Research Article

Quality and adequacy of sleep among dialysis patients

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ABSTRACT

Introduction and Aim: Chronic Kidney Disease (CKD) is a debilitating illness characterized by physical, mental, socioeconomic and psychosocial disability. Being a literature has documented evidences of increased risk of depression and sleep disturbances among these patients, which indirectly affect the quality of life. The present study was carried out to evaluate the burden of depression and sleep disturbances among dialysis patients.

Methods: This cross-sectional study was carried out among 160 patients on maintenance dialysis. A structured proforma was used to document the particulars regarding CKD care. Sleep Quality, Depression status of patients were assessed using Pittsburgh Sleep Quality Index (PSQI), Beck's Depression Inventory (BDI) and Kt/V formula respectively.

Results: Hemodialysis inadequacy was prevalent among 79.4% of the participants. About 51.3% were suffering from moderate depression. Severe sleep disturbance was seen in 88.7% of the participants. The present study observed a statistically significant association between dialysis vintage and depression ($p < 0.05$). Similar association was seen between frequency of dialysis and sleep disturbances ($p < 0.05$).

Conclusion: The prevalence of sleep disturbances and depression was higher among the maintenance hemodialysis patients receiving dialysis for more than 2 years and also with a frequency of twice a week. It may be inferred that by increasing the frequency and the dosage of dialysis in patients the quality of sleep can be adequately improved and thereby it may lower the depressive state in patients.

Keywords: Depression; hemodialysis; sleep disturbances; chronic kidney disease

INTRODUCTION

Chronic Kidney Disease (CKD) is a general term for heterogeneous disorders affecting kidney structure and function with variable clinical presentation, in part related to cause, severity and the rate of progression. CKD often goes undetected and undiagnosed until the disease is well advanced and kidney failure is fairly imminent. It is defined by structural or functional abnormalities of the kidney, with or without decreased GFR or GFR $< 60 \text{ ml/min/1.73 m}^2$ for ≥ 3 months, with or without kidney damage (1). The prevalence of CKD is rapidly rising in developing countries like India, due to extensive change in the lifestyle and increased risk of co-morbidities like diabetes mellitus and hypertension. The prevalence of CKD in India according to published literature is 17.2% (2). Being a chronic and debilitating illness, the management of CKD is challenging with dialysis and renal transplant being the available choices.

Dialysis is a process that substitutes for renal function by removing excess fluid and/or accumulated endogenous or exogenous toxins. Dialysis therapies include intermittent hemodialysis (IHD), Continuous Arteriovenous hemodialysis (CAVHD), continuous Veno-venous hemodialysis (CVVHD), and peritoneal dialysis. Some patients

with Acute Renal Failure (ARF) are sometimes hemodynamically unstable, and may benefit from continuous renal replacement therapy (CRRT). Ultrafiltration methods include continuous arteriovenous hemofiltration (CAVH) and continuous veno-venous hemofiltration (CVVH). The chosen type of fluid and or solute removal depends on the patients cause for renal failure, current hemodynamic stats, vascular access, and healthcare providers' equipment and training (3). Although dialysis provides considerable relief from uremic symptoms, they are associated with a few complications like sleep disorders and depression which can significantly affect the quality of life of these CKD patients.

The prevalence of sleep disorders in CKD patients is as high as up to 80% compared to general population (4). Sleep disorders are found commonly in hemodialysis and peritoneal dialysis patients. Older age, long dialysis vintage, alcohol and tobacco abuse and the presence of significant comorbidities are major determinants of sleep disorders in dialysis patients. There is an association between decreased quality of life, health related risk and mortality in CKD patients. Sleep disturbances are complex including insomnia, restless leg syndrome, periodic leg movement and sleep apnea syndrome are more

prevalent in hemodialysis patients. According to a study done by Ahmed *et al*, the prevalence of insomnia among CKD patients was 35.5% in India (5).

Studies have explored linkages between sleep disorders and hemodialysis inadequacy among these CKD patients. The other manifestations of this inadequacy consist of fatigue, infertility, anemia, and many more. Hemodialysis adequacy is an important and effective factor in reducing these side effects. In addition, numerous studies have shown that with higher hemodialysis adequacy, the patients' health status is improved, their life expectancy is increased, and the mortality rate is reduced. Thus, increasing the adequacy of hemodialysis is one the challenges of the hemodialysis treatment process.

