	Sometimes F (%)	Often F (%)	Almost F (%)
17	Difficulty in getting back to sleep after nocturnal awakening	11 (22.0%)	12 (24.0%)	14 (28.0%)	13 (26.0%)
18	Never falling asleep after awakening during sleep	18 (36.0%)	11 (22.0%)	8 (16.0%)	13 (26.0%)
19	Difficulty in falling asleep	21 (42.0%)	6 (12.0%)	13 (26.0%)	10 (20.0%)
20	Tossing and turning sleeplessly	5 (10.0%)	15 (30.0%)	14 (28.0%)	16 (32.0%)

The results presented in Table 3, which focuses on the "Restoration After Sleep" domain, show that many patients report insufficient restoration after sleep. Specifically, 40% of patients reported rarely experiencing relief from fatigue after sleep, while 22% experienced this occasionally, 22% often, and 16% almost always. In terms of regaining vigor, 48% of patients reported rarely feeling revitalized, with 26% experiencing this sometimes, 20% often, and 6% almost always.

Similarly, 34% of patients stated they rarely felt clear-headed after sleep, 32% experienced this sometimes, 22% often, and 12% almost always. Lastly, 38% of patients reported rarely feeling refreshed after sleep, 32% sometimes, 22% often, and 8% almost always. Overall, these findings suggest that a significant portion of patients undergoing hemodialysis do not feel fully restored after sleep, with many indicating that they experience only limited relief from fatigue, mental clarity, and physical refreshment. This highlights the need for further attention to improving sleep quality and addressing factors that may disrupt restoration during sleep for these patients.

Table 4. presents the distribution of patients in the study according to their responses in the "Difficulty in Falling Asleep" domain.

No.	Item	Few F (%)	Sometimes F (%)	Often F(%)	Almost F (%)
13	Relief of fatigue after sleep	20 (40.0%)	11 (22.0%)	11 (22.0%)	8 (16.0%)
14	Regaining vigor after sleep	24 (48.0%)	13 (26.0%)	10 (20.0%)	3 (6.0%)
15	Clear-headed feeling after sleep	17 (34.0%)	16 (32.0%)	11 (22.0%)	6 (12.0%)
16	Refreshed feeling of body after sleep	19 (38.0%)	16 (32.0%)	11 (22.0%)	4 (8.0%)

Table 4 presents the distribution of patients in the study according to their responses in the "Difficulty in Falling Asleep" domain. The results show that the highest percentage of answers were concentrated in the "few" categories, with 42% of patients reporting difficulty in falling asleep rarely (labeled as "few"). This was followed by 36% of patients reporting rarely experiencing difficulty in falling asleep after awakening during sleep.

Additionally, 32% of patients indicated that they almost always experienced tossing and turning sleeplessly, and 28% reported difficulty in getting back to sleep after nocturnal awakening as occurring often. These results suggest that many patients experience significant disruptions in their sleep, particularly in relation to falling asleep and staying asleep, highlighting potential sleep difficulties in this group.

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Table 5. Distribution of the Sample According to Their Answers on the "Difficulty in Getting Up" Domain (n = 100)

No.	Item	Few F (%)	Sometimes F (%)	Often F (%)	Almost F (%)
21	Wish for more sleep after getting up	9 (18.0%)	16 (32.0%)	16 (32.0%)	9 (18.0%)
22	Difficulty in getting up after sleep	28 (56.0%)	8 (16.0%)	9 (18.0%)	5 (10.0%)
23	Feeling unlikely to sleep after sleep	19 (38.0%)	12 (24.0%)	9 (18.0%)	10 (20.0%)

Table 5. illustrates the distribution of patients' responses regarding the "Difficulty in Getting Up" domain. The data reveals that the highest percentage, 56%, reported rarely experiencing difficulty in getting up after sleep, indicating that more than half of the patients do not frequently struggle with rising after sleeping. However, 38% of patients also reported rarely feeling unlikely to sleep after sleep, suggesting a degree of dissatisfaction or incomplete rest upon waking.

In contrast, the response to "Wish for more sleep after getting up" was more evenly distributed, with 32% selecting sometimes and another 32% selecting often, indicating that a significant portion of patients feel their sleep is not sufficient and wish for additional rest. Overall, while a majority do not frequently face extreme difficulty in getting up, a notable number still experience post-sleep fatigue or a desire for more rest, highlighting issues with the quality or depth of sleep in this population.

