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ORIGINAL ARTICLE

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A study of sleep quality and its correlates in end-stage renal disease patients on haemodialysis

Abstract

Background: Poor sleep quality is reported to be frequent in end-stage renal disease (ESRD) patients on haemodialysis. The aim of this study was to assess sleep quality and its predictors among haemodialysis patients. **Methodology:** This cross-sectional study included 70 consecutively recruited ESRD patients on haemodialysis, who were assessed for sleep quality and sleep disorders by administering Pittsburgh Sleep Quality Index, Berlin Questionnaire for sleep apnoea, and International Restless Legs Syndrome Study Group rating scale. Depression and anxiety were assessed using Beck Depression Inventory II and Hamilton Anxiety Rating Scale respectively. Sleep quality and its association with sleep disorders, psychological and sociodemographic factors were studied. **Results:** The mean age of the study sample was 46.2±9.42 years, most of the patients were males (65.7%), literate (55.8%), married (82.8%), Hindu by religion (82.8%), hypertensive (81.4%), and diabetic (30%). 65.7% of the sample were classified as poor sleepers. There was a statistically significant difference between poor sleepers and good sleepers in terms of severity of anxiety, increasing age, having comorbid anxiety and depression, and having a high risk of sleep apnoea. The severity of anxiety and increasing age were found to be independent predictors of poor sleep quality. **Conclusion:** Poor sleep quality was frequent among haemodialysis patients and it correlated with severity of anxiety and increasing age in the present study. Assessment of sleep quality in all patients undergoing haemodialysis is necessary as poor sleep quality is associated with greater psychopathology.

Keywords: Anxiety. Depression. Sleep Apnoea. Psychopathology.

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INTRODUCTION

End-stage renal disease (ESRD) represents the fifth stage of chronic kidney disease (CKD), where there is an accumulation of toxins, fluids, and electrolytes, which are normally excreted by the kidneys, resulting in uraemic syndrome. This syndrome leads to death unless the toxins are removed by renal replacement therapy, using dialysis or kidney transplantation.[1] Haemodialysis (HD) and peritoneal dialysis are the two main forms of dialysis. In India, HD is the preferred method in most centres.[2]

ESRD is a psychologically debilitating disease with considerable emotional morbidity.[2] Sleep disorders are common among patients undergoing dialysis in ESRD compared to general population. The sleep-wake complaints, sleep-disordered breathing, excessive sleepiness, sleep apnoea syndrome (SAS), and restless legs syndrome (RLS) can lead to poor quality of sleep in patients with ESRD.[3-5] Sleep apnoea in CKD patients is more frequently obstructive. Polysomnography study shows sleep apnoea ranging from 53% to 75% of ESRD patients on HD.[5] Poor sleep quality, longer duration of dialysis and declining renal function, reduced life expectancy have been associated with the presence of RLS in ESRD.[6,7] Anxiety and depression are associated with poor subjective sleep quality, obstructive SAS, and RLS in dialysis patients.[8-11] Poor sleep quality is significantly associated with variables like being single, older age, female gender, overweight, low socioeconomic status, morning dialysis shift, and dialysis duration of more than three years.[12] Sleep disorders have a significant effect on mortality and morbidity;[13] thus, identifying and treating dialysis patients who sleep poorly may significantly improve their lives.[14,15]

There is a dearth of hospital-based studies assessing the quality of sleep and sleep disorders in ESRD patients on HD and the possible contributory factors affecting sleep quality in this population in India. In this background, the present study was conducted at the People's Education Society Institute of Medical Sciences and Research (PESIMSR), Kuppam, Andhra Pradesh., India. The objective of the present study was to explore the correlates and predictors of sleep quality in ESRD patients on HD. Sociodemographic factors, psychological variables, and sleep disorders were assessed.

METHODOLOGY

This cross-sectional study included 70 consecutive ESRD patients undergoing HD at PESIMSR. Patients who gave

consent to participate in the study were recruited. The study was done during July 2014 to December 2014. Ethical clearance for carrying out the study was obtained from the ethics committee of the institute.

