Sleep Quality in End Stage Renal Disease Patients Undergoing Hemodialysis in a Tertiary Care Center in Rural Kanyakumari: A Cross Sectional Study

Priya R Panicker[1], Sivakarthik K[2]

[1] Assistant Professor, Department of Community Medicine, Sree Mookambika Institute of Medical Sciences, Kanyakumari, Tamil Nadu, India

[2] Intern, Sree Mookambika Institute of Medical Sciences, Kanyakumari, Tamil Nadu, India

Correspondence : Dr Priya Ravindra Panicker, Email: priya.ravipanicker@gmail.com

Abstract:

Introduction: End Stage Renal Disease (ESRD) has increased in prevalence worldwide, becoming a major public health problem. About 80% of ESRD patients have subjective complaints of poor sleep. Poor sleep quality can potentially affect their quality of life and the pattern of medication use. Hence this study was designed to evaluate the quality of sleep in patients undergoing haemodialysis and to determine associated risk factors. **Method:** This cross sectional study was carried out among 110 ESRD patients in the dialysis unit of Kanyakumari hospital. Patients previously diagnosed with neuropsychiatric disorders, sleep apnoea or epilepsy were excluded. An investigator-administered structured questionnaire was used. Sleep quality was assessed using the Pittsburg Sleep Quality Index. A global PSQI score of more than 5 indicates poor sleep quality. **Results:** Mean age of ESRD patients was 52.7 years. About 71% of the patients were males. Majority of the patients (68.2%) had pre-existing Diabetes and Hypertension. Almost all of the patients (97.3%) had a PSQI score of more than 5 and were 'poor sleepers'. About 94.7% patients had not used sleep medications at all. Increasing age and multiple morbidity were found to be statistically significant risk factors of poor sleep quality. **Conclusion:** Almost all of our subjects had poor sleep quality sleep and only few of them sought treatment for the same. Early detection of poor sleep quality will help in better management of sleep disorders among ESRD patients.

Keywords: End Stage Renal Disease, Hemodialysis, Sleep quality

Introduction:

Chronic kidney disease and End Stage Renal Disease (ESRD) have become public health problems worldwide. In India per year over 1,00,000 people are diagnosed with ESRD. The prevalence of ESRD in India is 152 per million population.[1] The poor quality of sleep can negatively affect persons emotions, cognitive process, motivation and ability to focus which in-turn leads to loss of appetite, anxiety, nervousness, depression. Similar to general population, increased stress, anxiety, depression and worry are associated with poor sleep quality in dialysis patients.[2] The reported prevalence of poor sleep including waking up and breathing disorders during the sleep period and excessive sleeplessness are in the range of 45-80%.[3] It has been reported that 80% of ESRD patients receiving dialysis report sleep complaints with day time sleepiness being most common reported symptom.[4] Sleep issues are not only associated with the quality of life (QOL) but also

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with increased health-related risks and mortality in these patients. Poor sleep quality affects many hemodialysis patients and can potentially predict their morbidity, mortality, quality of life and the pattern of medication use.[5] Sleep issues have a negative impact on immune response and also cause development of cardiovascular disease, which is the most important cause of death in all patients with renal disease.[6]

According to Hildreth, patients with Chronic Kidney Disease (CKD) exhibit sympatho-vagal imbalance due to baroreceptor reflex function impairment.[7] As the individuals goes through the cycles of (Rapid eye movement) REM and non – REM sleep there are oscillations in the sympatho-vagal balance and plasma renin levels. Plasma renin activity and aldosterone activity peaks during NREM sleep and lowers during REM sleep. In patients with sleep deprivations the oscillatory nature of the plasma renin aldosterone activity is absent.[8] It is believed that lack of nocturnal blood pressure dipping is the important risk factor for the progression of CKD.[9] Patients with ESRD typically exhibit poor sleep architecture as measured objectively on polysomnographic studies.[10] In a comprehensive review, ESRD patients had short, fragmented sleep with decreased total sleep times. Sleep efficiencies ranged between 66%-85% and time spent awake ranged from 77-135 min. Sleep latencies were reported below normal. There was a pattern of increased stage 1 and stage 2 sleep while slow wave sleep and REM sleep were decreased. Daytime sleepiness is a parameter not measured by polysomnographic studies but is still considered an important marker of inadequate sleep.[10]