The present study was carried out to evaluate the sleep disorders and depression among the hemodialysis patients and to correlate with the adequacy of dialysis among patients on maintenance hemodialysis.

METHODOLOGY

Study setting and participants

This study was carried out as a cross sectional study in the Department of Nephrology of our tertiary teaching institution among patients on maintenance hemodialysis for a period of three months.

Inclusion criteria:

1. Age group 18 -65 years
2. Dialysis vintage of at least 3 months
3. CKD patients on maintenance Hemodialysis
4. Patients who were willing to give informed consent

Exclusion criteria:

1. Acute kidney injury patients
2. Peritoneal dialysis patients
3. Newly initiated on hemodialysis

Sample size and sampling

Based on the available literature, the minimum prevalence of sleep disorders among CKD patients

was estimated to be 35.5%. (5) At 95% confidence limits and 7.5% absolute precision, the sample size was calculated as 156.3 and was rounded off to 160. Patients on maintenance hemodialysis were first screened as per the selection criteria and were included in the study based on convenience sampling.

Ethical approval and informed consent

Approval was obtained from the Institutional Ethics Committee prior to the commencement of the study. Each participant was explained in detail about the study and informed consent was obtained prior to the commencement of data collection.

Data collection

A structured proforma was used to document the demographic details of the study participants. Sleep Quality, Depression status of maintenance hemodialysis patients and adequacy of patients were assessed using Pittsburgh Sleep Quality Index (PSQI), Beck's Depression Inventory (BDI) and Kt/V formula for assessing hemodialysis adequacy based on KDOQI guidelines respectively (6-8).

Data analysis

Data was entered and analyzed using SPSS ver.20 software. The descriptive data regarding sleep quality and depression were presented as percentages. A p-value <0.05 was considered statistically significant.

RESULTS

Majority of the participants belonged to the age group of 40-60 years (43.1%) and, majority were males (63.1%). The common co-morbidities observed were diabetes (24.4%) and hypertension (95%). Majority of the participants were on dialysis for 2-4 years (54.4%) and were taking dialysis twice weekly (84.4%). Hemodialysis inadequacy was prevalent among 79.4% of the participants (Table 1). With regards to the prevalence of depression, moderate depression was seen among 51.3% while severe depression was seen among 30% of the participants. Severe sleep disturbance was seen in 88.7% of the participants (Table 1).

Table 1: Background characteristics of the study participants.

Characteristics	Categories	Frequency (n=160)	Percentage (%)
Age (in years)	18-40	24	15.0
	40-60	69	43.1
	>60	67	41.9
Gender	Male	101	63.1
	Female	59	36.9
Diabetes Mellitus	Present	39	24.4
	Absent	121	75.6
Hypertension	Present	152	95.0
	Absent	8	5.0
	<1	4	2.5
	1-2	68	42.5

Dialysis Vintage (years)	2-4	87	54.4
	>4	1	0.6
Frequency of dialysis (Weekly)	Twice	135	84.4
	Thrice	25	15.6
Kt/V	0.5-1 (inadequate)	127	79.4
	1.1-1.5 (adequate)	33	20.6
Becks Depression Inventory	Borderline clinical depression	29	18.1
	Moderate depression	82	51.3
	Severe depression	48	30
	Extreme depression	1	0.6
PSQI	Normal to mild sleep disturbance	18	11.3
	Severe sleep disturbance	142	88.7

The present study observed a statistically significant association between dialysis vintage and depression. While borderline difference was increasingly common among those on dialysis for 1-2 years,

moderate depression was highest among those on dialysis for 2-4 years (53.7%). Participants on dialysis for >4 years were diagnosed with extreme depression (100%; $p<0.0001$; Table 2).

Table 2: Association between dialysis vintage and depression

Beck Depression Inventory	Dialysis vintage				Chi square	P-Value
	<1 year	1-2 years	2-4 years	>4years		
Border line clinical depression	0(0.0%)	29(100%)	0(0.0%)	0(0.0%)	Chi square=13.379	P-Value = 0.004
Moderate depression	0(0.0%)	38(46.3%)	44(53.7%)	0(0.0%)		
Severe depression	4(8.3%)	1(2.1%)	43(89.6%)	0(0.0%)		
Extreme depression	0(0.0%)	0(0.0%)	0(0.0%)	1(100%)		

There was a statistically significant correlation between frequency of dialysis and depression, with borderline and moderate depression seen among those on twice weekly dialysis (86.2% and 91.5%

respectively), while severe and extreme depression were more common on thrice weekly dialysis (27.1% and 100%) ($p=0.004$) (Table 3).

