

# Quality of Sleep and its associated risk factors among maintenance Hemodialysis patients in Pakistan

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<sup>1,2,3,4,5,6</sup> Experimentation/Study conduction

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<sup>1,2,3,4,5,6</sup> Manuscript Writing

<sup>1,2,3,4,5,6</sup> Critical Review

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## Article Processing

Received: 16/04/2020

Accepted: 08/06/2021

**Cite this Article:** Yaseen, M., Naqvi, S., Saleem, A., Nasreen, R., Imran, R., Mahmood, A. Quality of Sleep and its associated risk factors among maintenance Hemodialysis patients in Pakistan. *Journal of Rawalpindi Medical College*. 30 Jun. 2021; 25(2): 165-170.

DOI: <https://doi.org/10.37939/jrmc.v25i2.1382>

**Conflict of Interest:** Nil

**Funding Source:** Nil

**Access Online:**



## Abstract

**Objective:** This study aimed to determine the poor sleep quality and associated risk factors in chronic hemodialysis patients in Karachi.

**Materials and Methods:** This research took place at hemodialysis units of Al Mustafa Medical Institute and Alamgir International Welfare Trust Center after receiving approval from the research committee of respective hospitals. A descriptive cross-sectional study was carried out on a total of 156 patients above 18 years of age from both genders. Quality of sleep was measured using the Pittsburgh Sleep Quality Index (PSQI) and the Hospital Anxiety and Depression Scale (HADS) in dialysis patients.

**Results:** The average PSQI total score in the study population was 6.56 (SD = 4.061), and 89 (57.1%) patients had poor sleep quality (PSQI total score higher than 5). According to the results, smokers had a higher percentage of poor sleep quality 22(81.5%) in comparison to non-smokers. Our results also show a correlation between Hepatitis B (positive) statuses and sleep quality; both Hepatitis B positivity and smoking statuses strongly influencing sleep quality.

**Conclusion:** Poor sleep quality seemed to be a very common problem among dialysis patients and should be addressed by the hospital management to a greater extent. Further research is required to study each associated factor in detail.

**Keywords:** Dialysis, Sleep-quality, HADS, PSQI.

## Introduction

With the global rise in patients with uncontrolled diabetes and hypertension, patients with chronic kidney diseases (CKD) grow steeply across the globe. Despite the advancement in treatments and increased survival rates with Chronic hemodialysis, CKD patients live compromised life in regards to social, physical, and mental capacities due to the disease's burden and side effects of dialysis itself.<sup>1</sup> Amongst which sleep quality is most widely affected, studies showed 30-80% of patients on hemodialysis exhibit sleep problems like insomnia, delayed sleep onset, frequent awakening, restless leg syndrome, sleep apnea syndrome, narcolepsy, excessive daytime sleepiness, sleepwalking, nightmares, rapid eye movement behavioral disorder, periodic limb movements in sleep, sleep latency and lack of focus throughout the day.<sup>2,3,4</sup>

The poor quality of sleep in CKD patients prevents them from resting adequately which is crucial for their psychological needs and subsequent daily activities.<sup>2</sup>

A recent study has inferred that both forms of dialysis; hemodialysis and peritoneal dialysis, actually affected the melatonin rhythm hence affecting sleep patterns of patients.<sup>5</sup>

Female gender, erythropoietin treatment, caffeine intake, duration of dialysis, heart disease, high body mass index (BMI), exercise, level of creatinine, and poor quality of life (QOL) are associated with poor sleep quality in dialysis populations.<sup>6</sup> Poor sleep is also frequently found in elderly patients of hemodialysis.<sup>7</sup>

A study done previously showed that hemodialysis patients have more sleep-related problems than renal transplant individuals.<sup>8</sup>

There is also work done to show the implications of inadequate and poor quality sleep in renal patients and the resulted increased risk and/or severity of other chronic diseases, notably hypertension, obesity, type 2 diabetes, and cardiovascular diseases.<sup>9,10</sup>

