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Research Article

The Effect of Breathing Exercise on Fatigue and Stress in Patients with Coronary Artery Diseases: A Randomized Controlled Trial

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Abstract

Complementary and alternative medicine methods, when used in addition to medical treatments, increase the physical and mental well-being of patients. This study was planned to examine the effects of breathing exercises, which are a complementary and alternative medicine method, on the stress and fatigue levels of patients with coronary artery disease. The study was planned as a randomized, controlled, and experimental study. A patient identification form, the Perceived Stress Scale, and the Piper Fatigue Scale were used in data collection. In the experimental group, the rate of phase 1-3 hypertension fell to 8.4% in the second monitoring from 30.0% ($p<0.05$). The experimental group was found to show statistically important differences in PSS and PFS scores between the 1st and 2nd monitoring compared to the control group, with scale scores decreasing in the second monitoring ($p<0.05$). In this study, breathing exercises were an important training that helped reduce stress and fatigue in patients with coronary artery disease. Breathing exercises are suggested to be added to routine trainings given to these patients.

Keywords: Complementary and alternative medicine; Breathing exercises; Stress; Fatigue; Coronary artery disease

Highlights

Breathing exercise training was seen to have a positive effect on the perceived stress and fatigue levels of coronary artery disease patients. The training, next one month monitoring, patients in the experimental group showed significantly reduced rate in the smoker patients. The two groups the two monitoring in Triglycerides, Low Density Lipoprotein and High Density Lipoprotein levels significant changes were observed. Breathing exercises in patients with coronary artery diseases can be suggested to be implemented into routine trainings since they improve physical and mental well-being and speed up recovery.

Introduction

Parallel to the fast developments seen in the diagnosis, care and treatment of diseases, the fact that patients want to take more control and responsibility in their treatment, that they make efforts to find interventions that would reduce symptoms, that health care teams can't give enough time to patients, that contemporary treatments have high costs, that patients want to feel better spiritually, and that patients aren't satisfied with modern medicine have increased the interest in complementary and alternative medicine (CAM) [1]. The use of CAM in coronary disease patients is between 29 and 64% [2]. CAM methods are supportive methods used for the control of symptoms, continuance of well-being, and contribution to patient care [3,4].

Hypertension, heart attacks, fatigue and energy loss are all among the physiological symptoms of stress. A second acute stress and related fatigue event in individuals with chronic stress has been reported to increase the risk of acute cardiac event development [5]. Fatigue is a multidimensional and complex condition stemming from many causes. In individuals with CAD, situations such as increased stress, anxiety, and depression increase fatigue. Chronic stress and feelings of fatigue cause lack of energy, irritability, demoralization, and increased reactivity in fibrinogen systems and platelets, which increase the risk of myocardial infraction. Increased blood pressure due to stress, left ventricle mass index, and progressing arteriosclerosis all speed up this phenomenon [6]. Stress is not an entirely negative event and may have positive effects on the individual. However excessive and uncontrolled stress may be harmful. Thus, the stress control of individuals with CAD is important. Breathing exercises may positively affect the emotional state and stress levels [7].

The increase in daily stress caused by circumstances and the sedentary lifestyle brought about by technological advancements are threats with regard to coronary artery diseases (CAD). Individuals diagnosed with CAD enter a stressful period and face problems such as fatigue, irritability, lack of concentration, and sleep deprivation [8]. Reasons that increase myocardial O_2 requirements, such as exercise heavier than normal and emotional stress, may cause acute myocardial infractions (AMI) [9] Fatigue is a subjective symptom seen widely in patients with coronary disease. If there is a cardiac problem at the root of fatigue, the individual will start the day with normal energy levels, increase in fatigue throughout the day and reach the point of exhaustion [10]. Mind and body practices, which form one group of CAM methods, include breathing exercises, which are useful in dealing with stress and fatigue individually. According to the National Health Interview Survey (NHIS-2012) deep breathing exercises come second among the most widespread CAM methods4. Breathing exercises are one of the factors making the heart and lungs function properly. Slow breathing activity affects sympathetic and parasympathetic activity, improving autonomous functions [11]. Breathing correctly and deeply breaks the stress chain reaction starting in the individual and reverses it. People can thus reduce their stress or fatigue [12]. Breathing exercises might be useful in dealing with stress and fatigue individually [13].

