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Exploring the Burden of Sleep Disorders on Daily Functioning and Well-Being in Hemodialysis and Post kidney Transplant Patients

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ABSTRACT

Background: Sleep disorders are widely recognized as common in people with end-stage kidney disease and may persist following kidney transplant affecting physical functioning, emotional well-being and general quality of life. This paper examined the prevalence of sleep disorders among hemodialysis patients and those patients who, after receiving kidney transplant treatment, were treated at tertiary care hospitals.

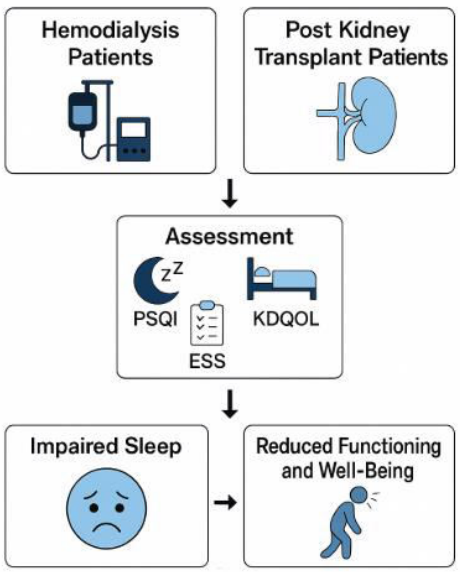
Methods: The pilot study was a cross-sectional study that took place among twenty adult participants (n = 20): ten on maintenance hemodialysis and ten following kidney transplantation. To determine sleep quality, daytime sleepiness, and day-to-day functioning and well-being standardized tools were used such as the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS), and brief functioning and well-being KDQOL domains questionnaire. Medical records were used to retrieve clinical and demographic data.

Findings: The quality of sleep in hemodialysis patients was found to be poorer and the scores of ESS were higher than those of the post-transplant patients. Sleep problems were closely related to poor energy levels, inability to concentrate, and difficulty carrying out regular duties across the sample. Despite the improvement in the sleep parameters of post-transplant patients, two patients still had clinically significant disturbances that affected the psychosocial well-being.

Conclusion: Within this small pilot sample, there was a prevalence and clinically significant sleep disturbances in both the hemodialysis and post-transplant groups. Timely diagnosis and intervention can be useful in enhancing functioning and well-being throughout the renewal replacement therapy system.

KEYWORDS: Hemodialysis, sleep disorder, PSQI, Quality of life, KDQOL, chronic kidney disease

Graphical Abstract



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INTRODUCTION

It is now known that sleep disorders have become a serious but undervalued complication in patients with chronic kidney disease (CKD), especially those who are in hemodialysis (HD) and those who have had kidney transplants. Insomnia, obstructive sleep apnea, restless legs syndrome and excessive daytime sleepiness are among the sleep disturbances that are experienced by up to 80% of patients subjected to long-term dialysis treatment which is significantly higher than the figures experienced by the general population [1]. The causes of these conditions are a complicated interplay between physiological, biochemical and psychosocial factors such as accumulation of uremic toxins, chronic inflammation, anemia, disturbed circadian rhythms, fluid overload and stress factors related to treatment [2]. Although there could be advances in the renal replacement therapies, sleep disturbance is recurrent and severe impairing the normal daily functioning and worsened quality of life.

Outcome measures which are essential to patients with advanced kidney disease include daily functioning and overall well being. Lack of sleep quality was significantly related to fatigue, cognitive, physical flexibility, and emotional distress that undermine the quality of participation in daily activities and self-management practices [3]. There are indications that patients in hemodialysis have had notable impairments because of heavy treatment routines, constraints on fluid intake and the impact of life-long therapy, which increases the impact of prior sleep disorders [4]. Also associated with more hospitalization rates, more symptoms burden, and poor social functioning, disrupted sleep is a critical issue as a clinical priority [5].

