Original Research

Comparison of Sleep Quality in Kidney Transplant Recipients vs. Hemodialysis Patients: A Cross-Sectional Study

Marjan Shamspour[1], Najmeh Shamspour[2*], Nazanin Kharazmi[3], Jalal Azmandian[4], Azam Dehghani[5], Mohamad Reza Zare[6]

[1.] *Department of Psychiatry, Hospital Shahid Beheshti, School of Medicine, Kerman University of Medical Sciences, Kerman, Iran*
[2.] *Clinical Research Development Unit, Shafa Hospital, Kerman University of Medical Sciences, Kerman, Iran*
[3.] *Student Research Committee, Afzalipour Faculty of Medicine, Kerman University of Medical Sciences, Kerman, Iran*
[4.] *Physiology Research Center, Institute of Neuropharmacology, Kerman University of Medical Sciences, Kerman, Iran*
[5.] *Clinical Research Development Unit, Afzalipoor Hospital, Kerman University of Medical Sciences, Kerman, Iran*
[6.] *Cardiovascular Research Center, Kerman University of Medical Sciences, Kerman, Iran*

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Abstract

Background and Objective: Determining sleep quality in hemodialysis patients and kidney transplant recipients can provide valuable clinical information for planning treatment and care in this group of patients. Thus, we compared sleep quality between hemodialysis patients and kidney transplant recipients.

Materials and Methods: In this cross-sectional study, 60 transplant patients and 60 hemodialysis patients were selected using convenience sampling method. The Pittsburgh Sleep Quality Index (PSQI) with 89% validity and 86% reliability was used to assess patients' sleep quality.

Results: The mean PSQI score was higher in the hemodialysis group (7.78) than the kidney transplantation group (6.15). This indicates that the sleep quality in hemodialysis patients is worse than in patients after kidney transplantation (P = 0.028). The frequency of poor sleep quality in hemodialysis patients was higher than in kidney transplant patients [50(83.3%) vs. 37(61.7%)].

Conclusion: The results of this study indicate that kidney transplant recipients have better sleep quality than hemodialysis patients.

Keywords: Sleep quality; Kidney; Transplant recipients; Hemodialysis; Sleep; Chronic kidney diseases

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Introduction

Chronic kidney disease (CKD) is a growing disease worldwide, and the need for renal replacement therapy (RRT) increases dramatically each year (1). Among the RRTs, hemodialysis (HD) and kidney transplantation (KTx) are increasingly growing in the world as well as in the Middle East (1, 2). Despite advances in treating HD patients and kidney transplantation recipients (KTRs), their quality of life (QOL) is still lower than the general population (3).

Sleep is a basic human need and one of the essential elements in the circular cycles associated with restoring physical and mental strength. Any disturbance in sleep can cause psychological problems and reduce a person's efficiency (4). Mostly, sleep-deprived patients have more problems in intellectual, social, and occupational functions. Their cognitive function may be impaired. It

** **Corresponding author**: N. Shamspour, Clinical Research Development Unit, Shafa Hospital, Kerman University of Medical Sciences, Kerman, Iran*
Tel: +98 34 31328000, Fax: +98 34 32115803
Email: n.shamspour@kmu.ac.ir

also reduces job satisfaction, resulting in poor performance and increased absenteeism (5).

Patients with CKD often show poor sleep architecture as objectively measured by polysomnography (4). Sleep disturbances are the most distressing symptoms that HD patients experience (6). The prevalence of sleep disorders in this population (50-80 percent) is significantly higher than the general population (5). Although KTx improves several aspects of dialysis patients' problems, the results of sleep quality studies in KTRs have been contradictory (7, 8). The prevalence of poor sleep quality after kidney transplantation was reported as 31% in a study in 2011 (9). Sleep disturbances may be related to transplant outcomes, as sleep influences physiological processes in the body and may impact kidney functioning through altering renal hemodynamics (10).

Therefore, considering the increasing number of dialysis and kidney transplant patients, the limitations and contradictions of the research performed in this field, and the importance of sleep quality in kidney transplantation, we compared sleep quality between HD patients and KTRs.

Materials and Methods

The present study was a cross-sectional study conducted at hemodialysis and kidney transplant centers of Kerman University of Medical Sciences between January 2020 and May 2021. This study was approved by the local Ethics Committee with the Ethical Approval Code of IR.KMU.AH.REC.1398.100. The statistical population included HD patients referred to Kerman HD centers and patients who had received a KTx at the Kerman center and were referred to the clinic for follow-up. The sampling method was convenience sampling. The sample size was calculated to be 50 subjects in each group, using G-power software and considering an alpha = 0.0500 (two-sided), power = 0.8000, P_1 = 0.7950, and P_2 = 0.5100. This number was increased to 60 subjects, considering a 20% loss of samples (11-13).

