

# Comparing Sleep Quality in Patients Before and After Kidney Transplantation

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**Keywords.** transplantation, end-stage renal disease, sleep quality

**Introduction.** The purpose of the present study was to identify the prevalence of sleep disturbances in ESRD, and to compare the sleep quality before and after kidney transplantation.

**Methods.** A semi-experimental study was performed on 40 participants with ESRD from September 2017 to September 2018 in Mashhad, Iran. Participants were in the waiting list of kidney transplantation, aged 18-years-old or more, had no history of any major psychological problems. They were excluded from the study if new medical condition or psychiatric disorder was initiated throughout the study. Patients' medical information including the duration of dialysis and laboratory data was extracted from medical records. Their sleep quality was assessed with the Pittsburgh sleep quality index (PSQI) within 1-month prior the kidney transplantation and at the 3<sup>rd</sup> and 6<sup>th</sup> months after it. Collected data was analyzed using SPSS-16.  $P < .05$  considered as significant.

**Results.** The frequency of poor sleepers was 37.5%, 37.5%, and 20.0%; before the kidney transplantation, 3 months and 6 months after the surgery; respectively. The average sleep quality score decreased significantly 6-month post-operation compared to pre-transplant phase ( $P < 0.05$ ). We found a significant relationship between the gender and quality of sleep before transplant surgery, whereas no correlation was found between sleep quality and the age, type or duration of dialysis, serum phosphorus or hemoglobin level, and the cause of kidney failure ( $P < .05, > .05, > .05, > .05, > .05, > .05, > .05$ ; respectively).

**Conclusion.** Kidney transplantation has a positive effect on patients' sleep quality after 6 months.

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## INTRODUCTION

Sleep disorders are more common among patients with chronic kidney disease (CKD) than in the general population.<sup>1</sup> According to several studies, the rate of different sleep disturbances in this group of population is as high as 80%, and the most frequent complaints of patients are insomnia, daytime sleepiness, restless legs syndrome, frequent waking up during the night and nightmares.<sup>2,3</sup> Although sleep disorders are divided into various

categories based on different classification systems, according to numerous epidemiological studies, a considerable proportion of people suffer from dissatisfaction with the quality of sleep.<sup>4</sup> Several factors contribute to sleep disturbances in CKD patients, such as uremia, anemia, and malnutrition.<sup>5</sup> Since lots of these factors are supposed to resolve after successful kidney transplantation, it is suggested that kidney transplantation may be associated with improvement in sleep quality

of recipients.<sup>6,7</sup> However, some studies have shown that complaining of sleep disorders do not always resolve with kidney transplantation.<sup>8</sup> Failure to address sleep disorders in recipients could be related to several causes, such as side effects of immunosuppressive drugs, surgical stress, decreased postoperative physical activity, increased fluid intake, or nocturia.<sup>9</sup>

It has been shown that in CKD patients, sleep problems not only reduce the quality of life but also increase cardiovascular mortality.<sup>10,11</sup> Therefore, understanding about the proportion of the patients suffering from sleep disturbances which need proper medical intervention, and exploring the factors affecting sleep disorders in order to correct them could be helpful for clinicians in order to provide more accurate care for their patients. Hence, the present study was conducted to determine the prevalence of sleep dissatisfaction in CKD patients before and after successful transplant surgery along with surveying some possible risk factors of sleep problems in this group of population.

## MATERIALS AND METHODS

This was a semi-experimental study, which was performed on 40 participants with end-stage renal failure in Montaserieh hospital from September 2017 to September 2018. The Montaserieh hospital is located in Mashhad, second largest city of Iran, and is a specialized center for patients suffering from different end-stage organ failures, especially end-stage renal disease. This hospital provides various special services, such as dialysis or kidney transplantation for patients with chronic kidney diseases. Based on the Inclusion criteria, study participants were selected from patients with end-stage renal failure and wait listed for kidney transplantation, aged 18-years-old or more, with no history of any major psychological problems. Patients with the history of hospitalization in the last 4 months due to any medical condition were not enrolled in the study. Examination of the mental status of participants and obtaining their psychiatric history was performed by a psychiatrist who was in charge of following up the participants through the study, especially after transplantation, to rule out the initiation of any major psychiatric disorder. Participants who developed psychological abnormalities have been excluded from the study.