Table 6. Distribution of the Sample According to (satisfaction with sleep and difficulty in maintaining sleep) domain. (n = 100)

No.	Item	Few F (%)	Sometimes F (%)	Often F (%)	Almost F (%)
24	Wish for more sleep after getting up	9 (18%)	16 (32%)	16 (32%)	9 (18%)
25	Difficulty in getting up after sleep	28 (56%)	8 (16%)	9 (18%)	5 (10%)
26	Feeling unlikely to sleep after sleep	19 (38%)	12 (24%)	9 (18%)	10 (20%)
27	Satisfaction with sleep pattern	33 (66%)	7 (14%)	4 (8%)	6 (12%)
28	I have deep sleep	29 (58%)	8 (16%)	9 (18%)	4 (8%)
29	I have enough sleep time	25 (50%)	9 (18%)	9 (18%)	7 (14%)
30	I have a clear head after sleep	29 (58%)	4 (8%)	9 (18%)	8 (16%)
31	Waking up easily due to noise	11 (22%)	8 (16%)	14 (28%)	17 (34%)
32	Poor sleep makes my life painful	29 (58%)	4 (8%)	9 (18%)	8 (16%)
33	Waking up during sleep	15 (30%)	10 (20%)	8 (16%)	17 (34%)

Table 6. The results from items 24 to 33 reflect various aspects of sleep quality among patients undergoing hemodialysis. A significant portion of participants reported a desire for more rest upon waking, as seen in item 24 where 32% sometimes and 32% often wished for more sleep after getting up. Although 56% of patients stated they rarely had difficulty getting up (item 25), 38% still reported feeling unlikely to sleep again after waking (item 26), indicating post-sleep dissatisfaction for some individuals.

In terms of overall sleep satisfaction, most patients had a positive perception, with 66% expressing satisfaction with their sleep pattern (item 27), 58% reporting they experienced deep sleep (item 28), and 50% stating they had enough sleep time (item 29). Additionally, 58% said they rarely experienced a lack of mental clarity after sleep (item 30), which suggests a generally restorative sleep for many. However, disturbances during sleep were also notable.

In item 31, 34% of patients reported almost always waking easily due to noise, and a similar percentage (34%) indicated they almost always woke up during sleep (item 33). These findings point to frequent sleep fragmentation among a considerable portion of the sample. Furthermore, 16% of patients stated that poor

sleep almost always made their life painful (item 32), even though the majority (58%) reported this rarely.

Table 7. Distribution of the Sample According to Their Quality of Sleep Levels (n = 50)

No.	Sleep Quality Domain	Low F (%)	High F (%)
1	Daytime dysfunction	37 (74%)	13 (26%)
2	Restoration after sleep	10 (20%)	40 (80%)
3	Difficulty in falling asleep	20 (40%)	30 (60%)
4	Difficulty in getting up	26 (52%)	24 (48%)
5	Satisfaction with sleep and Difficulty in maintaining sleep	10 (20%)	40 (80%)
6	Total Sleep Quality	30 (60%)	20 (40%)

Table 7 illustrates the distribution of patients according to their quality of sleep levels across six key domains. The findings show that the majority of participants experienced low sleep quality in areas such as daytime dysfunction (68%), difficulty in getting up (68%), and difficulty in maintaining sleep (56%). This suggests that many patients struggle with fatigue, sleep continuity, and alertness during the day. Additionally, 52% of participants reported low quality in the difficulty in falling asleep domain, further indicating common issues with initiating sleep.

On the other hand, more positive results were observed in the restoration after sleep domain, where 70% reported high sleep quality, and in satisfaction with sleep, with 76% expressing a high level of satisfaction. These responses suggest that despite some difficulties, many patients feel partially refreshed and generally satisfied with their sleep.

Overall, the total sleep quality score showed that 54% of participants had low sleep quality, while 46% experienced high sleep quality. This indicates that more than half of the patients undergoing hemodialysis are dealing with moderate to significant sleep problems, particularly in terms of daytime fatigue, trouble falling or staying asleep, and challenges with waking, emphasizing the need for targeted interventions to improve sleep health in this population.

4. Discussion of result

The current study explored sleep quality and patterns among 100 hemodialysis patients at Al-Diwaniyah Teaching Hospital, focusing on multiple sleep-related domains and their correlation with patients' socio-demographic and clinical characteristics. According to demographic and Clinical Profile (Table 1):

The demographic analysis revealed a predominance of male participants (60%), with the majority falling in the middle-aged group (40–60 years), accounting for 80% of the sample. This age group is often at higher risk for chronic illnesses such as kidney failure due to cumulative exposure to risk factors like hypertension and diabetes [26]. Regarding residency, 58% lived in district areas, and 34% resided in provincial centers, with only 8% from villages.

This urban predominance might reflect better access to specialized healthcare services such as hemodialysis in city centers. All patients lived with family members, suggesting strong familial support, which is a cultural norm in Iraqi society and may serve as a protective factor against psychological distress [27].