Kidney transplantation, though it normally enhances the survival and enlists more independence, does not in all cases solve the sleep related issues. Long-term immunosuppressive therapy, metabolic abnormalities, persistent anemia, and psychological stressors related to graft survival may continue to cause sleep disturbances in post-transplant patients [6]. Research has shown that despite effective transplantation, to 40 percent of recipients, persistent sleep problems, which are closely linked to fatigue, mood swings, and lower quality-of-life scores have still been experienced [7]. It indicates the necessity of comparative studies that will determine the different effects of sleep disorders along the continuum of HD and post-transplant settings.

Sleep disorders do not just affect physical symptoms but also affect the psychosocial and emotional skeletal strength. The conditions of anxiety, depression, and low life satisfaction are prevalent among both HD and post-transplant populations and enhanced by the chronic sleep disruption [8]. In tertiary care departments, patients can mostly turn up with several comorbidities and complicated health histories, and therefore, the initial identification of sleep issues is crucial in the comprehensive care of the kidneys. Though, it is often under-diagnosed and untreated in clinics dealing with nephrology, just because it has conflicting clinical needs, and they are unaware of the impact of these disorders on its functionality. A scale of the quality of life of HD and transplant patients is assessed with the assistance of the Kidney Disease Quality of Life (KDQOL) scale used to estimate physical, emotional, and social functioning and disease-specific distress. In the past research, practitioners have continuously demonstrated the presence of moderate, or robust relationships between low PSQI scores and low scores in KDQOL outcomes, which reveal the major position of sleep in defining the wellness of patients [9].

On these grounds, it is essential to investigate the sleep disorder burden on hemodialysis and post-kidney transplant patients in order to inform specific interventions and holistic care models development. Knowledge of the issue of sleep disorders on the quality of everyday activities and well-being may help to create comprehensive approaches to management, such as behavioral therapy, dialysis prescriptions, drug changes, and sleep-oriented education. This evidence is particularly critical in a tertiary care unit that has a significant resource base, with multidisciplinary teams and individualized evaluation being the core principles of patient outcome improvement.

The proposed research seeks to fill the gaps by investigating the prevalence and functional effects of sleep disorders in a sample of hemodialysis and post-transplant patients, tertiary care hospitals in the context of enhancing clinical awareness of sleep and informing future studies on pathways of sleep-centered care.

The researched measures are validated measures used to measure the sleep quality and QoL which are examined through correlation procedures to evaluate the strengths of relationship existing in PSQI scores and KDQOL domains. The study can assist in further assessment of sleeping-related issues in the populations of kidney disease in estimating the trends of impairments in the physical, emotional and social levels. Ultimately, the conclusions of this research can be employed to provide the use of sleep assessment as a care standard and highlight the importance of patient interventions that improve overall well-being in HD and the transplant patients.

1.1 Aim of the Study

This study will be undertaken in order to examine the morbidity of sleeping disorders and the impact it has on the normal functioning and quality of life of post-kidney donor recipients and patients under hemodialysis. Specifically, the study will provide the measurement of the quality of sleep through the standardised scores, take into account the key domains of functioning, namely physical, emotional and social and determine the degree of connections between the quality of sleep and the quality-of-life indicators within each patient group.

LITERATURE REVIEW

Sleep disorders are circumstances that are prevalent and have been ignored as complications affecting persons with advanced kidney disease, especially those under long-term conditions known as hemodialysis (HD) and individuals who have had kidney transplantation. Insomnia, restless legs syndrome, circadian disruption and sleep-disordered breathing are very common among these populations as well as are much higher than the general population [10]. The etiology is multifactorial, which includes metabolic imbalances, uremic toxin retention, inflammation, stress associated with treatment, and psychosocial causes, which are

reflected by the presence of chronic disease [11]. Therefore, sleep trouble has a significant impact on both the physical functioning, cognitive ability, and emotional status of patients.

Patients of hemodialysis are particularly susceptible, as they have to observe strict treatment plans, limit fluid consumption, and diet, and endure chronic fatigue caused by renal disease end-stage. Research has also revealed that low sleep quality among patients of HD correlates with low levels of vitality, reduced levels of an activity, as well as with an accumulation of symptoms, which represent significant obstacles to a desirable quality of life [12]. In addition, insufficient sleep has also been associated with increased hospitalization and negative clinical outcomes, which has made it applicable in just ordinary renal care [13].