All participants entered the study voluntarily

after signing a written informed consent. For all participants, two questionnaires were filled out. The first questionnaire was Patient Information Checklist (PIC) consisted of participants demographic variables including age, gender, their address and preferred way to be connected with, and their medical information including the duration of dialysis, laboratory data, past psychiatric history and brief mental status examination (including assessment of mood, affect, thought content, consciousness, orientation, memory and judgement). The second questionnaire was the Pittsburgh Sleep Quality Index (PSQI) questionnaire. PSQI is a standardized sleep questionnaire which could be used in different populations, even in severely ill patients and in many settings, such as clinical and research ones.<sup>12</sup> The questionnaire has seven components to assess different sleep dimensions over the past month. The sum of their scores makes the global PSQI score. The participants score the questionnaire on a Likert scale from 0 (best condition) to 3 (worst condition), so the minimum global score is 0, and the maximum is 21. A global PSQI score over five is associated with poor sleep quality.<sup>13</sup>

Researchers filled-up the PIC based on history taken from the participants, their medical examination, previous medical and psychiatric history and their medical records and asked the participants to fill-up PSQI three times, within 1-month before the transplantation and in the 3<sup>rd</sup> and 6<sup>th</sup> months after it in order to understanding the changes of sleep quality throughout the study. As one of the researchers of the study were an internist who was in charge of the CKD patients, the participants not only were monitored during the waiting period before kidney transplantation but also they were followed up after transplant surgery for any unwanted complications. Participants were excluded from the study if any new medical condition affected their sleep cycles.

Collected data was analyzed by Fisher's Exact test, Pearson Chi-square test, Paired samples t-test, and Wilcoxon signed ranks test using SPSS 16. The Level of significance was considered at less than .05.

## RESULTS

A total of 40 patients under dialysis were enrolled in this study, with the mean age of  $36.6 \pm 11.1$  years, minimum age of 19 and the maximum age of 65.

Patients' characteristics are described in Table 1. As it is shown in the table, the majority of participants were male and under hemodialysis before the transplant surgery (67.5% and 90.0%, respectively). According to their medical history, hypertension, diabetes mellitus, and glomerulonephritis accounted for 52.5% of the etiologies of the end-stage renal disease, and more participants were transplanted from deceased donors (80%). Comparing the mean sleep quality scores in three phases of the study revealed that the average sleep quality score which showed no significant changes between the first and second phases of the study ( $P > .05$ ), decreased significantly in the third phase (6-month post-transplantation) in comparison to both pre-transplant and 3-month post-transplant phase ( $P < .05$  and  $< .05$ , respectively) (Table 2). Diagram shows the frequency of participants who scored above the baseline in PSQI total score and its subscales in three phases of the study. According to the data, the rate of participants who have PSQI total score of more than 5, which defines the poor sleep quality, was 37.5%, 37.5%, and 20.0% prior the transplantation; 3 months after successful transplantation and 6 months after it, respectively; which shows no changes have happened in the number of participants reported better sleep quality throughout the study until the

**Table 1.** Demographic, Medical Characteristics, and PSQI Scores of Participants of the Study

| Variable                      | Frequency   |
|-------------------------------|-------------|
| Mean Age (years)              | 36.6 ± 11.1 |
| Gender                        |             |
| Female                        | 13 (32.5%)  |
| Male                          | 27 (67.5%)  |
| Type of Dialysis              |             |
| Hemodialysis                  | 36 (90%)    |
| Peritoneal Dialysis           | 4 (10%)     |
| Cause of ESRD                 |             |
| Hypertension                  | 7 (17.5%)   |
| Diabetes Mellitus             | 8 (20%)     |
| Glomerulonephritis            | 6 (15%)     |
| Others                        | 19 (47.5%)  |
| Type of Donor                 |             |
| Live                          | 8 (20%)     |
| Deceased                      | 32 (80%)    |
| Mean PSQI Score               |             |
| Pre-transplant Phase          | 5.2 ± 3.5   |
| 3-month Post-transplant Phase | 5.2 ± 4.1   |
| 6-month Post-transplant Phase | 3.3 ± 3.8   |

