

Effectiveness Of Deep Breathing Exercise and Soak Therapy on Sleep Quality Among Older Adults Residing in Old Age Homes: A Quasi-Experimental Study

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Abstract

Introduction: Sleep disturbances are among the most common health problems affecting elderly individuals and significantly influence their physical, psychological, and social well-being. Poor sleep quality is associated with impaired cognitive functioning, depression, anxiety, increased risk of falls, and reduced quality of life. Deep breathing exercise and warm foot soak therapy are simple non-pharmacological interventions that may improve sleep quality among older adults.

Objective: To assess the effectiveness of deep breathing exercise and warm foot soak therapy on sleep quality among elderly residents of selected old age homes in Sangli district.

Materials and Methods: A quantitative quasi-experimental pre-test post-test control group design was adopted. Sixty elderly residents were selected using purposive sampling and assigned to experimental (n=30) and control (n=30) groups. Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). The experimental group received deep breathing exercise and warm foot soak therapy daily for four weeks, whereas the control group received routine care. Data were analyzed using descriptive and inferential statistics.

Results: The mean PSQI score of the experimental group decreased from 9.13 ± 3.47 during pre-test to 6.97 ± 2.14 during post-test. The improvement was statistically significant ($t = 5.93$, $p < 0.001$). Comparison of post-test scores between the experimental and control groups revealed a statistically significant difference ($t = 2.08$, $p = 0.042$).

Conclusion: Deep breathing exercise and warm foot soak therapy were effective in improving sleep quality among elderly residents of selected old age homes. The intervention is simple, safe, economical, and can be incorporated into routine geriatric nursing care.

Keywords: Sleep Quality, Elderly, Deep Breathing Exercise, Warm Foot Soak Therapy, Old Age Homes, Pittsburgh Sleep Quality Index.

Introduction

Sleep is a fundamental biological process essential for maintaining physical health, psychological well-being, cognitive functioning, and overall quality of life. During sleep, several restorative physiological processes occur, including tissue repair, cell regeneration, immune strengthening, hormonal regulation, memory consolidation, learning, and emotional processing. Adequate sleep is particularly important among elderly individuals because ageing is associated with progressive physiological decline and increased susceptibility to health problems.¹

Ageing is accompanied by significant alterations in sleep architecture, including reduced slow-wave sleep, decreased rapid eye movement sleep, increased sleep latency, frequent nocturnal awakenings, and lower sleep efficiency. Research has shown that approximately 40–60% of older adults experience difficulty initiating sleep, 30–50% have difficulty maintaining sleep, and 20–30% report early morning awakening.² These age-related sleep disturbances are further aggravated by decreased melatonin secretion, chronic illnesses, pain, medication use, psychological stress, and social isolation.³

Sleep disturbances have emerged as a major public health concern among elderly populations worldwide. Epidemiological studies indicate that sleep-related problems affect nearly 30–70% of older adults, with insomnia being the most common sleep disorder.⁴ Poor sleep quality has been associated with cardiovascular diseases, diabetes mellitus, impaired immunity, depression, anxiety, cognitive decline, reduced functional ability, and poor quality of life.⁵ The elderly population is increasing rapidly throughout the world. According to the United Nations World Population Ageing Report, the number of individuals aged 60 years and above is expected to rise substantially by 2050.⁶ As life expectancy increases, sleep-related disorders are becoming increasingly prevalent and represent an important challenge for healthcare systems and caregivers.

Several studies have reported a high prevalence of sleep disturbances among elderly populations. A community-based study reported that 58.43% of elderly participants experienced poor sleep quality, 22.47% slept for less than five hours per night, and 23.6% experienced frequent sleep disturbances.⁷ Another study found that approximately 37% of elderly individuals suffered from insomnia, while only a small proportion sought professional treatment.⁸ Furthermore, 65% of elderly residents living in old age homes were reported to have poor sleep quality, indicating a substantial burden of sleep-related problems among institutionalized elderly individuals.⁹

Elderly residents of old age homes are particularly vulnerable to sleep disturbances because of loneliness, separation from family members, reduced social interaction, environmental disturbances, chronic illnesses, and emotional stress. Persistent sleep disturbances may lead to impaired concentration, memory deficits, daytime fatigue, mood disorders, reduced functional independence, and poor quality of life. Furthermore, elderly individuals with chronic insomnia are reported to be 1.5–2 times more likely to experience cognitive decline, while inadequate sleep increases the risk of falls by approximately 30–50%.¹⁰

Although pharmacological agents such as sedatives and hypnotics are frequently prescribed for sleep disorders, their prolonged use is associated with dependence, tolerance, cognitive impairment, daytime drowsiness, and increased risk of falls.¹¹ Consequently, there has been growing interest in safe, economical, and non-pharmacological interventions that can improve sleep quality without producing adverse effects.

