



Original Article

Psychological status and sleep quality among patients undergoing hemodialysis

✉ Mutaz Foad Alradaydeh,¹ ✉ Izzeddin A. Bdair²

¹Department of Community and Mental Health Nursing, Faculty of Nursing, Zarqa University, Zarqa, Jordan

²Department of Nursing, Al-Ghad College for Applied Medical Sciences, Riyadh, KSA

Abstract

Objectives: Patients undergoing renal dialysis complain of several psychological complications and poor sleep quality as a consequence of the procedure. This study aimed to identify the relationship between psychological status and sleep quality among Jordanian patients with end-stage renal diseases who are receiving hemodialysis.

Methods: A descriptive, cross-sectional, and correlational design was used. A convenience sample of one hundred four patients receiving hemodialysis at two main public hospitals in Jordan was enrolled.

Results: Three-quarters of participants reported mild to moderate depression, 63.5% had mild to extremely severe anxiety, and 55.8% had mild to moderate stress levels. The results of the Pittsburgh sleep quality index (PSQI) showed that most patients receiving hemodialysis had poor sleep quality. The results showed a significant correlation between the total global score of sleep quality and stress, anxiety, and depression ($r=0.47, p<0.001$; $r=0.62, p<0.001$; $r=0.49, p<0.001$), respectively. Higher levels of depression, anxiety, and stress were associated with a higher severity of sleep problems.

Conclusion: Poor sleep quality is correlated with patients' psychological outcomes; therefore, healthcare providers need to pay more attention to sleep quality in the assessment and nursing interventions in order to alleviate the levels of depression, anxiety, and stress among patients undergoing hemodialysis.

Keywords: Anxiety; depression; hemodialysis; sleep; stress.

End-stage renal disease (ESRD) is an irreversible stage of kidney failure. According to the ministry of health statistics, more than 5300 patients in Jordan complain of ESRD, and around 98% of them receive hemodialysis treatment.^[1] Hemodialysis causes numerous physical and psychological complications related to changes in personal lifestyles, recurrent hospital admissions, chronic symptoms like pain, diet restrictions, and fear of death.^[2] These complications make patients highly susceptible to several emotional and psychological consequences, including depression, anxiety, and stress.^[3]

Depression is cited as a common psychological complication of hemodialysis therapy, and it was found among 22.8–39% of patients undergoing hemodialysis.^[4] While 21–48% of patients receiving hemodialysis treatment reported severe anxiety and

mild to moderate stress levels.^[5] In Jordan, approximately half of the Jordanian patients receiving hemodialysis treatment complain of different levels of mild to severe depression and have never been screened for depression or received any psychological assessment or interventions.^[6] Moreover, Ahmad and Nazly (2015) found that patients undergoing hemodialysis therapy had high levels of psychosocial stressors related to fatigue, anger, social isolation, or work problems.^[7]

The psychological complications of hemodialysis were associated with sleep disorders.^[8] The sleep disorders among hemodialysis patients include insomnia, sleep apnea, and extreme sleepiness during the daytime.^[9] The prevalence of low-quality sleep among patients undergoing hemodialysis ranged from 24.5% to 83.3%, which was significantly higher than the

Address for correspondence: Izzeddin A. Bdair, Department of Nursing, Al-Ghad College for Applied Medical Sciences, Riyadh, KSA

Phone: 00962785792025; 00966530653727 **E-mail:** iabubdair@gc.edu.sa **ORCID:** 0000-0002-0429-7265

Submitted Date: December 16, 2022 **Revised Date:** June 11, 2023 **Accepted Date:** July 24, 2023 **Available Online Date:** March 29, 2024

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general population.^[10,11] Cengic' et al.^[12] (2012) discussed several factors associated with the high occurrence of sleep disorders among patients undergoing hemodialysis, which included physiological factors (electrolyte disorders, uremic toxins, neuropathy, and chronic pain), psychological factors (worries or fears, and psychosocial problems), and lifestyle factors (sedentary lifestyle, receiving hemodialysis at early morning or late night, long travel and waiting time to hospitals, and dialysis disequilibrium syndrome). However, poor sleep quality may negatively affect patients' emotions, thoughts, and motivations, and it may cause tiredness, difficulty concentrating, and nervousness.^[13,14] In addition, sleep disorders were considered essential determinant factors for overall physical and mental well-being among hemodialysis patients.^[15]