However, in contrast, kidney transplantation tends to have a better metabolic condition and increased independence as a result; nevertheless, sleep issues can still be experienced despite the renal performance recovery. Ongoing sleeping problems among transplant patients are usually predetermined by immunosuppressive drugs, fears of losing the graft and the residual comorbid conditions [14]. These issues remain unresolved to this day and they are impacting everyday functioning, the performance in the workplace, and the general well-being showing that transplantation does not completely address the problems associated with sleep [15]. Since insufficient sleep has functional and psychosocial consequences, it is necessary to learn the burden of sleep disorders among groups with HD and post-transplant. Comparative studies can inform the creation of specific interventions, streamlined patient care, and elaborate care approaches in tertiary healthcare settings [16].

MATERIALS & METHODS

This figure 1 shows the general workflow of the study to examine sleep disorders among the patients of hemodialysis and post-kidney transplant. It starts with the research design, which spells out the research framework and objectives. The second step involves the identification of the groups of the participants, which includes 20 people, who are equally split into two populations, that is, hemodialysis versus transplant. Validated instruments like PSQI, ESS and KDQOL are then implemented as inclusion and exclusion criteria. Collection of data occurs next and it includes variable in the form of answering questionnaire and obtaining pertinent clinical data. Collected data are subject to statistical analysis to compare the results of groups. Lastly, the process culminates in the study findings in the form of summary of sleep burden and functional influence.

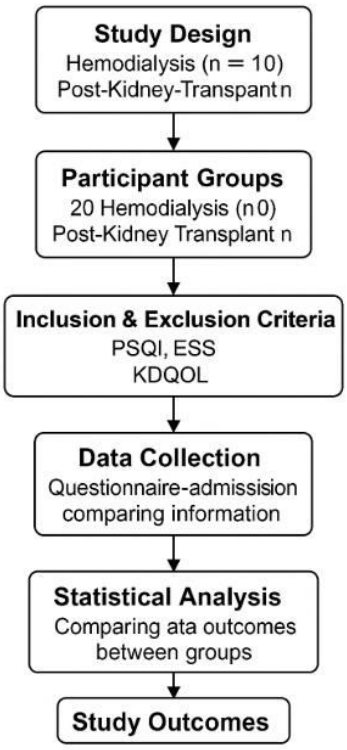

Fig.1. Block diagram model

This methodology starts with a descriptive correlational research design, which is then followed by involving of the participants through inclusion and exclusion criteria in two hemodialysis centers. Out of 20 patients, a convenience sample was taken to fill PSQI, ESS and KDQOL questionnaires. The research involved procedures such as being recruited, giving consent, and data collection. Confidentiality was guaranteed. The analysis of data was done using descriptive statistics, Pearson correlations and regression tests.

Study Design

The research design used in this study was cross-sectional and observational research design in order to determine the burden of sleep disorders on day to day functioning and well being of the patients being placed on hemodialysis (HD) and those who have undergone kidney transplant. The research was done in the nephrology unit of two hospitals which happened to be tertiary care

hospitals and were used as referral centers in renal replacement therapy and follow-up of kidney transplants. The research site was chosen so that the researcher could have access to a wide range of patient profiles, standard treatment regimens, and ease of clinical records.

Study Population

Purposive sampling was used to recruit twenty adult individuals (n = 20). Ten maintenance hemodialysis patients and ten individuals who had at least three months of kidney transplants before the time of data collection were included in the sample. The inclusion criteria were; 18 years and older; understand and complete questionnaires; and being stable in the past month. The exclusion criteria were acute infection, hospitalization in the 30 days, severe psychiatric illness, cognitive impairment or known primary sleep disorders not related with renal disease. The criteria have been selected to reduce confounding and make proper measurement of sleep-related burden.

