Original Article

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Effects of Aerobic and Resistance Exercise Program on Sleep Quality in the Elderlies with Heart Failure

A. Pourhabib (MSc)[1], Z. Fotokian (PhD)[*2], S. Abrotan (MD)[3], M. Nasiri (MSc)[4]

1.Student Research Committee, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran

2.Nursing Care Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran

3.Ramsar International Campus, Mazandaran University of Medical Sciences, Sari, I.R.Iran

4.Social Determinants of Health Research Center, Health Research Institute, Babol University of Medical Sciences, Babol, I.R.Iran

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ABSTRACT

BACKGROUND AND OBJECTIVE: Sleep disturbances, a common compliance of the elders with heart failure (HF) that can reduce quality of life. Because simple and low-cost interventions, such as exercise, help to improve sleep, therefore, this study was conducted to determine the effect of aerobic and resistance exercises on the quality of sleep in elderly patients with heart failure.

METHODS: In this clinical trial study, 60 males with type 2 and 3 heart failure were selected by available sampling method and were randomly entered to test and control groups. Pitzberg's sleep quality questionnaire was used to collect data. Aerobic and resistance exercises were performed three times a week for three months. Before and after the intervention, the questionnaires were completed and the sleep quality of the two groups was compared.

FINDINGS: The aerobic and resistance exercise had promoted scores of sleep duration (0.23±0.77), sleep efficiency (0.73±1.01), mental sleep quality (0.6±0.93), and daytime function (0.06±1.14)($p<0.05$). But the exercise Program doesn't effect on sleep latency, sleep disturbances, and use of sleep medications.

CONCLUSION: The results of this study showed that aerobic and resistance exercises help improve the daily performance of elderly patients with heart failure by improving sleep quality and some of the indices of sleepiness.

KEY WORDS: *Aerobic Exercise, Resistance training, Heart Failure, Aging, Sleep*.

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[*]Corresonding Author: Z. Fotokian (PhD)
Address: Faculty of Nursing & Midwifery, Shahid Motahari Ave., Ramsar, I.R.Iran
Tel:+98 11 55225151
E-mail: zfotoukian@yahoo.com

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Introduction

Heart failure is a common chronic disease in the elderly characterized by a disruption of left ventricular outflow and a discharge fraction of less than or equal to 40%. The prevalence of this disease in people over 65 years old is about 4-8% (1, 2). Dyspnea, taking diuretics and beta blockers can cause sleep disturbances in these individuals (1).

In addition, the phenomenon of aging and chronic illness associated with aging is also the cause of other sleep disturbances. So that about 33% of the elderly suffer from heart failure, they suffer from insomnia (3), which can cause fatigue, and can undermine their independence and quality of life (4, 5). Treatment for sleep disturbances includes medication and non-pharmacological interventions. Due to the complications of drug treatments in the treatment of sleep disturbances, it is necessary to seek simple, appropriate, and non-pharmacological approaches to improve the sleep pattern of these individuals. Among the available non-pharmacological interventions, the effect of exercise on the sleep quality of patients with fibromyalgia (6) and kidney transplant (5), elderly with sleep disturbances (7-9) has been confirmed. In Iran, studies on the effect of individual exercise at home and green exercise in elderly women were performed on sleep patterns (10, 11).

However, there is no study on the effect of aerobic and resistance combination exercises on the quality of sleep in elderly patients with heart failure. Regarding the effectiveness of aerobic and resistance exercises as a simple non-pharmacological intervention (2,3,5) and the prevalence of sleep disturbances in elderly patients with heart failure (1, 2), the present study aimed to investigate the effect of aerobic and resistance exercises on the quality of sleep in elderly patients with heart failure.

Methods

This clinical trial study was approved by the Ethics Committee of Babol University of Medical Sciences with code 177.1395MUBABOL.REC. and registered in the clinical trial system with code 1N 20161116309301RCT on all elderly men with heart failure type two and three who referred to the department of echocardiography at Imam Sajjad Hospital (Ramsar) and after obtaining written consent of the eligible samples, were performed in two groups of test and control. Sample size was determined by taking 80% probability, 95% confidence interval and the average difference sleep score of 10% of 60 people. By available sampling method, qualified individuals were selected and then randomly assigned by blocking method (six blocks of 10).

The equal number of participants in the consecutive and equal intervals entered the test and control group (30 people in each group). Entry Criteria: Patients with heart failure type 2 and 3 in the age range of 60-74 years had a diagnosis of systolic heart failure with an EF≤40% based on echocardiographic results (to measure the discharge fraction the Madison echocardiography device made in South Korea, model K07 E, Probe 3 and 2013 production was used), a history of at least six months of the disease, a lack of coronary artery disease with a stenosis of over 70% (based on the results of angiography), lack of ventricular arrhythmias requiring drug therapy, Second and third degree blocks, lack of regular exercise activities, ability to communicate (Gain score higher than 8 from the cognitive criteria of AMT) (12) and having sleep problems (sleep quality score higher than 5) (3, 5).