Educationally, 86% were literate, which is encouraging as health literacy is closely linked to better disease management and adherence to treatment protocols. More than half (58%) of patients had been diagnosed within the past five years, while 48% had already been on dialysis for more than four years,

highlighting a diverse range of disease progression and dialysis experience in the cohort. Economically, a significant portion (66%) reported a balance between income and expenses, but 30% experienced more spending than income, suggesting financial strain—often a consequence of long-term illness. Furthermore, a large proportion (80%) reported having other comorbid diseases, confirming the complex health burden that these patients endure [28].

.While in the domain of daytime dysfunction, a key component of sleep quality, the majority of patients reported symptoms as occurring "rarely." For example, 56% rarely made mistakes due to poor sleep, and the same percentage rarely experienced forgetfulness. These findings suggest that, although sleep disruption is present, it may not severely impair daytime cognitive functioning for most patients [29]. However, symptoms like irritability, tiredness at work, and loss of interest in activities were more evenly distributed across the frequency scale, with up to 36% of patients almost always feeling irritable. This variability implies that while some patients adapt well to disrupted sleep, others may experience significant psychological or functional impairment [30].

Otherwise the restoration after sleep domain revealed concerning findings. A substantial number of patients reported only minimal recovery from sleep. For instance, 48% rarely regained vigor, and 40% rarely felt relieved of fatigue after sleeping. This indicates that, despite spending sufficient time in bed, many patients do not feel restored—likely due to the non-restorative nature of fragmented or poor-quality sleep [31].

This lack of physical and mental rejuvenation can significantly diminish overall quality of life and exacerbate fatigue, already a common symptom in patients undergoing dialysis [31].According to table four, sleep initiation and continuity issues were prominent in this group. A significant number of patients (42%) reported difficulty in falling asleep rarely, but others reported it often (26%) or almost always (20%). Similarly, tossing and turning was reported as "almost always" by 32% of the sample. These data suggest that sleep latency (time to fall asleep) and continuity are major concerns [32].

Moreover, 28% of patients experienced difficulty getting back to sleep after nocturnal awakenings often, while 26% almost always failed to fall asleep again after waking during the night. These disruptions reflect possible insomnia symptoms, which are common in hemodialysis patients due to metabolic imbalances, anxiety, and restless leg syndrome [33]. The difficulty in getting up domain presented a mix of responses. While 56% of patients rarely had trouble getting up, others (32%) often wished for more sleep, and 38% rarely felt likely to fall back asleep, indicating a discrepancy between sleep quantity and perceived restfulness. This reflects non-refreshing sleep, a condition where patients technically sleep but do not derive the full restorative benefit [34].

This can lead to ongoing fatigue and decreased motivation, impacting daily functioning, especially for those who need to adhere to strict treatment and dietary regimens.Sleep satisfaction appeared more positive: 66% of patients were satisfied with their sleep patterns, 58% reported having deep sleep, and 50% believed they had enough sleep time. However, this perceived satisfaction contrasts with other data points: 34% woke up easily due to noise, and an equal percentage woke up during sleep almost always—highlighting sleep fragmentation as a real problem [35].

This fragmentation can undermine the perceived depth and quality of sleep and may explain why so many patients desire more sleep upon waking (item 24) or report fatigue despite seemingly sufficient sleep time [36]. When evaluating the six core sleep domains, it became evident that daytime dysfunction was the most impaired (74% low-quality), followed by difficulty in getting up (52%) and falling asleep (40%).

Conversely, restoration after sleep and sleep satisfaction/duration were relatively better, with 80% of participants scoring high in these areas [37,38]. Despite these isolated areas of better perception, the overall sleep quality analysis revealed that 60% of patients had low total sleep quality. This reinforces the

notion that while certain aspects of sleep may be perceived positively (e.g., sleep satisfaction), the broader experience of sleep—its ability to restore, reduce fatigue, and support cognitive function—is often lacking in this population [39,40].

5. Conclusions

60% of participants were classified as having low overall sleep quality. This underscores the widespread nature of sleep disturbances within the hemodialysis population and highlights the critical need for targeted interventions to improve sleep quality, which may in turn enhance patients' overall health and well-being.

6. Recommendations

Based on the findings of this study, the researchers suggest the following recommendations:

1. Given the high prevalence of poor sleep quality, efforts should focus on improving sleep hygiene, addressing factors contributing to poor sleep (e.g., noise, physical discomfort, and comorbidities), and offering targeted interventions to improve restoration after sleep and reduce daytime dysfunction.
2. Education programs on managing sleep quality could be beneficial, particularly in increasing awareness of how sleep quality can impact overall health outcomes.
3. Additionally, considering the comorbid conditions that many hemodialysis patients face, a multidisciplinary approach involving nephrologists, sleep specialists, and mental health providers may be necessary to optimize care.

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