

Efficacy of Deep Breathing Exercise and Range of Motion Exercise on Quality of sleep in patients with Chronic Kidney Disease undergoing Hemodialysis.

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KEYWORDS

Deep Breathing Exercise, Range of Motion Exercise, Quality of Sleep, Chronic Kidney disease and Hemodialysis.

ABSTRACT

Introduction: Up to 80% of patients receiving dialysis may experience sleep problems. These sleep problems are regularly linked to a reduction in life satisfaction overall and an increased risk of a number of complications. Older CKD patients undergoing HD patients, those undergoing HD for longer periods of time, and those attending HD sessions often are more possible to have sleep issues

Material and Methods: Pre-test-post-test Control group design was carried out on CKD patients undergoing treatment of HD. Totally 116 adult participants selected and further randomly assigned into two equal groups: control and intervention groups. (Every group has 58 samples). Both groups' participants' socio-demographic and PSQI assessment were collected. In pre-dialysis Session Experimental group received diaphragmatic breathing exercise. During dialysis Session range of motion exercise was administered for and the control group followed hospital routine management. After the completion of last session post-test was conducted for experimental group and control group.

Results: The results of this study shows a statistically significant difference in the mean total PSQI score between the experimental and control groups after the intervention ($p < 0.05$).

Conclusion: The research findings indicate that a regular deep breathing and range of motion exercise program significantly improve the quality of sleep in patients with CKD undergoing HD.

Introduction:

As many as 10% of people worldwide are affected by chronic kidney disease (CKD), which currently has no cure. Over a billion people live in India, where the rising incidence of CKD is predicted to put a major burden on the country's healthcare system and economy in the years to come¹. End-stage renal disease (ESRD) has been more common worldwide over the last ten years, with an annual increase of 4-8%². ESRD is primarily caused by diabetes mellitus (DM). HD, peritoneal dialysis, and transplantation are the most prevalent forms of RRT³.

CKD is the sixth leading source of disease burden, accounting for 3.6% of all cases⁴. Individuals with ESRD who receive dialysis are more possible to develop sleep disruptions than the general population. Common symptoms include insomnia, sleep-disordered breathing, restless leg syndrome, and excessive daytime sleepiness⁵. According to research, 40-85% of HD patients worldwide suffer from sleep difficulties. In the general population, poor sleep is related with greater illness, lower quality of life, and even higher mortality rates^{6,7}. Up to 80% of patients receiving dialysis may experience sleep problems. These sleep problems are regularly linked to a reduction in life satisfaction overall⁸.

Older HD patients, those undergoing HD for longer periods of time, and those attending HD sessions often are more possible to have sleep issues⁹. Sleep issues are more common in older CKD patients, which can result in chronic fatigue and a lower quality of life. Between 8% and 36% of people with early-stage kidney disease and between 50% and 75% of people with renal failure report having trouble falling asleep. Poor sleep and insomnia can hasten the course of chronic kidney disease (CKD) and raise mortality rates among maintenance dialysis patients¹⁰.

Sleep difficulties rank among the most prevalent symptoms that HD patients encounter¹¹. A study of 1,643 HD patients from 335 dialysis centres in the US revealed that 49% of patients struggled to get up early in the morning, 59% had problems staying asleep through the night, and 50% had trouble falling asleep. In total, one or more of these symptoms were commonly encountered by 53% of these patients¹². Sleep disorders affect more than 85% of HD patients¹³.

Inadequate sleep is a significant indicator of many diseases, and people frequently complain about their sleep. Disturbances in motivation, emotions, and mental state might result from inadequate sleep. A variety of mental and physical symptoms, including as exhaustion, drowsiness, trouble concentrating, decreased pain threshold, appetite loss, anxiety, and depression, can be experienced by those have poor quality of sleep¹⁴. Enhancing sleep quality has the potential to improve overall clinical results as well as mental health. As a result, more focus needs to be on diagnosing, treating, and determining the variables influencing patients' sleep quality¹⁵.

Healthcare workers, particularly nurses, possess the knowledge to facilitate patients' self-management by identifying the causes of low-quality sleep. Understanding this concern, health professionals can better address patients' sleep problems by creating individualised sleep interventions for them. It also serves as a foundation for further analytical and interventional studies on keeping HD patients' sleep disorder treatments going. It can also raise the awareness of this problem among healthcare administrators, encouraging more investigation and remedies. Thus, the study is to look at how well HD patients sleep as well as the effects of deep breathing exercises and Range of motion exercises on the quality of sleep in CKD patients undergoing HD.