Deep breathing exercise are effective relaxation techniques that activate the parasympathetic nervous system, reduce sympathetic stimulation, relieve anxiety, and promote physiological relaxation. Previous studies have demonstrated significant improvement in sleep quality following structured breathing exercise among elderly individuals.¹²

Warm foot soak therapy is another simple intervention that enhances peripheral circulation, improves thermoregulation, promotes muscle relaxation, and facilitates sleep initiation and maintenance. Studies have reported significant improvement in sleep quality among elderly individuals receiving warm foot bath therapy.¹³

Despite the availability of evidence supporting the individual benefits of deep breathing exercise and warm foot soak therapy, limited studies have examined their combined effectiveness among institutionalized elderly populations. Furthermore, very few studies have been conducted in Sangli district addressing sleep quality among elderly residents of old age homes. Therefore, the present study was undertaken to assess the effectiveness of deep breathing exercise and warm foot soak therapy on sleep quality among elderly residents of selected old age homes in Sangli district.

Materials And Methods

A quantitative research approach with a quasi-experimental pre-test post-test control group design was adopted to assess the effectiveness of deep breathing exercise and warm foot soak therapy on sleep quality among elderly residents of selected old age homes in Sangli district. The study was conducted in selected old age homes of Sangli district, Maharashtra.

The target population comprised elderly residents aged 60 years and above residing in selected old age homes. A total of 60 elderly residents were selected using purposive sampling technique and assigned into experimental group (n=30) and control group (n=30).

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI). The tool consisted of two sections: demographic variables and standardized PSQI items. The total score ranged from 0 to 21, with higher scores indicating poorer sleep quality.

The experimental group received deep breathing exercise using the 4-7-8 breathing technique for 15–20 minutes daily along with warm foot soak therapy before bedtime for four consecutive weeks. The control group received routine care without intervention.

Content validity of the tool was established through expert validation and reliability of the tool was found to be 0.82. Ethical clearance was obtained from the Institutional Ethics Committee of Bharati Vidyapeeth (Deemed to be University) College of Nursing, Sangli. Written informed consent was obtained from all participants before data collection.

The collected data were analyzed using descriptive and inferential statistics including frequency, percentage, mean, standard deviation, paired t-test, unpaired t-test and chi-square test.

Results

The results of the present study are organized and presented according to the objectives of the study. The findings include demographic characteristics of elderly individuals, assessment of sleep quality, effectiveness of deep breathing exercise and warm foot soak therapy, comparison between experimental and control groups, and association of sleep quality with selected demographic variables.

SECTION I

Description of Demographic Characteristics of Elderly Individuals

Table 1: Frequency and Percentage Distribution of Demographic Characteristics of Elderly Individuals
n = 30+30

Variables	Groups	Experimental Group		Control Group	
		Frequency	Percentage	Frequency	Percentage
Age (Years)	60-65	3	10.00	4	13.33
	66-70	5	16.67	6	20.00
	71 & Above	22	73.33	20	66.67
Gender	Male	16	53.33	16	53.33
	Female	14	46.67	14	46.67
Educational Status	Primary	23	76.67	16	53.33
	Secondary	4	13.33	7	23.33
	Graduate & Above	3	10.00	7	23.33
Duration of Stay in old age home (months)	0-12	6	20.00	14	46.67
	13-24	10	33.33	14	46.67
	More than 24	14	46.67	2	6.67
Dietary Pattern	Vegetarian	5	16.67	16	53.33
	Both Veg and Non-veg	25	83.33	14	46.67
Physical Activity	Sedentary	2	6.67	1	3.33
	Moderate	24	80.00	26	86.67
	Active	4	13.33	3	10.00
Sleep Pattern	Regular	17	56.67	16	53.33
	Irregular	13	43.33	14	46.67
Presence Chronic Illness	Present	11	36.67	11	36.67
	Absent	19	63.33	19	63.33
Smoking, Alcohol and Caffeine (Tea & Coffee) Use	Yes	20	66.67	22	73.33
	No	10	33.33	8	26.67

The demographic distribution revealed that the majority of elderly individuals in the experimental group (73.33%) and control group (66.67%) belonged to the age group of 71 years and above. Participants aged 66-70 years constituted 16.67% of the experimental group and 20.00% of the control group, whereas those below 65 years accounted for 10.00% and 13.33% respectively.