The inclusion criteria included

1- HD patients who have been on maintenance HD for at least 6 months at least 3 times per week for 4 hours per session,

2- KTRs who had stable graft function 6 months or more post-KTx,

3- Patients were 18 years of age or older, and were willing to participate in the study.

Patients with active psychiatric disorders, drug or alcohol abuse, malignancy, active infection, rheumatoid arthritis, multiple sclerosis (MS), and hearing, speech, or cognitive defects that interfere with their ability to understand and answer questions were excluded from the study. Moreover, patients who worked night shifts and consumed a great amount of coffee and tea (more than 3 cups of coffee and 6 cups of tea per day) were excluded from the study. All participants provided informed consent for participation.

HD patients were interviewed when they came for their dialysis sessions and KTRs when they visited. Then, the demographic characteristics of all participants were entered into the checklist. Sleep quality was determined using the Pittsburgh Sleep Quality Index (PSQI), a score derived from a self-rated questionnaire consisting of 19 questions that assess a wide variety of factors related to sleep quality in the previous month. The PSQI includes the 7 sub-components of sleep duration, sleep disturbance, sleep latency, daytime disturbance, sleep efficiency, overall sleep quality, and use of sleep medications. Each component of sleep receives a score between 0 and 3; a score of 3 indicates the highest disturbance. The total score of the questionnaire ranges from 0 to 21. The validity and reliability of the Persian version of the PSQI were evaluated by Chehri et al. (14). A PSQI score of > 5 is associated with poor sleep quality.

The collected data were analyzed in SPSS software (version 22, IBM Corp., Armonk, NY, USA). We performed a normality test before analysis. The collected data were reported descriptively as mean ± standard deviation and frequency (percentage). To compare the mean of the quantitative variables between the two groups, t-test, chi-square test, and analysis of variance (ANOVA) were used.

Results

In this study, 60 HD patients and 60 KTRs were selected according to the inclusion and exclusion criteria. In terms of gender, in the KTRs group, the number of women was higher than men, but in the HD group, the frequency of men was higher than women. This difference was not statistically significant (P = 0.361) (Table 1). The mean age of the patients in the KTRs group was 38.33 ± 1.65 and in the HD group was 48.83 ± 1.69 (P = 0.001). The frequency of using hypnotic drugs was 6.7% (n = 4) in the KTRs group and 5% (n = 3) in the HD group (P = 0.697).

Table 1. Baseline clinical findings of the study participants

Variable	Category	Group				P-value*
		Kidney transplantation (KTX) (n = 60)		Hemodialysis (HD) (n = 60)		
		f	%	f	%	
Gender	Female	34	56.7	29	48.3	0.361
	Male	26	43.3	31	51.7	
Marital status	Single	18	30.0	13	21.7	0.297
	Married	42	70.0	47	78.3	
Employment	Unemployed	43	72.9	34	56.7	0.098
	Employed	16	27.1	26	43.3	
Education	Illiterate	8	13.2	3	5.0	0.090
	Pre-diploma	8	13.2	9	15.0	
	diploma	24	40.7	18	30.0	
	Associate degree	14	23.7	12	20.0	
	Master's	6	10.2	18	30.0	
Quantitative variables		Mean	SD	Mean	SD	P-value**
Age		38.33	1.65	48.83	1.69	0.001

Data presented as percentage (Number) and age presented as mean ± SD (standard division);
* P-value for kidney transplant recipients vs. hemodialysis patients based on chi-square test
** P-value for age based on independent t-test

As can be seen in table 1, no statistically significant differences were observed between the groups in terms of marital status (P = 0.297), employment (P = 0.098), and education (P = 0.090) (Table 1).

The mean PSQI score in the HD group was significantly higher than the KTRs group (7.78 vs. 6.15; P = 0.028), illustrating its lower QOL. There was a significant difference between the two groups in terms of the components of sleep quality, duration of sleep, and mental quality of sleep. The mean score of sleep duration in HD patients (0.98) was higher than KTRs (0.58), which means that sleep duration in HD patients was shorter than that in KTRs and this difference was statistically significant (P = 0.001). The mean score of mental quality of sleep in HD patients (1.91) was higher than that in KTRs (1.66), which means that the mental quality of sleep in HD patients was significantly lower than KTRs (P = 0.012). The frequency of poor sleep quality was higher in HD patients than KTRs [50 (83.3%) vs. 37 (61.7%); P = 0.008]. Table 2 presents the comparison of sleep quality components between the two groups.