Material and Methods

Patients with CKD receiving HD treatment participated in a pre-test-post-test randomised trial design. The dialysis unit of Krishna Hospital and Medical Research Centre, Karad, served as the study's location. 116 adult samples were chosen, and they were then randomly split into two groups of equal groups the intervention group and the control group. There are 58 samples in each Group. Consent was obtained from each sample and ethical approval granted to perform the study. The study's inclusion criteria, which included receiving regular HD three times a week and being able to understand Hindi, Marathi, and English, were followed in the selection of samples. . Patients diagnosed with hepatitis B, hepatitis C and HIV, with history of uncontrolled hypertension, heart failure, heart block, cardiac arrhythmias, third degree AV heart block, suspected aneurysm and recent Significant change in resting ECG, Diagnosed with major psychiatric problems, Moderate or severe anemia, Musculoskeletal issues/ limitations, Heart rate of ≥ 100 beats/minute, Hearing and communication problems and Severe uncontrolled diabetes were excluded from the study.

Socio-demographic information was collected and Pittsburgh Sleep Quality Index (PSQI) was used to gather sleep quality assessment from samples in both groups. Diaphragmatic breathing exercises were given to the pre-dialysis session experimental group three times a week for ten minutes each, for a total of six weeks. For six weeks in a row, a range-of-motion exercise was administered weekly three times for ten minutes each during HD

treatments. The control group adhered to standard hospital procedures. A post-test utilising the same scale was administered to the experimental group and the control group.

Results

Description of Socio-demographic characteristics

Data presented in table no.1 shows age wise distribution of samples majority 42(72.41%) were in experimental group and 46(79.31%) of the control group were within the age group of 41 – 65 years. Gender distribution of sample reveals that about 39(67.24%) of the experimental group and 38(65.52%) of the control group were male. The percentage distribution of patients in educational qualification shows that among 29(50.00%) of the experimental group and 24(41.38%) of the control group were Primary Education. As regards to Occupation 24 (41.38%) of the experimental group and 17(29.31%) of control group were unemployed Majority of samples 52(89.66%) of experimental group and 48(82.76%) of Control group were married. In relation residence, it shows that the most 43(74.14%) in the experimental and 35(60.34%) in control group were belongs to the Rural area. Majority of samples 37(63.79%) in experiment group and 44(75.86) in control group had duration of HD 3 years and above. Majority of samples 27(46.55%) in both experiment group and control group had no any co-morbidities but 13(22.41%) in experiment group and 14(24.14) in control group had both Hypertension & Diabetes mellitus.

Table No. 1: Frequency and percentage distribution of samples according to their socio-demographic variables.

N=116						
Sr.No.	Demographic Variables		Experiment Group(58)		Control Group (58)	
			F	%	F	%
1	Age(Years)	18-40 years	16	27.59	12	20.69
		41-65 years	42	72.41	46	79.31
2	Gender	Male	39	67.24	38	65.52
		Female	19	32.76	20	34.48
3	Educational Qualification	No Formal Education	7	12.07	16	27.59
		Primary Education	29	50.00	24	41.38
		Secondary Education and Above	16	27.59	16	27.59
		Graduation/Post Graduation	6	10.34	2	3.45
4	Occupation	Home maker	18	31.03	18	31.03
		Employed	13	22.41	19	32.76
		Unemployed	24	41.38	17	29.31
		Retired	3	5.17	4	6.90
5	Marital Status	Married	52	89.66	48	82.76
		Unmarried	4	6.90	6	10.34
		Widow/Widower	2	3.45	4	6.90
		Divorced	0	0.00	0	0.00
6	Residence	Urban	15	25.86	23	39.66
		Rural	43	74.14	35	60.34
7	Duration Of Hemodialysis	Below 3 years	21	36.21	14	24.14
		3 years and above	37	63.79	44	75.86
8	co-morbidities	Hypertension	10	17.24	5	8.62
		Diabetes mellitus	8	13.79	12	20.69

Sr.No.	Demographic Variables	Experiment Group(58)		Control Group (58)	
		F	%	F	%
	Both Hypertension & Diabetes mellitus	13	22.41	14	24.14
	No co-morbidities	27	46.55	27	46.55

Table No. 2: Score Interpretation of Pre Test level of Quality of sleep in Experimental Group and Control Group

N=116

Quality of Sleep	Score	Experiment Group		Control Group	
		F	%	F	%
Poor Sleep	6-21	43	74.14	40	68.97
Good Sleep	0-5	15	25.86	18	31.03

Sleep level quality in patients with CKD undergoing HD

Data Presented in table no.2 shows that majority 43(74.14%) samples in Experimental Group and 40 (68.97%) in control group has poor Quality of sleep in pre-test. 15(25.86%) in Experimental Group and 18 (31.03%) in control group has good Quality of sleep in pre-test.