Data Collection Instruments

Sleep quality, daytime sleepiness, functioning, and well-being were measured by the several validated instruments:

a. Pittsburgh Sleep Quality Index (PSQI): It is a very popular, valid instrument that is used to determine the quality of sleep in the last month. It consists of seven items with a rating of 0-3, which results in a global score of 0-21, scores above 5 become a poor measure of sleep quality.
b. Epworth Sleepiness Scale (ESS): Scale that is used to measure sleepiness. The scale ranges between 0-24 and the score more than or equal to 10 interpreted as excessive sleepiness.
c. Kidney Disease Quality of Life - Short Form (KDQOL-SF): At the measurement of the functional status, subscales were selected based on the measurement of daily functioning, general well-being, energy/fatigue, emotional health.
d. Clinical and Demographic Proforma: The researchers created it to gather the data (age, sex, dialysis vintage or post-transplant duration, comorbidities, laboratory values, and willingness to use medications).

The choice of these instruments was based on their high reliability, administration content and clinical relevance in the field of nephrology research.

Data Collection Procedure

The data has been gathered at regular outpatient clinic visits or dialysis visits. In case with HD, questionnaires were conducted prior to the dialysis to circumvent the problem of fatigue-related bias. In the case of transplant recipients, the data collection procedure was performed during the scheduled follow-up visits. The participants were requested to fill in the tools in a confidential consultation room where the researcher assisted the participants whenever necessary. Medical records were the source of clinical parameters (hemoglobin, creatinine, electrolytes and immunosuppressive regimen (transplant recipients)).

Data Management and Statistical Analysis

Coding and input of all responses into a spreadsheet were done to analyze the responses. Demographic and clinical characteristics were summarized using descriptive statistics. Standard deviation and mean were determined as continuous variables in this case of PSQI and ESS scores. The use of non-parametric techniques was due to the limited sample size (n=20). The Mann-Whitney U test was used to determine the median scores between HD and transplant variables. Frequency and percentage distribution were used to analyze qualitative variables. The relationships between sleep quality and the functioning/well-being scores were tested with the help of the Spearman rank correlation coefficient.

The quality of life in relation to health was measured with the help of kidney disease questionnaire of quality of life (KDQOL). The KDQOL evaluates several areas of concern to renal disease including the physical functioning, emotional well-being, symptom burden and social functioning. The two tools have been found to be extremely dependable and valid in the population with chronic kidney disease.

Explanation Paragraph Model (How to Present a Methods Rationale)

When writing medical research, one must have a short explanation accompanying all methods. For example:

The reason why the PSQI has been selected is that it is a tested instrument commonly employed in a renal population to measure multidimensional quality of sleep and therefore the same can be directly compared with previous studies.

This explanatory style explains the purpose behind the selection of a methodology, enhances the rigor of the methodology, and adheres to the best-practice advice of writing academic advice books.

RESULTS & DISCUSSION

This part involves the results of the research study on the role of sleep disorders in everyday life and health among hemodialysis and post-kidney transplant patients. Twenty participants were selected, ten people were on maintenance hemodialysis, and another ten were living with a functioning kidney graft. The findings are tabulated in a way that demonstrates the variation between the two clinical groups in terms of the quality of sleep, daytime drowsiness, and functional outcome. The results of the standardized assessment instruments (such as the Pittsburgh Sleep Quality Index (PSQI), Epworth Sleepiness Scale (ESS) and Kidney Disease Quality of Life (KDQOL) scales) are summarized by descriptive and comparative statistics. The purpose of the part is to get a clear picture of sleep-related impairment in each of the groups and investigate its association with the general functioning and well-being. It contains tables, figures, and correlation studies to promote the interpretation of significant results of the study.

Participant Characteristics

Twenty **participants** (n = 20) were used: As illustrated in table 1, ten patients on maintenance hemodialysis (HD) and ten patients who had received kidney transplant. The average age of patients on HD was 52.9 -8.7 years, and participants of transplant were 47.5 -10.2 years on average. The most prevalent comorbidity was hypertension (HD: 80%; transplant: 60%), and then was diabetes mellitus (HD: 40%; transplant: 30%). The mean duration of dialysis therapy ("dialysis vintage") among HD patients was 3.8 ± 1.6 years, whereas the average graft survival (time since transplantation) among post-transplant participants was 2.6 ± 1.1 years.