With regard to gender, male participants constituted 53.33% of the sample in both the experimental and control groups, while female participants accounted for 46.67% in both groups.

According to educational status, the majority of participants in the experimental group (76.67%) had primary education, followed by secondary education (13.33%) and graduate and above education (10.00%). In the control group, 53.33% had primary education, whereas 23.33% each had secondary and graduate and above education.

Regarding physical activity, 80.00% of elderly individuals in the experimental group and 86.67% in the control group reported moderate physical activity, while 20.00% and 13.33% respectively reported mild physical activity.

According to sleep pattern, 56.67% of participants in the experimental group and 53.33% in the control group reported regular sleep patterns, whereas 43.33% and 46.67% respectively reported irregular sleep patterns.

According to the presence of chronic illness, 36.67% of participants had chronic illness and 63.33% had no chronic illness in both the experimental and control groups. Among those with chronic illness, in the experimental group 13.33% had hypertension, 10.00% had diabetes, and 13.33% had both diabetes and hypertension, whereas in the control group 16.67% had hypertension, 6.67% had diabetes, and 13.33% had both diabetes and hypertension.

According to smoking, alcohol and caffeine (tea and coffee) use, 66.67% of participants in the experimental group reported the habit, while 33.33% did not. In the control group, 73.33% of participants reported the habit and 26.67% did not. It is noteworthy that none of the participants reported smoking or alcohol consumption; the reported habit was exclusively related to caffeine intake in the form of tea and coffee. This finding indicates that caffeine consumption was the only prevalent substance-use habit among the elderly individuals in both groups.

Furthermore, none of the elderly individuals in either group were using sleep medications during the study period. Overall, the findings indicate that both the experimental and control groups were comparable with respect to their baseline demographic characteristics.

SECTION II

Assessment of Pre-test and Post-test Sleep Quality Among Elderly Individuals

Table 2: General Assessment of Sleep Quality Among Elderly Individuals in Experimental Group

n= 30

Variable	Groups	Score	Pre Test		Post Test	
			Frequency	Percentage	Frequency	Percentage
PSQI (Sleep Quality)	Good	0-5	5	16.67	7	23.33
	Moderate	6-10.	13	43.33	21	70.00
	Poor	11-21.	12	40.00	2	6.67
PSQI	Minimum		5		4	
	Maximum		15		13	
	Average (SD)		9.13 (3.47)		6.97 (2.14)	

The above table depicts the assessment of sleep quality among elderly individuals in the experimental group before and after administration of deep breathing exercise and warm foot soak therapy. During the pre-test, 16.67% of elderly individuals had good sleep quality, 43.33% had moderate sleep quality and 40.00% had poor sleep quality. Following the intervention, 23.33% of elderly individuals had good sleep quality, 70.00% had moderate sleep quality and only 6.67% had poor sleep quality. The findings indicate a considerable improvement in sleep quality among elderly individuals following deep breathing exercise and warm foot soak therapy.

Table 3: General Assessment of Sleep Quality Among Elderly Individuals in Control Group

n = 30

Variable	Groups	Score	Pre Test		Post Test	
			Frequency	Percentage	Frequency	Percentage
	Good	0-5	8	26.67	6	20.00

PSQI (Sleep Quality)	Moderate	6-10.	12	40.00	13	43.33
	Poor	11-21.	10	33.33	11	36.67
PSQI	Minimum		5		5	
	Maximum		13		13	
	Average (SD)		8.16 (2.85)		8.33 (2.89)	

The above table depicts the assessment of sleep quality among elderly individuals in the control group before and after the study period. During the pre-test, 26.67% of elderly individuals had good sleep quality, 40.00% had moderate sleep quality and 33.33% had poor sleep quality. During the post-test, 20.00% had good sleep quality, 43.33% had moderate sleep quality and 36.67% had poor sleep quality. The findings show that there was no substantial improvement in sleep quality among elderly individuals in the control group.