The relationships between sleep quality and psychological status were examined among hemodialysis patients. Trbojević-Stanković et al.^[15] (2014) showed that poor sleepers had higher levels of depression, while Kumar and Sagar (2018) found significantly greater levels of anxiety among patients who had poor sleep quality.^[8] There are limited hospital-based research studies assessing the correlation between psychological status (anxiety, stress, and depression) and specific domains of sleep quality among patients undergoing hemodialysis within the Arabic-Jordanian context. Therefore, the current study aimed to assess the association between anxiety, stress, and depression and the various domains of sleep quality, such as sleep quality, duration, latency, disturbances, efficiency, daytime sleepiness, and usage of sleep medications. The research questions are: (1) what is the level of psychological status (anxiety, stress, and depression) among patients receiving hemodialysis; (2) what is the level of sleep quality among patients receiving hemodialysis; and (3) what is the relationship between psychological status and sleep quality among Jordanian patients with ESRD who are receiving hemodialysis.

The findings of this study may improve psychological functioning and sleep quality, prevent the consequences of low sleep quality among patients receiving hemodialysis, and improve both the quality of nursing care and quality of life and life satisfaction for patients undergoing hemodialysis.

Materials and Method

Design and Setting

A cross-sectional, descriptive, and correlational design was employed to accomplish the study purposes. By the end of 2016, there were 78 hemodialysis working units distributed all over the country and more than 933 hemodialysis machines. Half of the hemodialysis units are administered by the Ministry of Health.^[1] The majority of patients with ESRD and undergoing hemodialysis treatment were located in the central region of Jordan, mainly in Amman city, the capital of Jordan, which includes around half of the Jordanian patients with ESRD. Therefore, this study was conducted in the largest hospitals located in Amman, which consisted of 2334 patients with ESRD.^[1]

What is presently known on this subject?

- Patients undergoing hemodialysis treatment reported high levels of psychosocial stressors.

What does this article add to the existing knowledge?

- The prevalence of anxiety, stress, depression, and low sleep quality is high among Jordanian patients receiving hemodialysis
- The higher levels of depression, anxiety, and stress were linked with the high severity of sleep problems
- Health-care providers focus primarily on physical care, with less attention to psychological assessment and interventions.

What are the implications for practice?

- Nurses should consider the psychosociological status and sleep quality in the assessment and interventions for patients undergoing hemodialysis.
- Nursing interventions like psychological counseling and follow-up could lessen the negative impact of psychological complications.

Sample

The target population was patients with ESRD receiving hemodialysis treatment. According to the Jordanian Ministry of Health, the number of patients receiving hemodialysis was 5352 by the end of 2016. The accessible population was patients undergoing hemodialysis therapy in dialysis departments in Amman province during the data collection, which constitutes more than 45% of Jordanian patients with ESRD and receiving hemodialysis.^[1] A nonprobability convenience sampling technique from two different public hospitals in Amman was utilized. The inclusion criteria were patients who were 18 years old and older, had ESRD and had been receiving hemodialysis for more than 3 months, had the ability to read and comprehend Arabic, and showed agreement to participate in the study.

The sample size was determined using G Power Software,^[16] with a level of significance of 0.05 and a 95% confidence interval. The minimum required sample size was 82 participants. To be more conservative, the researchers added 25% of the expected sample size to overcome the attrition rate. One hundred and four participants contributed to this study.

Ethical Considerations

The institutional review board of the data collection settings approved the study (PDs. 19.13 on September 26, 2019). To safeguard the participants' anonymity, at the beginning of the study, an identification code was allocated to each participant. Researchers informed participants that their participation is entirely voluntary and they can withdraw at any time without any potential risks. All patients' details were saved in electronic versions on the author's computer. The study was conducted in compliance with the Helsinki Declaration.

Data Collection Procedure

Patients receiving hemodialysis treatments at the selected health care centers were invited to participate using invitation cover letters, which included clear information about the study purposes, significance, eligible participants, the estimated time to fill the questionnaire (<10 min), the authors' contact information, and an informing statement that participants' privacy

is protected. Then the researcher checked the patients' files to ensure the inclusion criteria. Then, the self-administered questionnaires were distributed to patients during the hemodialysis session. Appropriate assistance was provided to participants if they faced any difficulty when filling out the questionnaires.

Measures

Two main sections of self-administered questionnaires were used to collect the data. Section one consists of the patients' demographic characteristics (age, gender, educational level, marital status, employment status) and health profile (comorbidity and length of time on dialysis). Part two involves the Arabic version of reliable and valid tools to measure anxiety, stress, depression, and sleep quality.