Previous studies have demonstrated the association between sleep disturbances and physical and mental well-being in the dialysis patients.[11] Although many of the dialysis patients complain about sleep deprivation, an objective assessment of sleep quality with a proven tool like Pittsburg sleep quality index will be better in quantifying the poor sleep quality among ESRD patients. Literature about the factors affecting sleep quality is also lacking from rural areas of Tamil Nadu. Hence this study was designed to measure the quality of sleep in patients undergoing hemodialysis and to determine the associated risk factors.

Method:

This was a cross sectional study carried out in the dialysis unit of a tertiary care centre in rural Kanyakumari, the southernmost district of Tamil Nadu from October to November 2020. The study participants included clinically stable adult Stage 5 CKD patients (End Stage Renal Disease)who were registered with this dialysis centre during the study period and underwent maintenance haemodialysis for at least 6 months. Subjects were selected by purposive sampling. Patients who were previously diagnosed with neuropsychiatric disorders or Obstructive Sleep Apnoea (OSA) or those on anticonvulsant drugs were excluded from the study. Sample size was calculated based on the reported prevalence of insomnia among ESRD patients being 50% as reported by Merlino et al. and a relative precision of 20% to get 100 subjects.[12] A non response rate of 10% was added to get a final total of 110 subjects.

The subjects were recruited according to eligibility criteria by a trained investigator. Data was collected using a pre-designed structured questionnaire administered by the investigator. The questionnaire was designed to capture demographic details of the patients, their clinical history and their sleep quality. Sleep quality was assessed using the Pittsburg Sleep Quality Index(PSQI) which is a scale used to assess the sleep habits of the subjects over the past month using a set of 19 self rated questions and five questions to be rated by the bed partner if available. Only the 19 self rated questions are included in the scoring for calculating the global PSQI score. PSQI assesses seven components, that is, sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleep

medication and day time dysfunction. Each component is scored from 0-3, yielding a global PSQI score with continuous scores ranging from 0 to 21 with higher scores indicating lower quality of sleep and a score more than 5 indicating poor sleep quality.[13] Since the spouses were not available most of the time, their substantiation of the patients' sleep habits could not be collected for all the patients and hence only the self rated questions were included for analysis. Age, gender, associated medical conditions, multiple morbidity (2 or more medical conditions) and duration of hemodialysis more than 1 year were the independent variables analysed for association with poor sleep quality.

Patient information was collected after obtaining informed consent and patient confidentiality was maintained by assigning identifying numbers. Data entry was done in Microsoft Excel 2010 and data analysis was done on SPSS software trial version 20.0. Continuous scores are described with mean and standard deviations. Descriptive statistics, Chi-square tests, independent t tests and Pearson correlation coefficient (r) were used for data analysis with significance level fixed at 5% (p value <0.05).

Results:

Demographic profile:

In this study, 110 patients undergoing haemodialysis were interviewed, majority of whom(71%) were males. The age of the study participants range from 18 to 79 years with the mean age being 52.7$\pm$13.3 years. In the age group 18 to 40 years, gender distribution was equal but there was male predominance in higher age groups of 41 to 60 and above 60 years (at 76.3% & 72.9% respectively).

Clinical history:

Regarding associated medical conditions leading to or coexisting with CKD, a majority of the patients (68.18%) suffered from both Diabetes mellitus and systemic Hypertension. A quarter of patients suffered from hypertension alone (25.45%), while 5.45% had diabetes alone with a single patient (0.9%) reporting a history of systemic lupus erythematosus(SLE).