Table No. 3: Pre-test Quality of sleep according to the PSQI.

PSQI Component	Experimental Group		Control Group		Score Range	P Value
	Mean $\pm$ SD	95% Confidence interval for mean	Mean $\pm$ SD	95% Confidence interval for mean		
Subjective sleep quality	0.96 $\pm$ 0.70	0.78-1.15	0.96 $\pm$ 0.70	0.78-1.15	0-3	0.9978
Sleep latency	1.81 $\pm$ 0.39	1.70-1.91	1.79 $\pm$ 0.40	1.68-1.90	0-3	0.8705
Sleep duration	0.79 $\pm$ 0.58	0.63-0.94	0.77 $\pm$ 0.59	0.61-0.93	0-3	0.8839
Sleep efficiency	0.58 $\pm$ 0.53	0.44-0.72	0.58 $\pm$ 0.53	0.44-0.72	0-3	0.9978
Sleep disturbance	0.82 $\pm$ 0.56	0.67-0.97	0.82 $\pm$ 0.56	0.67-0.97	0-3	0.9979
Use of sleep medication	0.18 $\pm$ 0.39	0.08-0.29	0.18 $\pm$ 0.39	0.08-0.29	0-3	0.9977
Daytime dysfunction	1.32 $\pm$ 0.60	1.16-1.48	1.29 $\pm$ 0.52	1.13-1.45	0-3	0.8053
Global PSQI Score : (Sum of seven component scores)	6.5 $\pm$ 2.29	5.89-7.10	6.43 $\pm$ 2.31	5.82-7.04	0-21	0.8724

The mean and SD global and component PSQI scores for the study population shows in Table no.3 the global PSQI score ranged from 0 to 21. There was no any statistical significant between PSQI Component and global PSQI Score at the level of $p < 0.05$ between experimental and control group in pre-test.

Table No. 4: Score Interpretation of post-test sleep level Quality in Experimental Group and Control Group

N=116

Quality of Sleep	Score	Experiment Group		Control Group	
		F	%	F	%
Poor Sleep	6-21	30	51.72	42	72.41
Good Sleep	0-5	28	48.28	16	27.59

Data Presented in table no.4 shows that majority 30(51.72%) were having good sleep level Quality and 28(48.28%) were having poor sleep level Quality in Post-test. Whereas in Control Group 42 (72.41%) samples were having poor sleep level Quality and only 16 (27.59%) samples e having good sleep level Quality in Post-test.

Table No. 5: Post-test Quality of sleep according to the Pittsburgh Sleep Quality Index (PSQI).

N=116

PSQI Component	Experimental Group		Control Group		Score Range	P value
	Mean $\pm$ SD	95% Confidence interval for mean	Mean $\pm$ SD	95% Confidence interval for mean		
Subjective sleep quality	0.93 $\pm$ 0.72	0.74-1.12	0.98 $\pm$ 0.71	0.79-1.17	0-3	0.7168
Sleep latency	1.62 $\pm$ 0.52	1.48-1.75	1.74 $\pm$ 0.44	1.62-1.85	0-3	0.3055
Sleep duration	0.74 $\pm$ 0.54	0.59-0.88	1 $\pm$ 0.52	0.86-1.13	0-3	*0.0344
Sleep efficiency	0.48 $\pm$ 0.50	0.35-0.61	0.65 $\pm$ 0.51	0.51-0.79	0-3	0.1231
Sleep disturbance	0.72 $\pm$ 0.52	0.58-0.86	0.87 $\pm$ 0.53	0.73-1.01	0-3	0.1987
Use of sleep medication	0.18 $\pm$ 0.39	0.08-0.29	0.29 $\pm$ 0.45	0.17-1.41	0-3	0.3243
Daytime dysfunction	0.94 $\pm$ 0.57	0.79-1.10	1.20 $\pm$ 0.61	1.04-1.36	0-3	0.043
Global PSQI Score :(Sum of seven component scores)	5.63 $\pm$ 2.10	5.08-6.19	6.74 $\pm$ 1.97	6.22-7.25	0-21	*0.0046

The mean and SD global and component PSQI scores for the study population are shown in 5 the PSQI global score between 0 to 21. There was changes in PSQI Component of Sleep Duration (p=0.0344), Daytime dysfunction (p=0.043) and global PSQI Score at the level of p<0.05 between experimental and control group in post-test. Other PSQI components (Subjective sleep quality, Sleep latency, Sleep efficiency, Sleep disturbance and Use of sleep medication) were not found significant difference.

