ORIGINAL ARTICLE
ASSOCIATION OF QUALITY OF SLEEP WITH COGNITIVE DECLINE AMONG THE PATIENTS OF CHRONIC KIDNEY DISEASE UNDERGOING HAEMODIALYSIS

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Background: This study was conducted to determine the association between the subjective quality of sleep and cognitive decline among the patients of chronic kidney disease (CKD) undergoing haemodialysis. **Methods:** In this cross-sectional study 106 patients of chronic kidney disease (CKD) undergoing haemodialysis at a tertiary care hospital in Rawalpindi, Pakistan were included in the final analysis. Cognitive decline was measured by British Columbia Cognitive Complaints Inventory (BC-CCI). Sleep quality was measured by using the Pittsburgh Sleep Quality Index (PSQI). Relationship of age, gender, marital status, education, occupation, BMI, duration of dialysis, dialysis count per week, family income, tobacco smoking and use of *naswar* was assessed with the cognitive decline. **Results**: Out of 106 patients screened through BC-CCI and PSQI, 13.1% had no cognitive decline while 86.9% had significant cognitive decline. Relationship between quality of sleep and cognitive decline was significant on binary logistic regression. **Conclusion**: This study showed significant relationship between the sleep quality and cognitive decline among the patients of CKD undergoing haemodialysis. The findings of our study also call for a greater degree of understanding of the physical and psychological state of patients of CKD undergoing haemodialysis.

Keywords: sleep quality; Cognitive decline; Haemodialysis; PSQI; BC-CCI

INTRODUCTION

Thousands of patients suffering from CKD have been undergoing haemodialysis each year in the US and other parts of the world making it a major public health problem worldwide.[1] All the biological functions of the body are altered to some extent when the patient is suffering from CKD and undergoing haemodialysis, including the appetite, sleep, cognition and the sexual function.[2]

Previous research highlights the decline in cognitive ability among the patients of CKD undergoing haemodialysis. A study done in Columbia revealed that 51% of dialysis patients showed signs of cognitive decline.[3] Another similar study done in our neighbouring country India showed that severity of CKD and cognitive decline has a positive correlation.[4] Sleep disturbances have also been commonly reported by the patients of CKD undergoing haemodialysis in various studies done in the past.[5–7]

Sleep disturbances have been linked with cognitive impairment in various studies done in the past both in normal population and haemodialysis patients.[8, 9] Sleep–wake cycle plays an important role in brain ageing, opening a new area for improvement of cognitive function in population high risk for dementia and cognitive decline.[9] Several biological and physiological theories might explain the association between cognition and sleep, but these pathways are not completely understood. Cognition problems among the dialysis patients may worsen the disease prognosis and also affect the treatment compliance so screening of sleep disturbances may be useful in early detection and treatment of these disorders and improving the overall quality of life of the patients.

No study has so far been undertaken on the patients undergoing haemodialysis in Pakistan to identify the cognition problems and their relationship with the sleep quality and the associated socio demographic factors. This study is designed to assess the cognitive decline among the dialysis patients and identify any correlation with the sleep quality and the social and demographic factors.

MATERIAL AND METHODS

This descriptive study was conducted at a dialysis unit of a tertiary care hospital of Rawalpindi between July–Dec 2016. Screening was performed on all the patients of CKD undergoing haemodialysis. Exclusion criteria were the patients less than 18 years of age or those who did not consent to or those with any history of psychiatric illness or delirium or with a past or current history of substance use. Patients who were pregnant or were undergoing dialysis due to reason other than CKD or could not read or perform the questionnaire were also excluded.

Instruments
British Columbia Cognitive Complaints Inventory (BC-CCI): It is a standardized screening tool for measuring the cognitive decline of the individuals. It is 6-item self-rating scale which takes less than 5 minutes to complete. Score greater than 4 by Likert scoring is taken as the cut off score. For assessing the severity of cognitive decline following classes were made
Normal 0-4
Mild cognitive decline 5-9
Moderate cognitive decline 9-14
Severe cognitive decline 15-18 [10]
Pittsburgh Sleep Quality Index (PSQI): It is a validated and effective screening tool for subjective measure of quality and patterns of sleep among the dialysis patients.[11]We applied the validated Urdu version of PSQI to use in our population.[12] A global sum of "5" or greater indicated poor sleep quality.