Quality of Sleep:

The mean global PSQI score of the patients was 13.49 with no statistically significant difference between scores in case of gender, as per independent t test (P value0.429). The minimum score was 1 and maximum score was 17. Almost all of the patients (97.3%), ie, 107 patients had a PSQI score of more than 5 and were considered as 'poor sleepers'. Only 3 patients (2.7%) had a score less than or equal to 5 and had good sleep quality (good sleepers).The distribution of scores of the patients and their gender differences across the seven components of PQSI are as given below in Table 1.

Around 65.5% patients had a long sleep latency as in it took them longer to fall asleep very frequently. Almost all patients (99.1%) had a habitual sleep efficiency of less than 65%. About 94.7% patients claimed not to have used sleep medications at all. Sleep quality had no effect on daytime functioning only in 10.9% of patients while others experienced daytime dysfunction in varying degrees from slight to big issues in daily life (35.5% and 6.4% respectively).

Factors associated with Sleep quality:

On univariate analysis, age was the most important risk factor associate with poor sleep quality. (Table 2) Age had a statistically significant positive correlation with the global PSQI score (r +0.36), meaning increasing age will have higher scores and poorer sleep quality. Habitual sleep efficiency, which is the percentage of actual sleep hours out of total hours spent in bed, also had statistically significant positive correlation with the global PSQI score(r +0.3, p 0.001).

Moreover patients suffering from multiple morbidity (2 or more medical conditions) had a higher mean global PSQI score than those with a single medical condition (mean PSQI score 14.23 versus 11.91; t 3.89, p value< 0.01). There were no

Table 1: Gender differences in PSQI component scores in ESRD patients [n=110]

PSQI Components	Frequency	Mean Score ± -SD		
		Male	Female	Total
Component 1: Subjective sleep quality				
Very good	3	2.17 ±0.86	2.03 ±0.89	2. 14±0.87
Fairly good	26			
Fairly bad	34			
Very bad	47			
Component 2: Sleep latency#		4.59 ±1.6	4.62 ±1.7	2.49 ±0.82
Component 3: Sleep duration				
>7 hours	9	2.6 ±0.8	2.3 ±1.1	2.55±0.93
6-7 hours	7			
5-6 hours	9			
< 5 hours	85			
Component 4: Sleep efficiency				
>85%	0	2.97 ±0.2	3 ±0.1	2.98 ±0.19
75- 84%	1			
65- 74%	0			
<65%	109			
Component 5: Sleep disturbances#		1.67 ±0.5	1.65 ±0.6	1.66 ±0.53
Component 6: Use of Sleep medication				
Not in past month	104	0.1 ±0.4	0	0.08 ±0.36
< Once a week	3			
Once/twice a week	3			
>Three times a week	0			
Component 7: Daytime dysfunction#		1.6 ±0.8	1.53 ±0.9	1.59 ±0.89
Global PSQI score		12.7 ±2.9	12.53 ±3.3	13.49 ±3.08

Standard deviation (SD), #Composite score

other statistically significant associations found among gender, multiple morbidity or other demographic variables with the PQSI scores or its components.

Discussion:

This study has revealed that a large amount of hemodialysis patients suffer from poor sleep. The prevalence of poor quality sleep in the present study was 97.3%. This is markedly higher than the prevalence of poor sleep quality reported by Walker et al.(83.5%)and Masoumi et al. (86.6%)while being slightly higher than 90.87% prevalence of sleep problems among hemodialysis patients reported by

Table 2: Factors affecting sleep quality

Outcomes	Factors	p value*
Global PSQI score	Age	0.000 (r+0.36)#
	Multiple morbidity	0.000 (t 3.89)$
	Gender	0.429
Habitual sleep efficiency	Age	0.001 (r+0.306)#
	Gender	0.117
Sleep disturbances	Age	0.000 (r +0.341)#
Multiple morbidity	Poor Subjective Sleep Quality	0.027 (χ^2 4.92)