Table no. 6: Association between socio-demographic variables with pre-test level of sleep level Quality among CKD patients undergoing HD

N=116

Demographic Variables		Quality of Sleep		Chi Square value	P value
		Good (F-33)	Poor (F-83)		
Age(Years)	18-40 years	8	20	0.00027	0.9868
	41-65 years	25	63		
Gender	Male	21	56	0.1555	0.6933
	Female	12	27		
	No Formal Education	8	15	5.322	0.1497

Demographic Variables		Quality of Sleep		Chi Square value	P value
		Good (F-33)	Poor (F-83)		
Educational Qualification	Primary Education	13	40		
	Secondary Education and Above	12	20		
	Graduation/Post Graduation	0	8		
Occupation	Home maker	10	16	4.946	0.1758
	Employed	8	24		
	Unemployed	15	26		
	Retired	0	7		
Marital Status	Married	30	70	2.516	0.2843
	Unmarried	3	7		
	Widow/Widower	0	6		
Residence	Urban	13	25	0.9218	0.3370
	Rural	20	58		
Duration Of Hemodialysis	Below 3 years	26	9	51.738	0.0001*
	3 years and above	7	74		
Types of co-morbidities	Hypertension	7	8	19.219	0.0002*
	Diabetes mellitus	2	18		
	Both Hypertension & Diabetes mellitus	1	26		
	No comorbidities	23	31		

*: Statistically significant at $p \leq 0.05$

Association between socio-demographic variables with pre-test level of sleep level Quality among CKD patients undergoing HD

Data presented in table no.6 revealed that there was no significant association between the level sleep level Quality and selected socio-demographic variables (except Duration of Hemodialysis and types of co-morbidities) in experimental group and control group at the level $p < 0.05$.

Duration of Hemodialysis and types of co-morbidities found significantly associated between the levels sleep level Quality at the level $p < 0.05$.

Discussion:

According to the study's findings, a regular exercise program markedly enhances sleep level Quality in patients with CKD undergoing HD. The study involved two groups: an experimental group that followed an exercise regimen and a control group that received hospital care. Statistical analysis indicated a significant improvement in sleep quality in the experimental group compared to the control group, both before and after the intervention.

Present study data reveals, the majority of participants had poor sleep quality in the pre-test, with 43 (74.14%) in the experimental group and 40 (68.97%) in the control group. There were no Changes in PSQI scores based on patients' gender and age. Similar results findings shown in the study of Edalat-Nejad M et al.¹⁶ which reported that 87 out of 100 patients (87%) were "poor sleepers" (global PSQI ≥ 5) and found no significant differences in PSQI scores based on gender, age, or time on HD. Similarly, a study by Anwar N et al.¹⁷ involving 113 patients found that 82 patients (72.6%) had poor sleep level quality, while 31 (27.4%) had good sleep level quality.

Present study results confirmed difference in the mean total PSQI score between the experimental and control groups after the intervention ($p < 0.05$). Supporting this finding, the

study by Sayed SE et al.¹⁸ reported a decrease in the mean total PSQI score after the implementation of relaxation techniques compared to the mean score one month before the application of these techniques, with a significant difference observed ($P = 0.0002$).

Present study results confirmed that there was no significant difference in seven components of the PSQI before the intervention, similar to the findings of Elsayed Rady S et al.¹⁹, which reported no significant differences between the control and study groups regarding the PSQI components before the intervention. However, after the intervention, our study found statistically significant differences in the PSQI components of Sleep Duration ($p=0.0344$), Daytime Dysfunction ($p=0.043$), and the global PSQI Score ($p<0.05$). In comparison, Elsayed Rady S et al.¹⁹ reported significant differences between the control and study groups in Subjective Sleep Quality, Sleep Latency, Sleep Duration, Habitual Sleep Efficiency, Sleep Disturbances, and Daytime Dysfunction, with p -values of 0.002, 0.001, 0.006, 0.001, 0.048, and 0.001, respectively.

Conclusion:

The research findings indicate that a regular deep breathing and range of motion exercise program significantly improve the sleep level quality in patients with CKD undergoing HD. Professional nurses play a vital part in addressing and evaluating poor sleep level quality in HD patients. Routine clinical assessments and early identification of sleep problems and complaints should be integral to the dialysis staff's responsibilities. Nurses should not focus solely on medical treatment but also assist patients in practicing behavioral and cognitive therapies and adopting a healthy lifestyle. Techniques such as deep breathing and range of motion exercise has positively impact the sleep quality of HD patients.

Acknowledgement: We sincerely value every participant who contributed their time and information to this study.

Conflicts of interest: The authors stated that they had no conflicts of interest concerning this study.

Financial Support and sponsorship: Nil

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