A study by Unruh et al attempts to highlight the severity of agony faced by CKD patients as they associate depression, anxiety, chronic medical conditions, and an overall decreased quality of life with their treatment of hemodialysis. The author also makes mentions that 57% of patients were willing to undergo frequent dialysis if promised sleep improvement.<sup>11</sup>

The association of sleep quality in dialysis patients in Pakistan has not fully been identified. Given the rapid rise in the number of chronic hemodialysis patients in the country, it is important to learn the burden on the

population. This study was aimed at determining poor sleep and associated risk factors in chronic hemodialysis patients in Karachi. This study hopes to explore this burden of poor sleep quality in hemodialysis patients, in the prevention of CKD complications, and in improving the quality of life of dialysis-dependent patients.

## Materials and Methods

It was a descriptive cross-sectional study. Non-probability Convenient sampling was used. This study took place at Hemodialysis units of Al Mustafa Medical Institute and Alamgir International Welfare Trust Karachi after receiving approval from the institutional review board of respective hospitals from March to August 2019. A total of 156 patients above 18 years of age from both genders with the willingness to participate and undergoing dialysis for at least 6 months were recruited in the study. Informed consent was taken from all participants. Those who have an altered mental state and unable to understand the English/ Urdu language were excluded. Data was collected regarding demographic characteristics (age, gender, education, marital status, employment), dialysis characteristics (duration, shift) renal disease characteristics (duration, etiology), smoking status, comorbidities (Cardiovascular Diseases (CVD), Hypertension (HTN), Diabetes Mellitus (DM), Hepatitis B and C status. Quality of sleep was assessed using Pittsburg Sleep Quality Index (PSQI) scale by the investigator through an in-person interview with the participants. PSQI is a validated tool to evaluate sleep quality. Participant responses to different questions of this tool were noted and sleep quality score was calculated according to that. The range of global PSQI scores is from 0-21, where scores of < 5 or 5 indicate good sleep quality and scores of >5 indicate poor sleep quality.

Data were analyzed using the Statistical Package for the Social Sciences version 25.0. Continuous parametric variables were reported as means  $\pm$  standard deviation, non-parametric continuous variables were reported as median with 25-75 interquartile range, and categorical variables were expressed as percentages. Normality was assessed by using QQ plots. Categorical variables were compared using the chi-square test, and continuous variables were compared using t-test for parametric data and Mann-Whitney U-test for non-parametric data. For all tests, p values of <0.05 were considered statistically significant.

## Results

In this study, 156 patients undergoing hemodialysis completed the questionnaire. Their mean age was 38 (SD = 14.2) and the majority of them receiving dialysis for at least 6 months. Other characteristics are shown in Table 1.

**Table 1: Comparison of demographic factors affecting sleep between good and poor sleepers**

Demographic Variables	Sleep		P-value
	Good(N=67)	Poor(N=89)	
<b>Age</b>			
<20	11(91.7%)	1(8.3%)	0.002
21-35	27(39.7%)	41(60.3%)	
36-59	21(33.9%)	41(66.1%)	
>60	8(57.1%)	6(42.9%)	
<b>Sex</b>			
Male	30(36.6%)	52(63.4%)	0.091
Female	37(50.0%)	37(50.0%)	
<b>Education</b>			
None	18(46.2%)	21(53.8%)	0.450
Primary	24(48.0%)	26(52.0%)	
Secondary	17(42.5%)	23(57.5%)	
University	8(26.9%)	9(70.4%)	
<b>Employment</b>			
Unemployed	51(45.5%)	61(54.5%)	0.298
Employed	16(36.4%)	28(63.6%)	
<b>Marital Status</b>			
Unmarried	23(48.9%)	24(51.1%)	0.321
Married	44(40.4%)	65(59.6%)	

We also conclude that the sleep quality to be worse in patients who have been receiving dialysis for more than six months 53(59.6%).