SECTION III

Effectiveness of Deep Breathing Exercise and Warm Foot Soak Therapy on Sleep Quality Among Elderly Individuals

Table 4: Comparison of Pre-test and Post-test Sleep Quality Scores Among Elderly Individuals in Experimental Group

n = 30					
Experimental	Frequency	Mean	S.D.	t value	P value
Pre Test	30	9.13	3.47	5.93	0.000
Post test	30	6.97	2.14		

*Significant at $p < 0.05$

The above table shows the comparison of pre-test and post-test sleep quality scores among elderly individuals in the experimental group. The mean post-test PSQI score (6.97 ± 2.14) was lower than the mean pre-test PSQI score (9.13 ± 3.47). The calculated paired t-value was 5.93 with a p-value of 0.000, which was statistically significant at the 0.05 level. Hence, deep breathing exercise and warm foot soak therapy were effective in improving sleep quality among elderly individuals.

Table 5: Comparison of Pre-test and Post-test Sleep Quality Scores Among Elderly Individuals in Control Group

n = 30					
Control	Frequency	Mean	S.D.	t value	P value
Pre Test	30	8.16	2.85	1.98	0.057
Post test	30	8.33	2.89		

*Significant at $p < 0.05$

The above table shows the comparison of pre-test and post-test sleep quality scores among elderly individuals in the control group. The mean post-test PSQI score (8.33 ± 2.89) was slightly higher than the pre-test score (8.16 ± 2.85). The calculated paired t-value was 1.98 with a p-value of 0.057, which was not statistically significant. Therefore, no significant improvement in sleep quality was observed among elderly individuals in the control group.

SECTION IV

Comparison of Post-test Sleep Quality Between Experimental and Control Groups

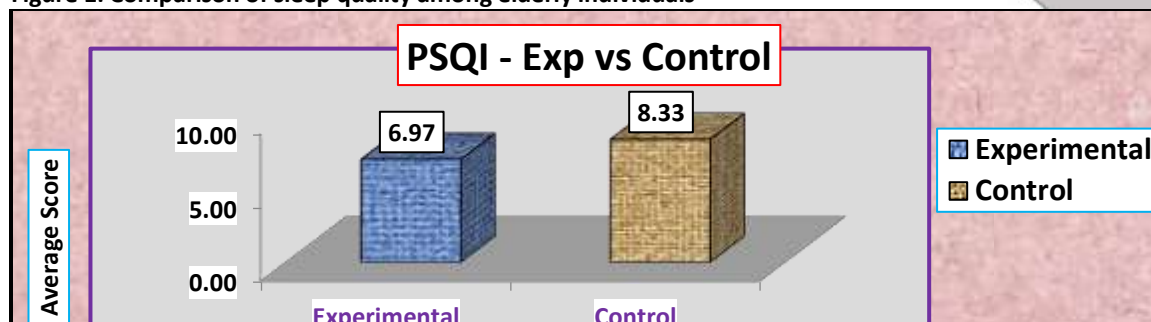
Table 6: Comparison of Post-test Sleep Quality Scores Between Experimental and Control Groups

n = 30+30					
Groups	Frequency	Mean	S.D.	t value	P value
Experimental	30	6.97	2.14	2.08	0.042

Control	30	8.33	2.89		
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*Significant at $p < 0.05$

Figure 1: Comparison of sleep quality among elderly individuals



The above table and figure show the comparison of post-test sleep quality scores between the experimental and control groups. The mean post-test PSQI score of the experimental group was lower than that of the control group. The calculated unpaired t-value was 2.08 with a p-value of 0.042, which was statistically significant at the 0.05 level. This finding indicates that elderly individuals who received deep breathing exercise and warm foot soak therapy experienced significantly better sleep quality compared with those who received routine care alone.

SECTION V

Association Between Pre-test Sleep Quality and Selected Demographic Variables

Table 7: Association Between Pre-test Sleep Quality and Selected Demographic Variables Among Elderly Individuals

Variable	Groups	PSQI		Chi Square	D.F.	p value	Significance
		Below Md	Above Md				
Age (in years)	below 65	4	3	8.97	2	0.011	Significant
	66-70	10	1				
	71 & above	17	25				
Sleep Pattern	Regular	29	4	38.5	1	0.000	Significant
	Irregular	2	25				

*Significant at $p < 0.05$

The above table shows the association between pre-test sleep quality and selected demographic variables among elderly individuals. Chi-square analysis revealed that age and sleep pattern were significantly associated with pre-test sleep quality among elderly individuals. Other demographic variables such as gender, educational status, physical activity, chronic illness, and smoking, alcohol and caffeine use did not show statistically significant association with sleep quality.

Discussion

The present study was conducted to assess the effectiveness of deep breathing exercise and warm foot soak therapy on sleep quality among elderly residents of selected old age homes in Sangli district. Sleep disturbances are highly prevalent among elderly individuals and adversely affect physical health, psychological well-being, cognitive functioning and quality of life.