Inclusion criteria

All ESRD patients on HD
Age: 18 years and above

Exclusion criteria

Patients who are not willing to give consent to the study
Patients with a psychiatric illness predating HD

Tools for assessment

Semi-structured proforma

It includes sociodemographic and other clinical details.

Becks depression inventory II (BDI)

BDI is a 21-item self-report inventory for measuring the severity of depression. Responses are measured on a four-point Likert scale, ranging from zero to three (total scores can range from zero to 63). A score of zero to 13 indicates minimal depression, 14 to 19 mild form of depression, 20 to 28 moderate depression, and 29 to 63 indicates severe depression.[16] BDI is well-validated to measure the depressive symptoms in medical (ESRD) patients with high internal consistency, reliability (Cronbach's alpha 0.91),[17] and has been used previously in Indian studies.[2,18]

Hamilton anxiety rating scale (HAM-A)

The HAM-A is a widely used and well-validated tool for measuring the severity of a patient's anxiety with good internal consistency, reliability (Cronbach's alpha 0.77 to 0.92). It consists of 14 items, each item is scored on a scale of zero (not present) to four (severe), with a total score range of zero to 56, where 14 to 17 indicates mild severity, 18 to 24 indicates mild to moderate severity, and 25 to 30 indicates moderate to severe anxiety.[19,20] HAM-A has been used previously to assess anxiety among patients with comorbid medical illness in India.[21,22]

Pittsburgh sleep quality index (PSQI)

PSQI is a validated scale to assess sleep quality with good internal consistency and reliability (Cronbach's alpha 0.83). It has seven "components" (subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, use of sleep medications, and daytime dysfunction) scores. Each of the seven components of PSQI is scored from zero to three. The sum of scores for these seven components yields one global score. The global PSQI score can vary from zero to 21 and scores less than or equal to five indicates good sleepers and greater than five indicates poor sleeper.[23] PSQI has been used previously in Indian studies.[24,25]

Berlin questionnaire for sleep apnoea

It is a validated scale to identify a patient at risk for the sleep apnoea with good internal consistency and reliability (Cronbach's alpha 0.86 to 0.92). It consists of three categories related to the risk of sleep apnoea. Category one is related to snoring and cessation of breathing, category two to daytime sleepiness, category three with high blood pressure and body mass index (BMI).

In category one and two, high risk was defined as persistent symptoms (more than three to four times/week). In category three, high risk was defined by the presence of hypertension (>140/90 mmHg or use of medication) or a BMI >30kg/m^2.[26] The scale has been used previously in Indian studies.[27,28] Overall high risk was given to patients if there are two or more categories where the score was positive. Overall low risk was assigned to patients if only one or no categories were scored positive.

International RLS study group (IRLSSG) rating scale (IRLS)

It is a valid instrument that has shown high internal consistency and reliability (Cronbach's alpha=0.86) to identify the severity of RLS. Scores interpreted as zero- none, one to ten as mild, 11 to 20 as moderate, 21 to 30 as severe, and 31 to 40 as very severe.[29] The scale has been used previously in Indian studies.[30,31]

Statistical analysis

The data were analysed using Epi info™ software version 3.2. Frequency and percentages were calculated for all categorical data. Mean and the standard deviation was calculated for continuous data. Mann-Whitney test was used to assess the differences between two independent variables and Kruskal-Wallis test was used to assess the differences between three or more independent variables in a non-normally distributed sample. Fisher's exact test was used for categorical variables if the expected frequency was less than five in more than 20% of the cells. Spearman's correlation and multiple logistic regression analysis were used to analyse data. p-value of ≤0.05 is considered as statistically significant.

RESULTS

The mean age group of the study sample was 46.2±9.42 years (minimum 26 years to maximum 65 years). The sample consisted of 65.7% males and 34.3% were females. Mean duration of dialysis was 15.84±10.33 months (minimum five months to maximum 60 months). Most of the patients were literate 39 (55.8%), married 58 (82.8%), Hindu by religion 58 (82.8%), hypertensive 57 (81.4%), 21 (30%) had diabetes mellitus, and 46 (65.7%) of the sample were classified as poor sleepers (PSQI ≥five) (Table 1).