Reducing fatigue by improving activity tolerance and removing anxiety and fear by ensuring compliance to lifestyle changes and controlling stress levels are among the issues that should be addressed in the nursing care of individuals with CAD. CAM methods, when used in addition to medical treatments, increase the physical and mental well-being of patients [1]. Studies examining the effect of

breathing exercises, which is a CAM method in the literature, on stress and fatigue in CAD are limited [14].

Method

A randomized, controlled study design was used.

Purpose

In this study, which we planned by taking into account the insufficiency on this topic, we examined the effects of breathing exercises on stress and fatigue in patients with CAD.

Our hypothesis was that stress and fatigue would be lower in patients with CAD who engaged in breathing exercises than patients who did not.

Sample and Setting

The study was performed in the cardiology clinic of the Osmaniye Private New Life Hospital. The population for the study consisted of patients diagnosed and followed for CAD between January and March 2015 who fulfilled the inclusion criteria. The inclusion criteria were being 18 or above, being suggested for only conservative drug treatment, no cholesterol drug use, non-obese patients, triglyceride levels consistent with non-genetic patients, having no communication problems, being able to answer all of the questions, being able to implement the applications, not having had any education on the subject previously, and agreeing to participate. Surgical operations or patients having acute coronary syndrome (ACS) were excluded from the study.

In sample selection, power analysis, which is a method ensuring the reliability, validity, and accuracy of research results, was used. Since there were no similar studies, a power analysis was performed taking the first 20 patients in both the application and control groups as a basis, and it was determined as a result that 82 patients were required to perform the study with 90% power. Since there could be sample losses during the study, the study was initiated with 120 patients with 60 in each group. As a result of the power analysis performed at the end of the study, the study was determined to be performed with 100% power.

Randomization was performed by a different researcher blind to personal and clinical characteristics using a randomization schematic with a simple randomization method according to the registry sequence of the patients in the polyclinic.

Measures

A patient identification form, the Perceived Stress Scale (PSS) and the Piper Fatigue Scale (PFS) were used in data collection. Items questioning personal characteristics (gender, age, education status, marital status, occupation) were included in the patient identification form.

The Piper Fatigue Scale (PFS) is a 22 item scale used to measure subjective fatigue. The PFS was developed by Piper et al. [15]. The scale consists of 4 sub-dimensions, namely behavioral, mood, emotional, and cognitive. Each item on the scale is scaled from 1 to 10 from weak to very powerful. In each item, the person marks the number that best defines the fatigue he or she experiences at the moment. Sub-dimension scores are obtained by adding all of the item scores in the sub-dimension together and dividing the result by the number of items. The total fatigue score is obtained by adding the results of all items together and dividing it by the total number of items. The total score taken from the scale varies between 0 and 10, and experienced fatigue increases with increasing scores. There are also 5 open ended questions in the scale which are not taken into consideration when calculating the PFS score. The Turkish validity and reliability of the scale was performed by Can, and the reliability coefficient for the scale was found to be 0.94 [16].

The Perceived Stress Scale (PSS) was developed by Cohen, Kamarck and Mermelste in 1983 and adapted to Turkish by Bilge et al. in 2009. The scale evaluates the subjective perception of stress. The scale, which is prepared as a 5 point likert type (0 never, 4 very often), has three items reverse scored (4,5,6) and five items normally scored (1, 2, 3, 7, 8). The scale is scored from 0 to 32. Perceived stress (items 1, 2, 3, 7, 8) and perceived coping (items 4, 5, 6) are the two subscales of the scale. The scale is evaluated according to both total score and subscale scores. A high total score means high perceived stress [14,17].

Study Procedures and Data Collection

In order to teach patients to control and manage stress and fatigue symptoms and cope with these symptoms, a patient training booklet containing basic information on CAD and breathing exercise techniques was prepared. Training on diaphragmatic breathing and pursed lip breathing was given. The training was completed in 20 minutes using narrative, question answer sessions and demonstration techniques, and feedback from the patients was taken in 10 minutes.