**Table 2: Comparison of sleep quality with dialysis characteristics**

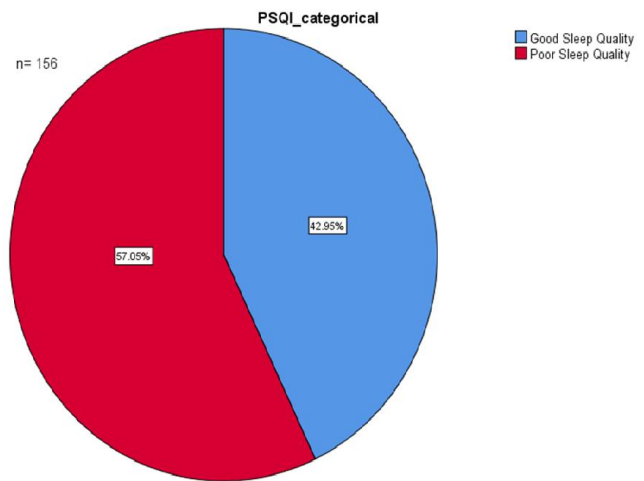
Dialysis Characteristics	Sleep		P-value
	Good(N=67)	Poor(N=89)	
<b>Dialysis duration</b>			
<6months	21(50.0%)	21(50.0%)	0.558
6 months	10(40.0%)	15(60.0%)	
>6 months	36(40.4%)	53(59.6%)	
<b>Dialysis shift</b>			
Morning	27(39.7%)	41(60.3%)	0.440
Afternoon	30(49.2%)	31(50.8%)	
Evening	10(37.0%)	17(63.0%)	

We also found a correlation between Hepatitis B (positive) status and smoking; both strongly influencing sleep quality.

**Table 3: Comparison of sleep quality with comorbidities**

Comorbidities	Sleep		P-value
	Good(N=67)	Poor(N=89)	
<b>Cardiovascular disease</b>			
Absent	51(40.5%)	75(59.5%)	0.201
Present	16(53.3%)	14(46.7%)	
<b>Hypertension</b>			
Absent	18(50.0%)	18(50.0%)	0.330
Present	49(40.8%)	71(59.2%)	
<b>Diabetes mellitus</b>			
Absent	50(44.2%)	63(55.8%)	0.595
Present	17(39.5%)	26(60.5%)	
<b>Hepatitis B</b>			
Absent	65(45.8%)	77(54.2%)	0.023
Present	2(14.3%)	12(85.7%)	
<b>Hepatitis C</b>			
Absent	59(43.4%)	77(56.6%)	0.775
Present	8(40.0%)	12(60.0%)	
<b>Smoking status</b>			
No	62(48.1%)	67(51.9%)	0.005
Yes	5(18.5%)	22(81.5%)	

The average PSQI total score in the study population was 6.56 (SD=4.061), and 89 (57.1%) patients had poor sleep quality (PSQI total score higher than 5), demonstrated in the chart below.