Poor sleep quality was associated with anxiety, age, comorbid anxiety and depression, and having a high risk of sleep apnoea and this difference was found to be statistically significant. Good and poor sleepers did not differ significantly from each other in levels of depression, presence of RLS, or duration of dialysis (Table 2).

All the variables were studied in logistic regression model; however, few variables like education, Berlin Questionnaire for sleep apnoea scores, and the patients with comorbid anxiety and depression were excluded from the analysis due

Table 1: Distribution of sleep quality (PSQI scores) among ESRD patients with respect to sociodemographic and clinical variables

Variables	Frequency (%)	PSQI Mean±SD	Test statistic and p-value
Gender			
Male	46 (65.7)	10.23±4.96	U=427.5
Female	24 (34.3)	11.12±5.74	p=0.12602
Education			
Illiterate	31 (44.2)	11.80±5.15	Kw=3.5116
Primary	6 (8.6)	9±5.47	p=0.17277
Secondary	33 (47.2)	9.86±5.47	
Religion			
Hindu	58 (82.8)	10.64±5.10	Kw=0.1771
Muslim	6 (8.6)	10.70±5.08	p=0.91526
Christian	6 (8.6)	10.64±5.18	
Marital status			
Married	58 (82.8)	10.81±5.16	U=298.5
Single	12 (17.2)	9.25±5.49	p=0.44726
Diabetes mellitus			
Present	21 (30)	8.85±6.39	U=494
Absent	49 (70)	11.26±4.50	p=0.79486
Hypertension			
Present	57 (81.4)	10.73±5.18	U=264
Absent	13 (18.6)	9.69±5.49	p=0.1096
Total	70 (100)		

p≤0.05=Statistically significant, SD=Standard deviation, U=Mann-Whitney test, Kw=Kruskal-Wallis test, PSQI=Pittsburgh Sleep Quality Index, ESRD=End-stage renal disease

Table 2: Comparison of clinical, psychological, and sleep-related variables among good and poor sleepers

Variables	Good sleeper (N=24)	Poor sleeper (N=46)	Test statistic	p-value
Anxiety (HAM-A)	10.45±5.18	14.5±6.10	345.5	0.01078*
Depression (BDI)	16.87±7.66	16.80±7.99	521	0.70394
IRLS	1.25±4.23	4.10±9.29	496	0.4902
Age	41.12±7.34	48.86±7.16	249	0.00018*
Duration of dialysis	13.41±5.80	17.10±11.90	538	0.86502
Both anxiety and depression				
Present	0	17 (36.96%)	Fisher's p=0.0003*	
Absent	24 (100%)	29 (63.04%)		
Berlin Questionnaire for sleep apnoea			Fisher's p<0.0001*	
Low risk	24 (100%)	16 (34.78%)		
High risk	0	30 (65.22%)		

*p≤0.05=Statistically significant, HAM-A=Hamilton Anxiety Rating Scale, BDI=Becks Depression Inventory II, IRLS=International restless legs syndrome study group rating scale

to poor fit of the model. Increasing age and severity of anxiety were found to be an independent predictors of poor sleep quality (Table 3).

DISCUSSION

A study conducted by Kusleikaite *et al.*[32] showed that 66.7% of ESRD patients on HD had poor sleep quality, which is similar to the results obtained in the present study (65.7%). Previous studies reported a prevalence ranging from 24.5% to 83.3% for poor sleep quality in HD patients,[33,34] which was higher compared to the prevalence of poor sleepers in the general population in India.[35]

We found that increasing age was significantly associated with poor sleep quality. Previous studies have reported increasing age to be significantly associated with poor sleep quality, i.e. younger patients had better sleep

Table 3: Multiple logistic regression analysis relating to outcome (PSQI) with clinical and sociodemographic variables