Table 3: Association between Frequency of dialysis and depression

Beck Depression Inventory	Frequency		Chi square	P-Value
	Twice	Thrice		
Border line clinical depression	25 (86.2%)	4 (13.8%)	Chi square=13.379	P-Value = 0.004
Moderatedepression	75 (91.5%)	7 (8.5%)		
Severe depression	35 (72.9%)	13 (27.1%)		
Extreme depression	0 (0.0%)	1 (100.0%)		

A significant association was also observed between sleep disturbance and frequency of dialysis. Mild sleep disturbance was 61.1% common among twice weekly dialysis regimen compared to 38.9% on thrice weekly regimen, while severe sleep disturbance was observed in 87.3% of twice weekly regimen.

($p=0.004$) (Table 4). Twice weekly regimen resulted in inadequacy among 91.3% of the participants compared to 57.6% in the adequacy group (1.1-1.5Kt/V). The observed difference was statistically significant ($p<0.05$) (Table 5).

Table 4: Association between frequency and sleep disturbance

PSQI	Frequency		Chi square	P-Value
	Twice	Thrice		
Normal to mild sleep disturbance	11 (61.1%)	7 (38.9%)	Chi-square = 8.326	P-Value=0.004
Severe sleep disturbance	124 (87.3%)	18 (12.7%)		

Table 5: Association between frequency and adequacy

Kt/V	Frequency		Chi square	P-Value
	Twice	Thrice		
0.5-1 (Inadequate)	116 (91.3%)	11 (8.7%)	Chi square= 22.649	P Value=0.0001
1.1-1.5 (Adequate)	19 (57.6%)	14 (42.4%)		

DISCUSSION

Chronic Kidney Disease (CKD) is a terminal illness resulting in physical, mental, socioeconomic and emotional debilitation. In developing countries like India, the health care cost for renal replacement therapy has been consistently increasing, forcing the patients to opt for out-of-pocket expenditure, which results in increase in drop out from renal care regimen. Therefore, it is inevitable for a CKD patient in India to be faced with various turmoil, as a result of which, they are vulnerable to various emotional pathologies.

The present study was carried out among 160 CKD patients on maintenance hemodialysis in a tertiary health facility. The study has observed increased prevalence of moderate to severe depression and severe sleep disturbance among majority of the participants. Furthermore, there was a statistically significant association between frequency of dialysis and depression/ sleep disturbances ($p < 0.05$). The study findings were similar to several studies published. In a study done by Ahmed S et al, insomnia was prevalent among 35.5% of the participants, similar to the present study (5). Another study done by Rai M et al reported a prevalence of 47.8% of depression and 60.9% of insomnia among patients on maintenance dialysis (9). Further, depression was increasingly common among those on dialysis vintage of over one year, similar to the present study. A study done by Mosleh *et al.*, observed moderate depression among 24.6% of the CKD patients, similar to the present study (10). Prolonged duration of hemodialysis was observed to be one of the risk factors for depression among the CKD subjects.

Apart from the external factors, CKD is associated with various physiological changes which increase their vulnerability to sleep disorders and depression. It has been suggested that ineffective glomerular filtration results in impaired homeostasis of various metabolites, bio-elements and proteins, which can severely affect the sleep routine of these patients (11). The metabolic derangements have been attributed to elevated levels of orexins and hypercalcemia. While orexins are associated with increase in the wakefulness and appetite, presence of hypercalcemia is reported to affect various signaling pathways resulting in hyperparathyroidism, which in turn can alter the sleep cycle. Although the hypothesis has been made, there is a need for further molecular studies to emphasize on the causal relationship between the physiological derangements and sleep disorders.

CONCLUSION

The present study has demonstrated a significant association between sleep disturbances and depression with adequacy of dialysis. The prevalence of Sleep disturbances and Depression was higher among the maintenance hemodialysis patients perceiving dialysis for more than 2 years and also with a frequency of twice a week. It may be inferred that by increasing the frequency and the dosage of dialysis in patients the quality of sleep can be adequately improved and thereby it may lower the depressive state in patients.

CONFLICT OF INTEREST

Authors declare no conflict of interest.

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