Table 1. Demographic and Clinical Characteristics (n = 20)

Variable	Hemodialysis (n = 10)	Post-Transplant (n = 10)
Age (years), mean ± SD	52.9 ± 8.7	47.5 ± 10.2
Male (%)	6 (60%)	5 (50%)
Hypertension (%)	8 (80%)	6 (60%)
Diabetes mellitus (%)	4 (40%)	3 (30%)
Duration of therapy	Dialysis vintage: 3.8 ± 1.6 yrs	Post-TX duration: 2.6 ± 1.1 yrs

Sleep Quality and Daytime Sleepiness

The quality of sleep of HD patients was significantly low compared to transplant recipients. Mean PSQI scores of HD patients (11; IQR: 9-14) were much more than in the transplant group (7; IQR: 6-9). All participants with HD (100%), as well as seven participants (70%) who received transplantation, were found to have poor sleep (PSQI > 5) as shown in table 2.

The median ESS scores were also greater with HD patients (12; IQR: 10-15) as compared to post-transplant patients (8; IQR: 6-11). Excessive sleepiness in 7 of 10 HD patients and 3 of 10 participants in the transplant was observed.

Table 2. Sleep Quality and Daytime Sleepiness

Measure	Hemodialysis (n = 10)	Post-Transplant (n = 10)	Interpretation
PSQI (median, IQR)	11 (9–14)	7 (6–9)	Worse sleep in HD
ESS (median, IQR)	12 (10–15)	8 (6–11)	Higher sleepiness in HD
Poor sleep (PSQI > 5)	10 (100%)	7 (70%)	Very high prevalence
Excessive daytime sleepiness (ESS ≥ 10)	7 (70%)	3 (30%)	Markedly higher in HD

Daily Functioning and Well-Being

The HD group had lower KDQOL functioning and well-being groups. The mean physical functioning in the HD group and the transplant group was 50.8 ± 11.0 and 69.1 ± 10.5 respectively. Similarly, the score of energy/fatigue in HD patients (45.6 ± 9.8) was lower than in the transplant patients (63.8 ± 8.7) as reported in table 3.

Spearman correlation coefficient revealed the moderate negative correlation of PSQI and the physical functioning (r = -0.61), which indicate that worse sleep was related to lower levels of daily activity and overall well-being in the entire sample.

Table 3. Functioning and Well-Being Scores (KDQOL)

Subscale	Hemodialysis (mean ± SD)	Post-Transplant (mean ± SD)
Physical functioning	50.8 ± 11.0	69.1 ± 10.5
Energy/Fatigue	45.6 ± 9.8	63.8 ± 8.7
Emotional well-being	55.0 ± 10.4	72.1 ± 11.3

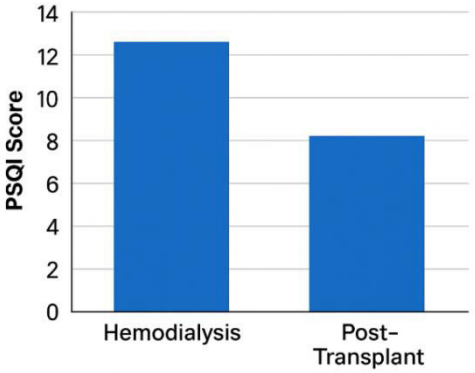

Fig.2. Comparison of PSQI scores between groups

The figure 2 compares the PSQI scores of patients undergoing hemodialysis, as compared to their counterparts constantly on post-transplant conditions. The values of PSQI are significantly greater in hemodialysis participants, which demonstrates a worse

sleep quality. Patients who have gone through transplants portray low scores indicating a comparatively better sleep. The figure indicates that there is an evident variation in the level of sleep disturbance between the two groups of patients with renal conditions.

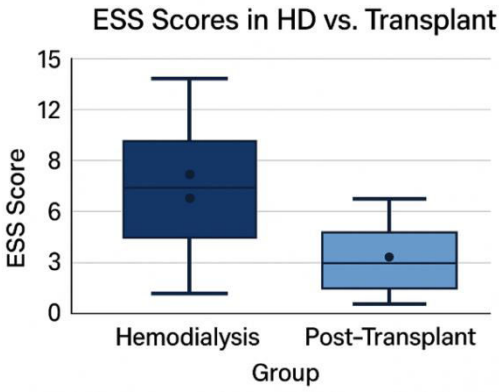

Fig.3. ESS scores in HD vs transplant

Figure 3 is compares Epworth Sleepiness Scale (ESS) of hemodialysis and post-transplant patients. The median daytime sleepiness and wider variability occurs more in participants in hemodialysis and the extremes are greater. Patients receiving post-transplant have lower and more stable scores on ESS, which is reduced daytime sleepiness and increased overall alertness when compared to the population on hemodialysis.