ESRD, end stage renal disease; PSQI, Pittsburgh sleep quality index

**Table 2.** Comparison the Mean Sleep Quality Index Scores of Participants Between 3 Phases of the Study

| Variable                                                                              | t/z*  | P     |
|---------------------------------------------------------------------------------------|-------|-------|
| Quality of Sleep                                                                      |       |       |
| Comparison Between Pre-transplant and 3-month Post-transplant Measurement**           | -0.04 | > .05 |
| Comparison Between Pre-transplant and 6-month Post-transplant Measurement***          | -2.80 | < .05 |
| Comparison Between 3-month Post-transplant and 6-month Post-transplant measurement*** | -2.90 | < .05 |

\*t for paired samples t-test and z for wilcoxon signed ranks test

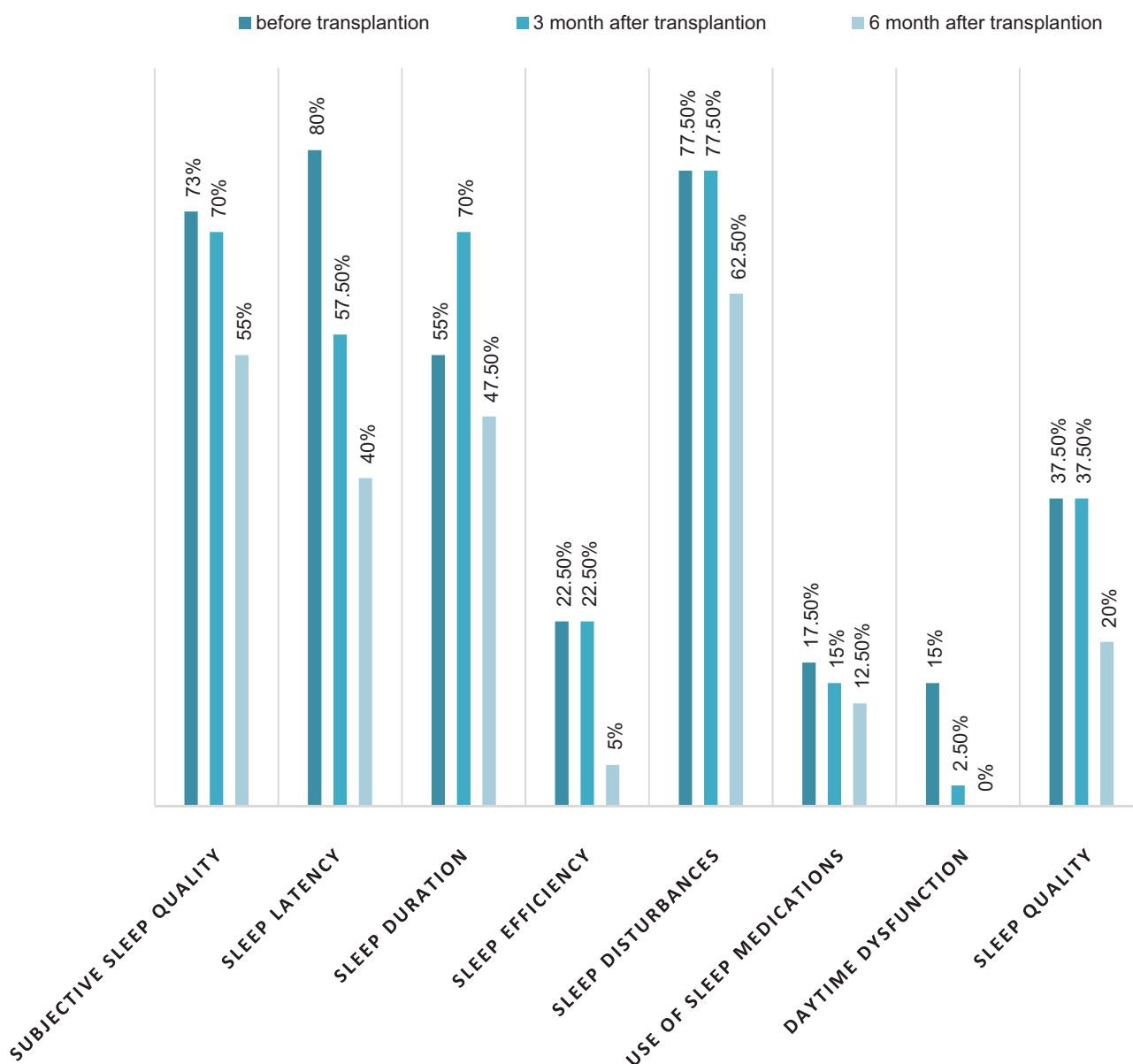
\*\*Using paired samples t-test

\*\*\*Using wilcoxon signed ranks test

second follow up assessment on the 6 months after successful surgery. Evaluating the effect of some important clinical and demographic characteristic on the sleep quality of participants has been shown in Table 3. According to this table there was no significant relationship between the age, type of dialysis, duration of dialysis, serum phosphorus level and serum hemoglobin level with sleep quality ( $P > .05$ ,  $> .05$ ,  $> .05$ ,  $> .05$ , and  $> .05$ ; respectively); however, a significant relationship was found between gender and the quality of sleep ( $P < .05$ ).

## DISCUSSION

In the present study, the effect of kidney transplantation on the quality of sleep in CKD patients was analyzed. According to the study, the mean sleep quality score changed from  $5.2 \pm 3.5$  to  $5.2 \pm 4.1$  within 3 months after kidney transplantation which shows no significant recovery in sleep quality 3 months after