Anxiety, stress, and depression were measured using the depression, anxiety, and stress scale 21 (DASS 21), a set of three self-report domains designed to measure the negative emotional states of depression, anxiety, and stress over the past week.^[17] Each subscale has seven items with a four-point combined severity/frequency scale ranging from 0 (did not apply to me at all) to 3 (applied to me very much).^[17,18] The total scores for depression, anxiety, and stress were computed by summing the scores for the relevant items for each subscale.^[18] The total scores for DASS-21 were calculated by summing the scores of all items. The internal consistency value for this scale in the current study was 0.88.

Sleep quality was measured using the Pittsburgh sleep quality index (PSQI) to evaluate sleep quality and sleep disturbances.^[18] The PSQI was composed of 18 self-reported questions in addition to 5 items scored by a bed partner or a roommate.^[18] The first four questions included written items about bedtime, sleep latency, sleep duration, and time to wake up. The next 10 questions were on a 4-point rating scale about the frequency of having trouble sleeping related to different causes, while the last four items included subjective questions about sleep quality.^[18] The global score consists of the total scores of all seven domains, and it's ranged from 0 (no difficulty in sleep) to 21 (severe difficulties in all areas of sleep); good sleepers scored five or less, and poor sleepers scored >5.^[18] PSQI has been used among the Arabic-speaking population.^[19]

Data Analysis

SPSS software (version 22) was used to analyze the data. Descriptive statistics (mean, median, and standard deviation [SD]) were used to describe and summarize the main study variables (anxiety, stress, depression, and sleep quality). Frequencies and percentages statistics were used to describe the participants' socio-demographic characteristics and health profiles. An independent sample t-test was used to compare the means of anxiety, stress, depression, and sleep quality according to demographic characteristics. The Pearson correlation coefficient test was used to determine the association between anxiety, stress, depression, and components of sleep quality. The level of significance was set at 0.05.

Results

Participants Demographic Characteristics

The study sample consisted of 104 patients. As shown in Table 1, patients' ages ranged from 22 to 79, with a mean age of 51.2 (SD=14.11). Male patients represented 59.6% (n=62) of the total sample. The majority of participants were married, 82.7% (n=86), while 77% (n=80) of participants were not working or retired. Participants with secondary education or below represented 80.8% (n=84). The patients had received hemodialysis for 6.8 years on average, ranging from 8 months to 23 years; the mean dialysis time was 3 h and 30 min, 3 times weekly for almost all participants.

Participants Psychological Status

The mean total score of the DASS 21 was 36.69 (SD=11.42) out of 63, the median was 38, and the values ranged from 13 to 56. Specifically, the mean score for the depression subscale was 13.10 (SD=4.09), the median was 14, and the scores ranged from 5 to 20. In the anxiety subscale, the mean score was 9.12 (SD=5.29), the median was 10, and the scores ranged from 0 to 20. In the stress subscale, the mean score was 14.48 (SD=4.03), the median was 15, and the values ranged from 6 to 21. The descriptive statistics for the DASS subscales showed that 25% of participants had normal depression levels, and 75% of participants reported mild to moderate depression levels. Normal anxiety levels were found in 36.5% of participants, while 63.5% had mild to extremely severe anxiety levels. Normal stress levels were found in 44.2% of participants, while 55.8% had mild to moderate stress levels. Table 2 shows the levels of stress, anxiety, and depression among study participants.

Table 1. Description of sample characteristics (n=104)

Variable	n (%)	M (standard deviation)
Age		51.2 (14.11)
Gender		
Male	62 (59.6)	
Female	42 (40.4)	
Educational level		
Secondary education or below	84 (80.8)	
University or graduate levels	20 (19.2)	
Marital status		
Married	86 (82.7)	
Un married (single or divorced)	18 (17.3)	
Occupation status		
Working	24 (23)	
Not working or retired	80 (77)	
Medical comorbidity status		
With co-morbid diseases	68 (65.4)	
Without co-morbid diseases	36 (34.6)	
Length of time on hemodialysis (years)		6.8 (5.4)

Table 2. Description of stress, anxiety, and depression among study participants

	Normal	Mild	Moderate	Severe	Extremely severe
Stress	46 (44.2)	34 (32.7)	24 (23.1)	0	0
Anxiety	38 (36.5)	10 (9.6)	40 (38.5)	14 (13.5)	2 (1.9)
Depression	26 (25)	20 (19.2)	58 (55.8)	0	0

Participants Sleep Quality

The mean global score for the PSQI was 11.98 (SD=3.02) out of 21, the median was 12, and the global scores ranged from 7 to 17. However, the highest score on PSQI indicates severe difficulty sleeping. Specifically, the PSQI covers seven domains of sleep quality; the scores of each domain ranged from 0 (no difficulty) to 3 (severe difficulty); the mean score of the habitual sleep efficiency component had the highest value of 2.96 (SD=0.19), while the mean score of the sleep medication component had the lowest value of 0.50 (SD=0.93). Table 3 shows the description of sleep components.