We considered PSQI > 5 as poor-quality sleep. Gender (male/female) and quality (good/bad) are categorical variables, and we used chi-square test to determine statistically significant differences between groups (Table 3). The frequency of poor sleep quality was 37 (61.7%) in KTRs and 50 (83.3%) in HD patients. The frequency of poor sleep quality was higher in HD patients than in KTRs, and this difference was statistically significant (P = 0.008).

In the KTRs group, the frequency of poor sleep quality was higher in women, and married and unemployed people (Table 2). However, this difference was not statistically significant. The mean age of individuals with poor sleep quality was higher than those with good sleep quality (41.24 years vs. 33.45 years); this difference was statistically significant (P = 0.02) (Table 3).

In the HD patients group, the frequency of poor sleep quality was higher in men, and married and unemployed individuals. However, this difference was not statistically significant. The mean age of participants with poor sleep quality was higher than those with good sleep quality (49.84 years vs. 43.8 years); however, this difference was not statistically significant (Table 3).

Table 2. Determining and comparing sleep quality components in Kidney Transplant Recipients and Hemodialysis patients

Variable	Kidney transplant Recipients	Hemodialysis patients	P-value
Mental quality of sleep	1.66 ± 0.07	1.91 ± 0.06	0.012
Delay in falling asleep	1.20 ± 0.21	1.45 ± 0.09	0.290
Duration of sleep	0.45 ± 0.09	1.00 ± 0.11	0.001
Sleep efficiency	0.45 ± 0.08	0.58 ± 0.11	0.356
Sleep disorder	0.83 ± 0.09	0.96 ± 0.03	0.190
Daily dysfunction	0.50 ± 0.08	0.58 ± 0.08	0.500
Total sleep quality score	6.15 ± 0.61	7.78 ± 0.39	0.028

Table 3. Determining and comparing demographic variables based on sleep quality

Items	Groups	Kidney transplant Recipients		Hemodialysis Patients		P-value*
	Subgroups	Poor sleep quality	Good sleep quality	Poor sleep quality	Good sleep quality	
Sleep quality	Percentage (Number)	61.7 (37)	38.3 (23)	83.3 (50)	16.7 (10)	0.008
Gender	Male	35.1 (13)	35.1 (13)	35.1 (26)	50 (5)	0.361
	Female	64.9 (24)	43.5 (10)	64.9 (24)	50 (5)	
P-value**		0.10		0.90		
Marital status	Single	24.3 (9)	39.1 (9)	18 (9)	40 (4)	0.290
	Married	57.7 (28)	60.9 (14)	82 (41)	60 (6)	
P-value**		0.22		0.12		
Employment status	Unemployed	70.3 (26)	77.3 (17)	52 (26)	80 (8)	0.090
	Employed	29.7 (11)	22.7 (5)	48 (24)	20 (2)	
P-value**		0.55		0.56		
Age (year)		41.24 ± 2.15	33.45 ± 2.28	49.84 ± 1.66	43.8 ± 5.83	0.001
P-value**		0.02		0.18		

Data presented as percentage (Number) and age presented as mean ± standard division;
* P-value for kidney transplant recipients vs. hemodialysis patients based on chi-square test and for age based on ANOVA
** P-value for poor sleep quality vs. good sleep quality based on chi-square test and for age based on independent t-test

The age and marital status of the studied groups had a significant relationship with sleep quality (Table 4). All the variables that were significant in the univariate test were entered into the multivariate regression model, none of the variables had a significant relationship with sleep quality.

Discussion

Measuring the quality of sleep in clinical studies creates a closer relationship between the doctor and the patient and the members of the treatment team, including nurses. This issue increases patients' awareness of their illness, their familiarity with their health conditions, and the advantages and disadvantages of different therapies. Chronic diseases, such as chronic kidney failure, have negative impacts on the quality of sleep and ultimately the quality of a person's life. Dialysis and kidney transplant are treatments for end-stage kidney disease. Therefore, we decided to compare the quality of sleep between these two groups.