* Very high statistical significance; #Person correlation ; $ Independent t test

Mehrabi et al.[14-16] However Walker et al. only examined subjective complaints of disturbed sleep through a sleep questionnaire, with daytime sleepiness being the most common complaint.[14] On the other hand, Mehrabi et al obtained 90.87% poor sleep quality using the same PSQI scale among similarly aged long term hemodialysis patients in Iran. [16]

Rai et al from New Delhi described a self reported prevalence of insomnia at 60.9% but the diagnosis of insomnia was based on frequency of symptoms experienced by dialysis patients. This lower prevalence could be due to underreporting of sleep symptoms to the treating physician by the patients. Rai also reported higher prevalence of insomnia among patients older than 55 years and those who had been on dialysis for over a year. [17] These results show that dialysis patients commonly experience sleep problems and most of them have poor quality of sleep. In the present study also, we found an increasing prevalence of poor sleep quality with increasing age. Yoshioka et al. found that advanced age affects patients experiencing sleep problems.[18] Age more than 60 years was a statistically significant associated risk factor of sleep disturbance, as per Walker et al.[14] It is important to note that the mean age of men and women diagnosed with end stage renal diseases increased from 40 to 59 years in India, similar to our study population, in which the mean age of patients was 52.7 years.[19]

In addition, our results show that patients having multiple morbidities (two or more medical conditions) are more likely to report decreased sleep quality. Mehrabi et al also reported similar findings of diabetic patients having poorer sleep quality than nondiabetic patients.[16] Also, the sleep quality in males was lower than that of females, although this was not statistically significant. This is similar to the findings of Walker et al. where males had more sleep wake complaints than females. [14] Varying gender differences are reported in other studies with somereporting that females had more sleep problems than males while others reported the reverse.[20] Hemodialysis patients in this study had more problems in their functionality during daytime, which has been proven to affect their day time alertness, activity level, the incidence of accidents and overall well-being. [1]

Santhosh Pai et al. also reported a high prevalence of sleeplessness using the PSQI scale, with females having poorer sleep quality than males. But some patients had snoring and other sleep apnoea symptoms which could be the reason for poorer sleep quality. Their study also reported a higher PSQI score among those patients who were in the initial months of HD.[21] Our study did not study the effect of HD duration on sleep quality. Also, we had excluded patients with sleep apnea from our study.

The main limitations of the present study are the selection of patients from the dialysis unit and a lack of a suitable control group from the community, which means the findings are not generalizable to the general population. Only self-rated responses were obtained in PSQI scale as spouses and room partners were not available at that time. The effect of stress of the disease, availability of family support and financial burden due to hemodialysis were not evaluated as factors affecting the sleep. These may be the potential confounders. Also, the sample size was comparatively low. Larger prospective longitudinal studies are needed to confirm the high prevalence of impaired quality of sleep. The PSQI survey is a simple tool offering comprehensive information on sleep quality. Therefore, the PSQI scale should be encouraged in all dialysis units since it presents the first step to detect poor sleepers in order to begin a more accurate procedure for early diagnosis and treatment of sleep disorders among ESRD patients.[22]

In addition to medical treatment to eliminate sleep problems and increase the sleep quality of ESRD patients, the implementation of sleep hygiene interventions could also be beneficial. These interventions include an environment with comfortable room temperature and ventilation, minimal noise, a comfortable bed and proper lighting. They should be applied to each patient's personal routine.[23] A counseling program that encourages exercise and smoking cessation, as well as other therapeutic methods, can help patients who suffer from poor sleep quality.[24]

Conclusion:

Almost all of our subjects had poor quality of sleep and only few of them sought treatment for the same. This risk of poor sleep quality can potentially affect their quality of life and aggravate their existing health risks. The sleep characteristics of hemodialysis patients need to be routinely evaluated. Early detection of poor sleep quality will help in better management of sleep disorders among ESRD patients. Further research should focus on identifying new methods and treatment techniques aimed at improving sleep quality among ESRD patients.

Declaration:

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Conflict of Interest: Nil

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