Correlation between Psychological Status and Sleep Quality with Participant Demographics

The results showed significant differences in the mean score of the study variables (anxiety, stress, depression, and sleep quality) in relation to the patients' demographics (Table 4). Female patients displayed higher levels of anxiety and depression $t(102)=-2.28, p=0.033$; $t(102)=-1.68, p=0.04$, respectively. Married patients reported higher levels of stress and depression $t(102)=-2.28, p=0.025$; $t(102)=-2.86, p=0.005$, respectively. Patients who are not working or retired had higher anxiety levels $t(102)=-2.66, p=0.009$. Married patients and not-working or retired patients showed higher levels of total sleep quality disturbances $t(102)=-2.99, p=0.003$; $t(102)=-2.99, p=0.003$, respectively. In addition, the mean total score of sleep quality has no significant differences with gender, educational levels, or co-morbidity status.

Correlation between Psychological Status and Sleep Quality

The Pearson's correlation coefficient test was performed to assess the correlation between stress, anxiety, depression,

and components of sleep quality. The results showed a significant positive correlation between the total score of DASS and the total global score of PSQI ($r=0.627, p<0.001$). Specifically, significant positive correlations were found between the total global score of sleep quality and stress, anxiety, and depression ($r=0.47, p<0.001$; $r=0.62, p<0.001$; $r=0.49, p<0.001$), respectively. Higher levels of stress, anxiety, and depression were associated with a high severity of sleep problems. The correlation coefficient (r) between stress, anxiety, depression, and each component of sleep quality is shown in Table 5.

Discussion

This is the first study addressing the association between psychological status (anxiety, stress, and depression) and sleep quality among patients receiving hemodialysis treatment in Jordan. The results showed that 75% of participants had mild to moderate depression levels. These levels of depression are consistent with the results of earlier studies conducted in Jordan that showed that 78.4–83% of hemodialysis patients had depression in various degrees.^[20,21] The high levels of depression among patients undergoing hemodialysis are caused by a variety of somatic symptoms and a lack of attention to social, occupational, and recreational activities, which negatively impact the quality of life and development of depression.^[22] Furthermore, the high level of depression among patients receiving hemodialysis is expected due to psychological complications of uremia and increased catabolism of amino acids in hemodialysis patients.^[4]

The results showed mild to extremely severe anxiety levels among approximately two-thirds (63.5%) of participants. Anxiety is considered a very common consequence of hemodialysis treatment, which ranged from 21% to 48%,^[3] while the

Table 3. Description of components of sleep quality among study participants

Sleep component	Mean (SD)	Median	Range
Subjective sleep quality	1.63 (SD=0.93)	2.00	0–3
Total sleep latency	2.12 (0.85)	2.00	1–3
Sleep duration	1.85 (1.03)	2.00	0–3
Habitual sleep efficiency	2.96 (0.19)	3.00	2–3
Sleep disturbances	1.27 (0.49)	1.00	1–3
Sleep medication	0.50 (0.93)	0.00	0–3
Day times dysfunction	1.65 (0.73)	2.00	0–3
Total global scores of Pittsburgh sleep quality index I	11.98 (3.02)	12.00	7–17

SD: Standard deviation.