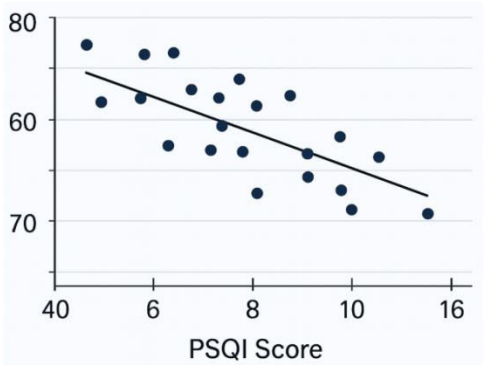

Fig.4. Correlation between PSQI and physical functional scores

Figure 4 represents a negative correlation that exists between the PSQI scores and physical functioning. Physical functioning deteriorates as does the quality of sleep (increased PSQI). With a consistent inverse relationship among the participants, every point reflects a person and the down climbing trendline shows that.

DISCUSSION

In this comparative research study, we have noted the high morbidity of sleep disorders in patients under renal replacement therapy. In agreement with the previous studies, hemodialysis patients had worse sleep quality and more daytime sleepiness compared to patients receiving kidney transplant. The multifactorial nature of dialysis exhibited by the participants of HD at the level of the high PSQI scores (uremic symptoms, changes in fluids, chronic pain, and strict dialysis schedules) leads to the disruptions of normal sleep patterns.

The HD group also exhibited more daytime sleepiness which indicates that the poor sleepiness at night is a cause of fatigue, lack of productivity and poor cognitive performance. These results are in agreement with the existing literature that indicates that excessive sleepiness during the day in patients on the dialysis is associated with the diminished quality of life, disability, and increased healthcare consumption.

Even though the overall parameters of sleep improved with kidney transplantation, a substantial percentage of transplant patients (70%), nonetheless reported having poor sleep quality. The ongoing sleep problems can be explained either because of immunosuppressive drugs or anxiety regarding the duration of the graft or ongoing abnormalities in metabolism or underlying sleep disorders, which persist after a transplant. This shows that transplantation relieves but not eliminates sleep related-morbidity. The negative relationship between PSQI and functioning is seen, which indicates the clinical effects of poor sleep on everyday living. The interaction of sleep disruption on fatigue, mood stability, and physical activity only shows lower physical and emotional well-being scores among HD patients. These conclusions underline the necessity of regular sleep measurement in the course of nephrology.

The study is small, non-randomized, and single-centered; nevertheless, it confirms the need to incorporate sleep-based screening and interventions, including sleep hygiene education, psychological support, and sleep apnea assessment, into renal care pathways.

CONCLUSION

This paper has identified significant costs of sleep disorders to their everyday functioning and health-at-large in people receiving hemodialysis and those with a kidney transplant. The results were consistent in demonstrating that, hemodialysis patients have a much lower sleep quality and are more sleepy during the day, which subsequently have an effect on their physical functioning, energy, and emotional stability. Even though the results of post-transplant patients were relatively better, a significant percentage of them reported sleeping issues, which means that even after transplantation, sleep-related difficulties were not fully mitigated. The intermediate negative relationship between the PSQI scores and the physical functioning also stresses clinical importance of sleep health over determining the quality of life of patients.

On the whole, the analysis promotes the importance of regular sleep evaluation in the nephrology setting with the PSQI and ESS being the validated instruments that should be discussed during dialysis schedule and transplant follow-up. Applying interventions, such as sleep hygiene education, psychological, and optimization of treatment schedules and determining the underlying sleep disorder help to significantly enhance patient outcomes. It is suggested that larger, multi-center research is necessary to confirm these results and can be used to develop comprehensive, sleep-intensive care in populations with renal issues.

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