transplant surgery. Considering the effect of surgery and the anxiety of possible rejection of the transplantation, along with the use of immunosuppressive drugs and patients' life modifications such as temporary job withdrawal, limitation in communication with friend and families or financial issues, non-improvement in sleep quality index could be justified. However, a significant reduction in sleep quality scores of patients were observed at the 6-months follow-up assessment which shows that kidney transplantation has had a positive effect on patients' sleep quality after 6 months. It seems that patients' physical and mental recovery process needs a relatively long time and could not be achieved immediately after the surgery. Improvement of sleep parameters has been reported in some other studies, especially in patients suffering from sleep



The frequency of participants who have problem in different PSQI subscales and its total score (sleep quality) in three phases of the study.

breathing disorders prior to transplant surgery.<sup>14</sup> However, in some other studies; it was reported that kidney transplantation had not affected the quality of sleep during a 1-year follow-up period.<sup>15</sup> Several studies have assessed the prevalence of sleep disturbances in dialysis patients and reported the prevalence in the range of 64-87%.<sup>2, 16-8</sup> In our study, the frequency of poor sleep quality in dialysis patients was 37.5% which was lower than similar studies. Still, according to the PSQI subscales, 73% of patients complained of moderate to severe problems in subjective sleep quality, 80% had prolonged sleep latency and 77.5% suffered

from some sleep disturbances such as nightmares, breathing difficulties or discontinuation of sleep (Diagram). Considering PSQI subscales, the rate of sleep disorders in patients of the present study is in the range of other studies.