Subjects were inducted into the study after detailed description and written informed consent. Subjects with confounding variables like presence of chronic mental illness or substance use were identified by detailed history taking and excluded from the study. The BC-CCI and PSQI questionnaires were administered to the patients and were asked to answer the questions according to their condition in last one month. Socio demographic variables were also collected. Variables in the study included age, gender, marital status, psychiatric morbidity, education, occupation, BMI, duration of dialysis, dialysis count per week, level of family income, use of *naswar* and tobacco smoking. Age more than 50 was taken as high-risk age.[11] Marital status was classed as married and single or divorced or widowed. Family income was asked in detail and concluded as the sum of amount gathered from all the earning sources at the end of each month. It was classed as income lower than outgoings or equal to or higher than outgoings on the basis of recent economic survey in Pakistan.[13] Duration of dialysis was classified as less than one year or more than or equal to one year.[7] Dialysis count was studied as more than 02 per week or 02 or less. [14] A history of tobacco smoking and *naswar* use was obtained. People answering "yes" to question "Have you been consuming tobacco products regularly now a day or in the past?" were labelled as smokers or *naswar* users. Those having BMI more than 24 were regarded as overweight. The socio demographic data of the full sample of subjects participating in the research was entered in a structured Performa.

Characteristics of participants and the distribution of the BC-CCI and PSQI score were described by using the descriptive statistics. Participants were resulted by categorical compared by Participants were identified under the categories of no cognitive decline, mild cognitive decline, moderate cognitive decline and severe cognitive decline. Chi-square was used to determine between-group variances in categorical correlates. Relationship of quality of sleep and other factors with the cognitive decline was assessed by the binary logistic regression. Statistics Package for Social Sciences version 20.0 was used for all the statistical analysis. Chi-square test was used and differences between groups were considered significant if *p*-values were less than 0.05.

RESULTS
A total of 163 patients of CKD undergoing dialysis were approached to participate in the study. Eleven refused participation and 05 were ineligible due to exclusion criteria (01 gave history of psychoactive substance use, 02 had dialysis due to poisoning, 01 was diagnosed cases of depression and 01 was pregnant).

After being consented, an additional 10 did not provide complete data at baseline, leaving 137 participants who had completion of the PSQI and BC-CCI. Out of 137, 86.9% showed the presence of cognitive decline while 13.1% showed no cognitive decline. Table-1 shows that presence of poor sleep quality and increased duration of dialysis had strong association with the presence of cognitive decline when regression analysis was done. As shown in Table-2 poor sleep quality and longer duration of dialysis were associated with cognitive decline when chi-square was applied.

Table-1: The correlated factors relating to cognitive decline: the binary logistic regression

	B	*p*-value	OR (95% CI)
Age (ref. is 50years or less)	0.058	0.933	1.059 (0.275–4.075)
Gender (ref. is male)	-0.540	0.544	0.583 (0.102–3.326)
Family income (ref. is more than or equal to outgoings)	0.920	0.209	3.413 (0.700–16.634)
Smoking (ref. is non-smoker)	-0.139	0.923	2.510 (0.597–10.550)
Education (ref. is above matriculation)	0.370	0.612	1.448 (0.346–6.056)
Naswar use (ref. is non-user)	0.635	0.479	1.888 (0.326–10.943)
Duration of Dialysis (ref. is <1 year)	-2.927	0.014	0.054 (0.005–0.557)
No of dialysis per week (ref. is >2)	-3.526	0.190	0.029 (0.003–0.276)
BMI (ref. is 24 or less)	-0.228	0.785	0.796 (0.154–4.101)
Occupation (ref. is employed)	2.197	0.43	8.995 (1.704–47.480)
Sleep quality (ref. is good sleep quality)	2.371	0.002	10.709 (2.373–48.334)