**Figure 1: Pie chart showing sleep quality as determined by PSQI**

**Table 4: Comparison of variables with PSQI mean values**

Variables	PSQI Score Mean (SD)	Mean differ. (95% CI)	t statistic (df)a	P-value <sup>a</sup>
<b>Sex</b>				
Male	1.63(0.485)	0.134	1.692 (150.988)	0.093
Female	1.50(0.503)	(0.023, 0.291)		
<b>Employment</b>				
Unemployed	1.54(0.500)	-0.092 (-0.265, -0.082)	-1.051 (80.727)	0.296
Employed	1.64(0.487)			
<b>Marital Status</b>				
Unmarried	1.51(0.505)	-0.086	-0.979 (85.370)	0.910
Married	1.60(0.493)	(-0.257, -0.086)		
<b>Smoking status</b>				
No	1.52 (0.502)	-0.295	-3.355 (45.369)	0.002
Yes	1.81 (0.396)	(-0.473, -0.118)		
<b>Cardiovascular diseases</b>				
Absent	1.60(0.493)	0.129 (-0.070,0.327)	1.27 (154)	0.363
Present	1.47(0.507)			
<b>Hypertension</b>				
Absent	1.50(0.507)	-0.092	-0.971 (154)	0.268
Present	1.59(0.494)	(-0.278,0.095)		
<b>Diabetes Mellitus</b>				
Absent	1.56(0.499)	-0.092	-1.051 (80.727)	0.296
Present	1.60(0.495)	(-0.265,0.082)		
<b>Hepatitis B</b>				
Absent	1.54(0.500)	-0.315	-2.978 (18.255)	0.008
Present	1.86(0.363)	(-0.537,-0.093)		
<b>Hepatitis C</b>				
Absent	1.57(0.497)	-0.034	-0.284 (154)	0.510
Present	1.60(0.503)	(-0.269,0.202)		

SD=Standard Deviation; CI=Confidence Interval

<sup>a</sup>=Independent t-test; df=Degree of freedom

## Discussion

Decreased kidney function for more than or equal to 3 months is diagnosed as CKD. Literature reports the frequency of sleep-related disorders in such patients ranging from 40-80%. The associated comorbidities documented include but are not limited to diabetes mellitus, dyslipidemia, coronary heart disease, hypertension, depression, and anxiety.<sup>12</sup> Our study showed a significant number of patients undergoing hemodialysis suffering from poor sleep. Smoking, Hepatitis B (positive) status and age group showed to have a significant influence on the sleep patterns of the patient.

Through our study, we found the prevalence of poor sleep is to be 57.1% which is consistent with that of the previous studies. A previous study by Tel et al. reported 78.7% of patients of dialysis experienced poor sleep while Iliescu et al. supporting the above by

reporting 71% of poor sleepers in their study.<sup>13,14</sup> Some of the studies done previously reported great occurrence (84.7-87%) of poor sleep quality in hemodialysis and chronic kidney disease patients.<sup>4,15</sup> In patients on peritoneal dialysis poor sleep is found in 43.5% of the participants.<sup>16</sup> Poor sleep affects many patients undergoing dialysis and can play a role in predicting patient's mortality, depression, and quality of life in general.<sup>4,17,13,18</sup>

Our results exhibit data skewed to right for the age of patients in relation to the quality of sleep which coincides with the finding of Yoshioka et al. who describe patients experiencing the greatest sleep trouble with increasing age.<sup>19</sup> Moreover, a study in Iran reported mean age of patients diagnosed with CKD increased from 47 to 53 years, which can be supported by our study in Karachi, where the mean age for patients was 38.04 (SD= 14.22).<sup>20</sup>

An interesting correlation was also observed between Hepatitis B (positive) status and sleep quality. While there is a study by Huang et al concluding that chronic

hepatitis B patients were prone to depression and insomnia, our study would not be enough to support theirs due to a very small number of such population tested (9% of subjects were hepatitis B positive).<sup>21</sup> A positive association was also noted with smoking with 81.5% of smokers suffering from poor sleep. Such patterns have also been recorded in literature by Donovan et al.<sup>22</sup>

The main limitation in our present study is sleep quality assessed only of sleep availed at night hours, ignoring any possibility of naps throughout the day. This study has a small sample size, future larger sample studies are required to further strengthen this association. The PSQI questionnaire served as a simple tool, providing comprehensive and standardized information on sleep quality. Therefore, its use should be promoted periodically at all dialysis centers as it offers the initial screening to detect poor sleep quality in efforts to commence a more useful way for early diagnosis and treatment for sleep impairment.

## Conclusion

The current study finds a poor sleep quality in patients on maintenance hemodialysis. Associated risk factors were concluded to include increasing age, hepatitis B positive status, and smoking. Further research is required to study each associated factor in detail.

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