Based on the results of our study, no significant relationship was found between the participants' age cause of renal failure, serum hemoglobin or phosphorus levels, and type or duration of dialysis with the prevalence of sleep dissatisfaction. Although the limited number of patients participated in the study makes it difficult to interpret the findings, especially in parameters such as the type

**Table 3.** The Relationship Between Clinical and Demographic Characteristic of Participants with Their Sleep Quality Index Before Kidney Transplant Surgery

| Variable                | PSQI     |            | P        |
|-------------------------|----------|------------|----------|
|                         | ≤5       | >5         |          |
| Gender                  |          |            |          |
| Male                    | 14 (56%) | 13 (86.6%) | 0.046*   |
| Female                  | 11 (44%) | 2 (13.4%)  |          |
| Age, y                  |          |            |          |
| > 34                    | 10 (40%) | 9 (60%)    | 0.220**  |
| ≤ 34                    | 15 (60%) | 6 (40%)    |          |
| Type of Dialysis        |          |            |          |
| Hemodialysis            | 21 (84%) | 15 (12.5%) | 0.067*   |
| Peritoneal Dialysis     | 4 (16%)  | 0 (0%)     |          |
| Duration of Dialysis, y |          |            |          |
| < 2                     | 4 (16%)  | 3 (20%)    | 0.624*   |
| 2 - 5                   | 17 (68%) | 8 (53.3%)  |          |
| ≥ 5                     | 4 (16%)  | 4 (26.7%)  |          |
| Cause of ESRD*          |          |            |          |
| Hypertension            | 6 (24%)  | 1 (6.7%)   | 0.081    |
| Diabetes Mellitus       | 2 (8%)   | 6 (40%)    |          |
| Glomerulonephritis      | 4 (16%)  | 2 (13.3%)  |          |
| Others                  | 13 (52%) | 6 (40%)    |          |
| Serum Phosphorus, mg/dL |          |            |          |
| ≤ 5                     | 23 (92%) | 12 (80%)   | 0.345**  |
| > 5                     | 2 (8%)   | 3 (20%)    |          |
| Serum Hemoglobin, mg/dL |          |            |          |
| ≤ 10                    | 10 (40%) | 7 (46.6%)  | 0.680*** |
| > 10                    | 15 (60%) | 8 (53.3%)  |          |

\*End Stage Renal Disease

\*\*Fisher's Exact test

\*\*\*Pearson Chi-square test

of dialysis with only 4 participants were under peritoneal dialysis, according to our research, no determinant for predicting the quality of sleep in patients under dialysis was identified. To date, many studies have obtained similar results, and efforts to identify any prognostic factor for sleep quality or any other factors to discriminate good sleepers from poor sleepers in CKD patients have not been successful yet. In a study which was done by Eduard *et al.* on 120 patients with renal failure, the researchers found no significant correlation between age, gender, serum hemoglobin and phosphorus levels with sleep quality of patients, either.<sup>19</sup> Eryavuz and colleagues studied 102 patients under hemodialysis and peritoneal dialysis and reported that sleep disturbances were high in both groups.<sup>20</sup> In the study of Huis *et al.* which was published in 2000, 77% of patients with peritoneal dialysis complained of daily sleepiness,<sup>21</sup> while in the study of Walker's *et al.* from 64 patients undergoing hemodialysis, 83 percent suffered from sleep disorders;<sup>22</sup> yet, both studies supported

the high prevalence of sleep disturbances among CKD patients. Our study showed that there is no significant relationship between the cause of renal failure and the quality of sleep; however, in the study of Ameli and colleagues, patients with impaired renal failure due to hypertension found to have poorer sleep quality.<sup>23</sup>

## CONCLUSION

The prevalence of sleep problems is high among CKD patients, and could be related to several factors that affect the normal physiology of the patient. Unfortunately, kidney transplantation cannot resolve sleep disorders in many patients. Therefore, clinicians should pay enough attention to other factors which may have possible effects on the sleep cycle such as the psychological state of the patients, physical conditions after transplant surgery, and side effects of medications.

## LIMITATIONS

Further investigations with larger sample size,



longer follow-up period, and controlling more confounding variables are suggested.

### CONFLICT OF INTEREST

This study was financially supported by vice chancellor of Mashhad University of Medical Sciences. The authors declare that they do not have any conflict of interest with the results.

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