In this cross-sectional observational study, we found that HD patients had poor sleep quality, as indicated by their PSQI score of 7.78, which significantly exceeded the cut-off point of 5 and was higher than that in the KTR group (6.15). The frequency of poor sleep quality in hemodialysis patients was (83.3%) higher than that in kidney transplant patients (61.7%). The results of the present study are consistent with the results of previous studies on the sleep quality of HD patients and KTRs (5, 6, 11-13, 15). Hasanzaman et al. performed a study on the sleep quality of 40 HD patients on the waiting list for KTx and reported the frequency of poor sleepers to be 37.5%, 37.5%, and 20.0% before the kidney transplantation, and 3 months and 6 months after the surgery, respectively (7).

Hasanzaman et al. found a significant relationship between gender and sleep quality before surgery, while in the hemodialysis patients in our study, there was no significant relationship between gender and sleep quality. In the study by Chughtai et al., the PSQI was used to assess 40 KTRs and HD patients. They found that the incidence of poor sleep was much higher in patients with HD (80%) when compared with KTRs (37.5%) (7). This was in line with our study findings. Liaveri et al. evaluate the self-reported quality of sleep, particularly insomnia problems, among KTRs in comparison to HD patients and participants with normal renal function through the administration of the Athens Insomnia Scale (AIS). They concluded that KTRs and HD patients had a lower quality of sleep compared to participants with normal renal function (8).

Table 4. Examining predictors of sleep quality in logistic regression test

Items	Crude			Adjusted		
	OR	P-value	95% CI	OR	P-value	95% CI
Groups	0.32	0.009	0.13-0.75	0.60	0.30	0.22-1.59
Sex	1.47	0.34	0.66-3.30			
Age (year)	0.94	0.002	0.91-0.97	0.95	0.056	0.91-1
Marital status	0.4	0.04	0.16-0.95	1.04	0.95	0.29-3.62
Employment status	0.42	0.058	0.16-1.03	0.45	0.12	0.16-1.24

Brekke et al. evaluated 301 HD patients, of which 110 patients who underwent kidney transplantation were evaluated for sleep quality before and after transplantation (6). They concluded that sleep quality improved after KTx in nearly half of the patients, but poor sleep quality was prevalent in KTRs (6). Finally, in all these comparative studies, similar to our study, the quality of sleep in the KTRs group was better. Although the prevalence of sleep deprivation varied depending on the study population, the average PSQI score in all four studies and our study was about 6.

Other studies focused on a single group of HD patients or KTRs. In the study by Ozer et al. on 64 KTRs, 30% of patients had poor sleep quality, which was less than that in our study (16). Pourfarziani et al. evaluated sleep disorders in 39 KTRs using the PSQI to evaluate sleep quality (17). They reported a prevalence of 67% for poor sleep quality, which was similar to our study (17). This finding in our study and similar studies in Iran shows that the prevalence of poor sleep quality may be higher in Iran, especially in centers other than Tehran (Tehran is the capital of the country), due to more difficult access to medicine and treatment, which is a concern for KTRs. A systematic review and meta-analysis evaluated 21 articles on sleep quality in dialysis patients and the prevalence of poor sleep quality in hemodialysis patients was 75.30% (12). In a study in Qatar on 253 HD patients who underwent peritoneal dialysis, 83.8% had sleep disorders (18).

A 2020 study found that the overall prevalence of patients with sleep disturbances in the non-dialysis stage, 3-5 CKD population, with a mean eGFR of 32.4 ± 15.7 ml/min/1.73m^2 was 66.4% (19). A systematic review that reviewed 35 articles showed that the prevalence of poor sleep quality was 53.2% in CKD patients, 60.2% in HD patients, and 30.3% in KTRs. They concluded that the prevalence of sleep disorders is even higher among dialysis patients and is partially normalized after kidney transplantation (20). Although the quality of sleep in KTRs is lower than in HD patients, it still seems to be a significant problem in kidney transplant patients.

Our study had some limitations. Due to the nature of cross-sectional studies, the cause and effect relationship is not specified in these studies. The most important limitation was the age mismatch between the two groups. KTRs were significantly younger, which effectively reduces the prevalence of poor sleep quality in the KTRs group as a confounding factor. Moreover, a greater sample size can increase study power. It seems that in future research laboratory data and the causes of sleep disorders should be examined concurrently.

Conclusion

The results of this study indicate that KTRs have better sleep quality than HD patients, but the prevalence of poor sleep quality in KTRs is still high.

Conflict of Interests

Authors have no conflict of interests.

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