Patients who had heart problems more than once a week during the intervention, or their fatigue score and dyspnea according to the Borg scale were above 5 (13), and those who had more than four consecutive sessions in the program were not excluded from the study. Demographic and Pitzberg's Sleep Quality Questionnaire (PSQI) was used to collect data. This questionnaire has been compiled from 18 items of 0-3, and its scientific credibility in Iran was confirmed by Cronbach's alpha of 87% (11).

The Pitzberg's Sleep Quality Score is between 0 to 21 points, with a score of less than 5 indicating the absence of a problem and a score of more than 5 that denotes sleep disturbance (3,5). Before the intervention, sleep quality questionnaire was completed by the two groups. The experimental group performed a light walking (aerobic) for 30 minutes, three times a week for 12 weeks.

Before and after completing exercise for 5 to 10 minutes, they performed warming and cooling (40 minutes per session, in the first month). After completing the 4 weeks, the group performed a light-intensity exercise program (using a dumbbell 500 grams in 30 minutes 3 times a week) in addition to a 30-minute aerobic (up to 60 minutes per session in the second and third month). In each sesion, the exercise program at 3 o'clock in the normal room temperature (18 to 22 degrees Celsius), with clothing (cotton, lightweight and appropriate season) and suitable sports shoes (lightweight, with strap and foot arch protector,

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Distance between fingers to the edge of the shoes is 1.5 cm and heel 1.5 cm). Participants were advised to feed their diet at least two hours before exercise (4). All patients in the intervention group had approval from a cardiologist for exercise. In all sessions, the intervention was supervised by a sports instructor and principal researcher (nurse with 15 years of work in CCU) at sport gym of Ramsar Imam Sajjad Hospital. The gym was in the immediate vicinity of an emergency room. Therefore, if the patient had symptoms of pain, dyspnea and dizziness during exercise, he was immediately excluded from the study and was treated by a cardiologist.

There was no intervention in the control group and this group received routine care (self-care education). This care was routinely trained to all people. At the end of the 12th week, Pitzberg's sleep quality questionnaire was completed and the elderly sleep quality of the two groups was compared. For data analysis, SPSS software version 18 was used and Chi-square, t-test, paired t-test, Lone, Bonferroni and ANOVA were used and $p<0.05$ was considered significant.

Results

Out of 60 elderly patients with heart failure, the five elderly were excluded from the study due to un-continuously presence in the test, and two of the control groups were excluded from the study due to Lack of cooperation. Therefore, the total number of test group was 25 and control group was 28. The mean age of the experimental group was 68.72±8.4 and the control group was 66.07±4.25 years. The mean duration of the disease in the experimental group was 47±3.8 and the control group was 51±9.5 months.

The age range was between 74-64 years old and the duration of the disease was 23-23 months. The mean discharge score of the experimental group was 33.5±4.5 and the control group was 30.44±6.6, respectively. Between ages, duration of disease, ejection fraction, marital status, income, occupation, education level, and type of disease, location, other disease and heart failure cause was no significant difference in the two groups (Table 1).The results showed that there was a significant difference between the mean sleep quality score in the intervention group before and after the intervention (1.9±2.6) (p=0.003).

In addition, there was a significant difference between the scores of sleep quality before and after intervention between the two groups (p=0.035) (Table2). The results showed that there was a significant difference between sleep scores (p=0.02), daily dysfunction (p=0.002), mental quality (p=0.001) and sleep efficiency (p=0.045) among two groups can be seen. However, there was no significant difference in the mean score of sleep disturbances, sleep latency and drug intake for sleep (Table 3).

Table1. Demographic variables of participants in control and test groups

Variables	Groups	Test N(%)	Control N(%)
marital status	Single	0(0)	5(17.85)
	Married	19(76)	20(71.45)
	widower	6(24)	3(10.7)
Income	Less than cost	10(40)	6(21.45)
	Equal cost	8(32)	20(71.45)
	More than cost	7(28)	2(7.1)
Job	Unemployed	2(8)	3(10.7)
	Farmer	2(8)	4(14.28)
	manual worker	1(4)	5(17.85)
	Retired	8(32)	6(21.42)
	undetermined	12(48)	10(35.75)
Level of Education	illiterate	6(16)	6(21.42)
	Literacy reading and writing	5(20)	7(259)
	Under diploma	4(16)	9(32.14)
	Diploma	9(36)	6(21.42)
	Super-diploma and higher	3(12)	0(0)
Disease type	Type 2	17(68)	17(60.72)
	Type3	8(32)	11(39.28)
Location	City	17(68)	15(53.57)
	Village	8(32)	13(46.43)
Suffering from other disease	Yes	20(80)	22(78.58)
	No	5(20)	6(21.42)
Cause of illness	Ischemic	20(80)	20(71.5)
	Non Ischemic	5(20)	8(28.5)