Table-2: Characteristics of the study group and their BC-CCI scores

Socio demographic factors	No Cognitive decline	Mild Cognitive decline	Moderate Cognitive decline	Severe Cognitive decline	
Total	(BC-CCI 0–4) n (%) 18 (13.1)	(BC-CCI 5–9) n % 86 (62.8)	(BC-CCI 9–14) n % 20 (14.6)	(BC-CCI 15–18) n % 13 (94.9)	*p*-value
Age					
50 years or less	07 (38.9)	37 (43)	08 (40)	06 (46.1)	0.973
>50	11 (61.1)	49 (57)	12 (60)	07 (53.9)	
Gender					
Male	12 (66.7)	65 (75.6)	13 (65)	09 (69.2)	0.725
Female	06 (33.3)	21 (24.4)	07 (35)	04 (30.8)	
Family income					
Less than outgoings	09 (50)	57 (66.3)	15 (75)	06 (46.1)	0.214
More than or equal to outgoings	09 (50)	29 (33.7)	05 (25)	07 (53.9)	
Marital status					
Unmarried/widowed	00 (00)	03 (3.5)	02 (10)	02 (15.3)	0.166
Married	18 (100)	83 (96.5)	18 (90)	11 (84.7)	
Duration of Dialysis					
Less than one year	01 (5.5)	31 (36)	09 (45)	08 (61.5)	0.003
One year or more	17 (94.5)	55 (64)	11 (55)	05 (38.5)	
No of dialysis per week					
2 or less	16 (88.9)	57 (66.3)	13 (65)	10 (76.9)	0.190
More than 2	02 (11.1)	29 (33.7)	07 (35)	03 (23.1)	
Tobacco smoking					
Non-Smoker	16 (88.9	78 (90.7)	19 (95)	12 (92.3)	0.917
Smoker	02 (11.1	08 (9.3)	01 (05)	01 (7.7)	
Education					
Less than 10th grade	11 (61.1	49 (56.9)	12 (60)	08 (61.5)	0.977
10th grade or more	07 (38.9	37 (43.1)	08 (40)	05 (38.5)	
BMI					
24 or less	14 (77.8	71 (82.5)	17 (85)	08 (61.5)	0.378
>24	04 (22.2	15 (17.5)	03 (15)	05 (38.5)	
Occupation					
Employed	12 (66.7	70 (81.4)	17 (85)	09 (69.2)	0.403
Unemployed	06 (33.3	16 (18.6)	03 (15)	04 (30.8)	
Use of *naswar*					
No	13 (72.2	71 (82.5)	18 (90)	09 (69.2)	0.360
Yes	05 (27.8	15 (17.5)	02 (10)	04 (30.8)	
Sleep quality					
Good	11 (61.1	29 (33.7)	05 (25)	01 (7.7)	0.01
Poor	07 (38.9	57 (66.3)	15 (75)	12 (92.3)	

DISCUSSION

Pakistan has been facing a very high burden of CKD patients undergoing haemodialysis posing a considerable strain on our health care budget.[15,16] Cognitive decline and sleep disturbances have been associated with the haemodialysis in various studies done in the past.[7,8,11] Using the BC-CCI we found that 86.9% of our subjects showed cognitive decline which is in accordance with the studies done in different parts of the world in terms of frequency and patterns of cognitive decline among the patients of CKD undergoing hemodialysis.[3,4,8] Some of the factors that may affect cognition among these patients have been reported as depression, sleep disorders, increased risk of cardiovascular disease and oxidative stress and inflammatory cytokines.[3,8,17]

Presence of poor quality of sleep among the patients undergoing haemodialysis has been supported by local as well as foreign data.[6,7] Strong correlation between the quality of sleep and cognitive decline have

been reported in past too.[8,9] Findings of our study supported this correlation. A positive feedback cycle sometimes develops between the poor sleep and cognitive decline which becomes very annoying for the patient and a challenge for health care physicians. Cognition is such a complex neurological function with physiological, psychological and social dimensions that it needs large studies from this aspect especially among the chronic patients of various physical illnesses. It is difficult for the treating physicians to screen the patients of haemodialysis for mental health issues and even the individual himself is usually unable to comprehend the psychosomatic issues which may give rise to multiple problems including poor cognition.

Longer duration of dialysis has been associated with cognitive decline and poor quality of sleep in our study. Longer duration of dialysis has been associated with various mental health issues in the studies done in the past.[3,18] Long standing costly treatment may lead to economic issues which can also give rise to increased

psychiatric morbidity leading to poor sleep quality and cognitive decline. Similarly, long standing CKD may give rise to more biochemical abnormalities making the situation worse. Poor sleep quality and depression has been linked in various studies done in the past and both can have a vicious relationship.[19] Depression has also been associated with the cognitive decline in the studies of recent past[20] so this can also explain the relationship established in our study. Poor quality of sleep might have precipitated the mental health issues which might have been the cause of the cognitive decline.

The major limitation of this study is that target population was not investigated for sleep and cognitive disturbances prior to the start of haemodialysis. As study was not prospective so we cannot hypothesize that cognitive decline was a consequence of poor sleep quality and haemodialysis. The use of self-administered questionnaires and sample size pose methodological issues as well. The findings cannot be generalized as this was not a population based study. A specific group of patients in a tertiary care hospital was targeted instead of a randomized sample of all the patients undergoing dialysis at various hospitals of Pakistan. We recommend further studies on a large sample size using standardized and locally developed psychometric tools on the subject.

CONCLUSION

This study showed significant relationship between the sleep quality and cognitive decline among the patients of CKD undergoing hemodialysis. The findings of our study also call for a greater degree of understanding of the physical and psychological state of patients of CKD undergoing haemodialysis.

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AUTHORS' CONTRIBUTION

UBZ: Planned the study and wrote the final manuscript. BB: collected the data and contributed in writing the final manuscript

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