The findings of the present study revealed that a considerable proportion of elderly individuals experienced moderate to poor sleep quality before intervention. In the experimental group, 43.33% of participants had moderate sleep quality

and 40.00% had poor sleep quality during the pre-test assessment. Similar findings were reported in a study conducted by Jesudoss et al., which revealed that approximately 65% of elderly residents living in old age homes experienced poor sleep quality, highlighting the high prevalence of sleep disturbances among institutionalized elderly populations.¹⁵

Following administration of deep breathing exercise and warm foot soak therapy, a significant improvement in sleep quality was observed among elderly individuals in the experimental group. The proportion of participants with poor sleep quality decreased from 40.00% during pre-test to 6.67% during post-test, while the proportion of participants with moderate sleep quality increased from 43.33% to 70.00%.

The mean sleep quality score in the experimental group decreased from 9.13 ± 3.47 during pre-test to 6.97 ± 2.14 during post-test. The calculated paired t-value was 5.93 and the obtained p-value was less than 0.001, indicating a statistically significant improvement in sleep quality following the intervention. Similar findings were reported in a study conducted by Swain et al., where the mean sleep quality score improved significantly following breathing exercise, decreasing from 8.82 ± 2.94 before intervention to 5.96 ± 2.11 after intervention ($p < 0.001$).¹⁶ The improvement observed in the present study may be attributed to the relaxation response produced by deep breathing exercise, which stimulate the parasympathetic nervous system, reduce sympathetic activity and promote psychological calmness.

The present findings are also supported by a study conducted by Lufina et al., which demonstrated significant improvement in sleep quality following warm foot bath therapy. The investigators reported a reduction in mean sleep disturbance scores from 10.21 ± 3.18 before intervention to 6.14 ± 2.37 after intervention ($p < 0.001$).¹⁷ Similarly, Kuriyama and Kamata reported that elderly individuals receiving warm foot bathing before bedtime experienced significant improvement in sleep quality and reduction in sleep latency compared with baseline values.¹⁸ Warm foot soak therapy promotes peripheral vasodilation, enhances blood circulation, induces relaxation and facilitates sleep initiation, thereby contributing to improved sleep quality.

In contrast, no statistically significant improvement was observed among elderly individuals in the control group. The mean sleep quality score changed from 8.16 ± 2.85 during pre-test to 8.33 ± 2.89 during post-test, indicating minimal variation during the study period. Similar findings were reported by Rahman et al., who found no significant change in sleep quality among elderly individuals receiving routine care without structured sleep-promoting interventions ($p > 0.05$).¹⁹

Comparison of post-test sleep quality scores between experimental and control groups revealed a statistically significant difference. The mean post-test sleep quality score of the experimental group (6.97 ± 2.14) was lower than that of the control group (8.33 ± 2.89). The calculated unpaired t-value was 2.08 with a p-value of 0.042, demonstrating the effectiveness of deep breathing exercise and warm foot soak therapy. Similar findings were reported in a systematic review conducted by Nasiri et al., which concluded that non-pharmacological interventions significantly improved sleep quality among older adults and reduced sleep-related complaints when compared with routine care.²⁰

The present study also revealed a significant association between sleep quality and age as well as sleep pattern among elderly individuals in the experimental group. In the control group, age was significantly associated with sleep quality. Similar findings were reported by Patel et al., who identified increasing age and irregular sleep habits as important predictors of poor sleep quality among elderly individuals.²¹

Overall, the findings of the present study provide evidence that deep breathing exercise and warm foot soak therapy are simple, safe, economical and effective non-pharmacological interventions for improving sleep quality among elderly residents of old age homes. These interventions can be easily incorporated into routine nursing care and geriatric health promotion programmes to enhance sleep quality and overall well-being among elderly individuals.

Conclusion

The study concluded that sleep disturbances were prevalent among elderly residents of selected old age homes. Deep breathing exercise and warm foot soak therapy significantly improved sleep quality among elderly individuals in the experimental group. The mean sleep quality score showed significant reduction following the intervention, whereas no significant improvement was observed in the control group. Comparison of post-test scores between experimental and control groups demonstrated statistically significant differences, confirming the effectiveness of the intervention. Therefore, deep breathing exercise and warm foot soak therapy can be considered safe, economical and effective non-pharmacological interventions for improving sleep quality among elderly residents of old age homes.

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