Table 4. Comparison of mean scores of stress, anxiety, depression, and sleep components by demographic variables

Variable	Stress M (SD)	Anxiety M (SD)	Depression M (SD)	Total SQI M (SD)	Subjective sleep quality M (SD)	Total sleep latency M (SD)	Sleep duration M (SD)	Habitual sleep efficiency M (SD)	Sleep disturbances M (SD)	Sleep medication M (SD)	Day times dysfunction M (SD)
Gender											
Male	14.1 (3.9)	8.16 (4.6)	12.4 (4.1)	11.9 (2.9)	1.6 (0.9)	2.1 (0.8)	1.9 (1.0)	2.9 (0.2)	1.2 (0.5)	0.6 (1.0)	1.6 (0.8)
Female	15.1 (4.1)	10.5 (5.9)	14.1 (3.9)	12.0 (3.2)	1.6 (1.0)	2.2 (0.8)	1.7 (1.0)	3.0 (0.9)	1.4 (0.5)	0.3 (0.65)	1.7 (0.6)
Education level											
Secondary or low	14.8 (3.9)	9.6 (5.2)	13.2 (4.2)	12.0 (3.0)	1.6 (0.9)	2.1 (0.8)	1.8 (1.0)	2.9 (0.1)	1.2 (0.4)	0.6 (0.9)	1.7 (0.7)
More than secondary	13.3 (4.4)	7.1 (5.1)	12.5 (3.3)	11.9 (2.9)	1.8 (0.9)	2.2 (0.9)	1.8 (0.9)	2.9 (0.3)	1.5 (0.7)	0.3 (0.6)	1.4 (0.8)
Marital status											
Un married	12.6 (4.3)	9.2 (6.1)	10.7 (4.0)	10.1 (3.3)	1.0 (0.9)	1.6 (0.8)	1.0 (0.8)	2.9 (0.3)	1.2 (0.4)	0.3 (0.4)	2.0 (0.8)
Married	14.9 (3.9)	9.1 (5.1)	13.6 (3.9)	12.3 (2.8)	1.7 (0.9)	2.2 (0.8)	2.0 (0.9)	2.9 (0.1)	1.3 (0.5)	0.5 (1.0)	1.5 (0.7)
Employment status											
Working	13.4 (4.5)	6.7 (4.3)	12.7 (3.8)	10.4 (2.6)	1.2 (0.9)	1.7 (0.7)	1.6 (1.1)	2.8 (0.4)	1.0 (0)	0.5 (0.9)	1.4 (0.8)
Not working	14.8 (3.8)	9.8 (5.3)	13.2 (4.1)	12.4 (2.9)	1.7 (0.9)	2.2 (0.8)	1.9 (1.0)	3.0 (0.0)	1.3 (0.5)	0.5 (0.9)	1.7 (0.7)
Comorbidity status											
No	13.6 (4.3)	7.7 (5.6)	12.3 (4.0)	11.9 (2.6)	1.6 (0.8)	1.9 (0.9)	1.9 (1.0)	2.9 (0.2)	1.3 (0.6)	0.7 (1.2)	1.5 (0.8)
Yes	14.9 (3.8)	9.8 (4.9)	13.5 (4.1)	12.0 (3.2)	1.6 (0.9)	2.2 (0.8)	1.8 (1.0)	2.9 (0.1)	1.2 (0.4)	0.4 (0.7)	1.7 (0.7)

SD: Standard deviation.

higher levels of anxiety were significantly associated with being females, and not working or retired patients. Although the exact cause of anxiety is still not known, some environmental or social factors may trigger the incidence of anxiety disorder, such as having susceptibility inherited, co-morbidity, or having major family problems.^[23]

The results revealed that more than half of the participants had mild to moderate stress levels, which were associated with various physical, pathological, and psychological stressors related to hemodialysis treatment.^[7] The physical stressors include the alteration in daily life, fluid restrictions and diet, fatigue, medications, therapy-related complications, length of treatment and stay, vascular access surgeries, and reduced mobility.^[24] The pathological stressors include body fluid retention, high blood pressure, anemia, renal osteodystrophy, and sexual dysfunction.^[25] While psychological stressors include fatigue, anger, social isolation, and work problems.^[26] However, stressful conditions stimulate the occurrence of psychological stress. Moreover, the stress levels in the current study were consistent with other studies that showed more than 50% of hemodialysis patients had stress levels.^[27,28]

However, the hemodialysis patients who have psychological complications (anxiety, stress, and depression) did not receive enough psychological assessment or interventions, and their medical records showed that they had never been screened for these complications. Furthermore, health-care providers focus only on physical care, with less attention to psychological assessment and interventions in their care plans. However, the prevalence of psychological status among hemodialysis patients in this study highlights the significance of psychological counseling, screening, and follow-up to lessen the severity and impact of psychological complications.