Based on the results, the effects of disease type variables, duration of disease, education level, marital status, income level, location, cause of heart failure and occupation on unsatisfactory sleep quality and the effect of age variables (p=0.075), discharge fraction (p=0.05), and the other disease (p=0.05) was significant on the sleep quality of the elderly.

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Table2. Comparison of the mean of sleep quality before and after intervention in two groups

Groups	Before intervention Mean±SD	After intervention Mean±SD	P-value	Average difference	P-value
Control	9.78±1.23	9.56±2.12	0.81	-0.22±2.43	0.035
Intervention	9.82±3.6	7.92±3.44	0.003	-1.9±2.6	
Inter-group estimation	0.14	0.001			

Table3. Comparison of the mean sleep outcome before and after intervention in subjects of two groups

Groups / Sleep estimation	Test Mean±SD Before intervention	Test Mean±SD After intervention	Test Mean±SD Change mean	Control Mean±SD Before intervention	Control Mean±SD After intervention	Control Mean±SD Change mean	P-value
Sleep duration	1.6±1.1	1.43±1.1	0.23±0.77	1.93±0.89	2.12±0.7	-0.19±0.7	0.02
Sleep disturbances	1.5±0.68	1.4±0.62	0.06±0.69	2.09±0.39	2.06±0.4	0.03±0.4	0.81
Sleep latency	1.76±0.8	1.36±0.8	0.4±0.96	1.58±0.62	1.4±0.56	0.09±0.62	0.15
Daily dysfunction	0.86±0.8	0.8±1.03	0.06±1.14	1.8±1.01	2.6±0.61	-0.8±0.9	0.002
Sleep efficiency	1.2±1.2	0.46±0.7	0.73±1.01	0.77±1.05	0.54±0.9	0.22±1.23	0.045
Mental Sleep Quality	1.6±0.77	1±0.69	0.6±0.93	1.61±0.55	0.5±0.76	-0.51±0.6	0.001
Taking medicine for sleep	1.13±1.1	0.6±1.01	0.56±1.7	1.26±1.25	1.3±1.3	-0.16±1.3	0.12

Discussion

The results showed that exercise improves the daily performance of the elderly with heart failure by improving the overall quality of sleep, sleep time, efficiency, and sleep quality. These findings are consistent with the results of other studies (3, 8-15). In the study of Yang et al., aerobic and strength exercises improved the quality of sleep by 25% (7), and the study of Pooranfar et al., caused 27% improvement in sleep quality (4). The results of Lavretsky et al. (16), Reid et al. (8), Khajavi et al. (11) and Bahrami Einolgasi et al. (10) also showed that physical activity improves the mental quality of sleep. In this study, exercise was effective on the rate of sleep efficiency of the elderly. This finding is consistent with the results of other studies (8-11) and contradicts the results of Ranjbaran et al. (15). The reason for this difference can be related to the research community. Because in the study of Ranjbaran, people performed these exercises one month after coronary artery bypass grafts, and the sleep efficiency of these individuals may have been influenced by mood-induced anesthesia. The results indicated that exercise was not affected by the duration of sleep latency. The results of Ranjbaran et al. (1394) also showed that cardiac rehabilitation after coronary artery bypass graft does not affect the sleep latency (15). While the results of other studies showed that exercise reduces the amount of sleep latency (8, 10-16). Perhaps the reason for the difference is the difference in the studies in terms of the method, type of intervention, age of the participants in the study and the research community. The results showed that aerobic and resistance exercises do not resolve sleep disturbances. This finding is inconsistent with the results of some studies (8, 10, 16) and is consistent with the results of Khajavi et al. (11). Perhaps the reason for this discrepancy is related to the research community. Because in the Khajavi study, healthy aged women were present. While the study population is the elderly men with heart failure who had more sleep disturbances due to their association with heart failure. The results showed that combined aerobic and resistance exercises improve sleep quality and some of the indicators of sleep(17). These findings for clinic work will be useful for evidence-based interventions from the elderly with heart failure. The limitations of the study are that due to the lack of physical space, the simultaneous presence of male and female elderly was not possible. Therefore, it was not possible to determine the effectiveness of exercise on sleep quality in elderly women patients with heart failure.

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