PSQI	β-coef	Odds ratio	95% confidence interval	p>[Z]
Age	0.249	1.283	1.086-1.515	0.003*
Sex	−0.438	0.645	0.149-2.786	0.557
Marital status	1.510	4.528	0.499-41.041	0.179
Religion	−1.269	0.280	0.032-2.454	0.251
Diabetes mellitus	−0.017	0.982	0.225-4.272	0.981
Hypertension	−0.505	0.602	0.115-3.144	0.548
Duration of dialysis	0.037	1.037	0.961-1.120	0.340
HAM-A	0.149	1.161	1.006-1.332	0.040*
BDI	0.050	1.051	0.950-1.164	0.330
IRLS	0.002	1.002	0.899-1.117	0.966

*p≤0.05=Statistically significant, β-coef=β coefficient, SE=Standard error, Z=Standardised coefficients, PSQI=Pittsburgh Sleep Quality Index, HAM-A=Hamilton Anxiety Rating Scale, BDI=Becks Depression Inventory II, IRLS=International restless legs syndrome study group rating scale

quality than older individuals.[36-38] Multiple logistic regression analysis shows age as a significant independent predictor of sleep quality (β=0.249, p=0.003). Similarly, studies done by Menon *et al.*[12] and Eryavuz *et al.*[39] show age as one of the independent predictors of sleep quality. This may be due to age-related changes in sleep, or due to lifestyle modification, comorbid physical diseases, or multiple medications use.

Anxiety levels were significantly greater in poor sleepers. Similar studies by Danielle *et al.*[40] and Guney *et al.*[41] show a significant association between anxiety scores and PSQI global scores.[40,41] Poor quality of sleep had a positive correlation with the increased severity of anxiety (r=0.264, p=0.05); also, few other studies show a positive correlation of anxiety with poor sleep quality in chronic HD patients.[42,43] Anxiety was an independent predictor for sleep quality that was statistically significant (β=0.149, SE=0.072, p=0.04). Similarly, studies by Masoumi *et al.*[44] and Gholamrezaei *et al.*[45] show anxiety as one of the independent predictors of sleep quality. Anxiety might lead to arousal and other symptoms like palpitations, tremors, indigestion, numbness/tingling, nervousness, shortness of breath, diaphoresis, and fear about consequences in ESRD patients leading to poor sleep quality.

This study shows that poor sleepers were associated with both comorbid anxiety and depression (36.96%), a finding that has been corroborated by previous research.[41,46,47] According to a study by Iliescu *et al.*,[4] dialysis patients had 20% prevalence of overt depression with PSQI score greater than five, while among ESRD patients with almost nil depression reported normal sleep.[48] Similarly, in the present study, patients with only anxiety and with comorbid anxiety and depression were associated with poor sleep quality; but, depression alone was not associated with poor sleep quality, this may be because the majority of patients (52.9%) in the study sample had no or minimal depression.

This study shows that poor sleepers had a statistically significant high risk of sleep apnoea (65.22%). These sleep apnoea syndromes were common among dialysis patients and were associated with poor sleep quality.[49,50] Obstructive sleep apnoea was associated with frequent arousals[51] and hence, it worsens the quality of sleep.

Conclusion

Poor sleep quality is frequent in HD patients and it is associated with anxiety and increasing age of the patients in the present study. Early diagnosis and treatment of anxiety and disturbed sleep will improve quality of life and decreased morbidity in ESRD patients undergoing HD.

Limitations of the study

This was a cross-sectional study and hence, no cause and effect relationships between the studied parameters and quality of sleep could be established. We assessed sleep disorders subjectively, did not perform polysomnography for objective sleep measure. ESRD patients who had a past history of sleep disorders predating their dialysis was not considered in this study. Comorbidities such as substance use, personality factors, and biochemical parameters like serum phosphate, C-reactive protein levels, triglyceride levels, haemoglobin levels were not considered in this study. The study sample was small with no control group; thus, our result may not be generalised. More studies involving larger sample is recommended.

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