The current study evaluated sleep quality and the results showed that the majority of participants have sleep problems. This finding is greater than the results obtained from other studies, such as.^[11] The high prevalence of sleep problems could be related to different factors, such as lower serum albumin levels, sleep apnea syndrome, bodily pain, and day and night sleep reversal.^[12] Moreover, sleep disturbances and poor sleep quality were associated with stressful states and events associated with the uremic condition.^[14] Furthermore, the patients who have poor sleep quality or sleep disturbances did not exhibit symptoms of these disorders.^[29]

Habitual sleep efficiency was the greatest component of sleep disturbances, which includes small numbers of actual sleep hours and longtime spend in bed due to psychological complications such as anxiety, which leads to arousal tremors, shortness of breath, diaphoresis, and nervousness, leading to poor sleep quality.^[8] On the other hand, the sleep medication component was the lowest component of sleep disturbances because patients did not ask for sleep-induced medication or because they were worried about the side effects of these medications.

The results of the current study have shown a significant cor-

Table 5. Correlation coefficient between stress, anxiety, depression, and the component of sleep quality

	Subjective sleep quality	Total sleep latency	Sleep duration	Habitual sleep efficiency	Sleep disturbances	Sleep medication	Day times dysfunction
Stress	0.39**	0.44**	0.22*	0.30**	0.29**	0.08	0.26**
Anxiety	0.51**	0.59**	0.29**	0.21*	0.32**	0.15	0.35**
Depression	0.44**	0.57**	0.15	0.15	0.13	0.13	0.28**
Total depression, anxiety and stress scale-21	0.53**	0.64**	0.27**	0.26**	0.30**	0.14	0.36**

**Correlation is significant at $p < 0.001$; *Correlation is significant at $p < 0.05$.

relation between psychological status (anxiety, stress, and depression) and sleep quality. The higher levels of psychological complications were linked with higher levels of sleep disturbances among hemodialysis patients, which is consistent with the findings of other studies that found a significant correlation between poor sleep quality and mental health disturbances.^[30] Furthermore, anxiety level had the highest correlation with sleep quality ($r=0.62$). These findings were verified with the aforementioned studies that prove anxiety is one of the predictors of sleep quality because it triggers other symptoms like palpitations, shortness of breath, indigestion, numbness, nervousness, diaphoresis, and fear regarding hemodialysis consequences, and these symptoms are leading to poor sleep quality.^[8]

The specific component of sleep quality had significant correlations with total DASS 21. These findings are in agreement with the results of Firoz et al.^[29] (2019), who showed that depression is increased by low sleep efficiency and low sleep duration due to psychological complications of uremia in dialysis patients. Moreover, it seems that daytime sleep dysfunctions related to low sleep duration are correlated with stress and anxiety levels due to lack of concentration, tremors, nervousness, and shortness of breath.^[8]

Limitation

There are several limitations to this study that we have to highlight. First, although the PSQI is a widely accepted subjective tool for measuring sleeping problems, the study did not include objective sleep measures such as polysomnography. Second, some confounding variables affecting sleep quality were not included in this study such as personality factors, substance use, and other biochemical parameters like serum phosphate, C-reactive protein levels, and hemoglobin levels. Lastly, the convenience sampling method might produce sampling bias that could limit the generalizability of the study findings.

Conclusion

The majority of the participants in the current study have psychological complications as a consequence of dialysis procedures. Almost all participants in the current study suffer from

poor sleep quality. Moreover, the findings of this study are relevant because psychological disturbances and sleep quality could be considered consequences of ESRD. Therefore, enhancing sleep quality by applying special interventions such as relaxation, meditation, and physical exercise based on the patients' ability levels may reduce the severity of psychological complications of hemodialysis and improve the mental health status. Further interventional studies are recommended to understand the effectiveness of nursing intervention programs for improving the psychological status and sleep quality of patients with different cultures and physical conditions.

Ethics Committee Approval: The institutional review board of the data collection settings approved the study (PDs. 19.13 on September 26, 2019). To safeguard the participants' anonymity, at the beginning of the study, an identification code was allocated to each participant. Researchers informed participants that their participation is entirely voluntary and they can withdraw at any time without any potential risks. All patients' details were saved in electronic versions on the author's computer. The study was conducted in compliance with the Helsinki Declaration.

Conflict of interest: There are no relevant conflicts of interest to disclose.

Peer-review: Externally peer-reviewed.

Authorship contributions: Concept – M.R.; Design – M.R.; Supervision – I.B.; Fundings – M.R., I.B.; Materials – M.R., I.B.; Data collection &/or processing – M.R., I.B.; Analysis and/or interpretation – M.R.; Literature search – M.R., I.B.; Writing – M.R., I.B.; Critical review – I.B.

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