The first questionnaire was performed after diagnosis in the hospital. Pre-training hypertension (HT) levels were determined. The training of the patients in the study group was performed in the hospital. The booklet was handed out during the training. The booklets of patients who were illiterate were given to a relative present with them. The patients were suggested to perform 10 minutes of breathing exercises three times a day for one month. The subjects in the study group were asked to perform simple, deep slow breathing exercise at 6 breaths per min, for the duration of one month of the study. They were trained to perform this breathing exercise, such that each breathing cycle consisted of 4 seconds of inspiration and 6 seconds of expiration. For the diaphragmatic breathing exercise, inspiratory sighs, and maximal inspiration, the subjects were instructed to perform smooth and controlled pursed lip expiration.

The patients in the study group were called via phone each week to evaluate their application status. No intervention was made for the patients in the control group at all. The control group only instituted the medications recommended by doctors. The patients in both groups were given the questionnaires in the evaluation one month later, and HT levels were checked. Subjects continued the usual medical care throughout the study.

Ethical Aspect

In the progression of the study, scientific principles as well as the ethical principles of the Helsinki Declaration were held [16]. In this context, the principles of informed consent, autonomy, secrecy and the protection of secrecy, fairness, and no harm were taken into consideration. Necessary written permission from the necessary institutions was taken. Before the application, patients were explained the aim, plan, and benefits of the study. Informed consent was obtained from the patients.

Analysis

Data was evaluated using the SPSS 21.0 (SPSS Inc., Chicago, IL, USA) statistics program. Continuous variables used mean ± standard deviation and numbers (percentages). For categorical variables, McNemar test and paired sample t test were used in evaluations between the two groups.

Results

The socio demographic and clinical characteristics of the patients who participated in the study are given in Table 1.

Characteristics	Experiment Group (n= 60) n %		Control Group (n:60) n %	X^2	p
Gender Female Male	23 37	38.3 61.7	21 35.0 39 65.0	2.35	p>0.05
Education level Illiterate Literate Elementary High College	3 12 25 12 8	5.0 20.0 41.7 20.0 13.3	2 3.3 7 11.7 22 36.7 20 33.3 9 5.0	4.13	p>0.05
Marital status Married Single	52 8	86.7 13.3	49 81.7 11 18.3	1.96	p>0.05
Occupation Housewife Laborer Retired Officer Independent	18 12 10 8 12	30 20 16.7 13.3 20	16 26.7 14 23.3 11 18.3 7 11.7 12 20	3.88	p>0.05
Age (years)	58.96 ± 11.11		53.32 ± 9.01	t:10.39	p>0.05

Table 1: The distribution of patients according to characteristics (n: 120) Categorical variables were presented as the number (percent), continuous variables were presented as mean ± standard deviation

The pre-training (1st monitoring) and post-training (2nd monitoring) PSS and PFS total scale scores and subscale scores are given in Table 2. Breathing exercise training was seen to have a positive effect on the perceived stress and fatigue levels of coronary artery disease patients. The experimental group showed statistically important differences in PSS and PFS scores between the 1st and 2nd monitoring compared to the control group, with scale scores decreasing in the second monitoring ($p<0.05$) (Table 3).

Characteristics	Experiment Group (n= 60) n %		Control Group (n:60) n %	X^2	p
Smoking Yes No	26 34	43.3 56.7	22 36.7 38 63.3	3.55	p>0.05
Hypertension Optimal Normal High-normal Stage 1	8 12 22 12 4	13.3 20.0 36.7 20.0 6.7	11 18.3 13 21.7 17 28.3 14 23.4 3 5.0	4.18	p>0.05

Stage 2 Stage 3	2	3.3	2 3.3		
Triglycerides (mg / dl)	148.66 ± 19.45		157.93 ± 21.90	t:14.36	p>0.05
LDL (mg/dl)	149.91 ± 21.00		148.99 ± 25.11	t:7.36	p>0.05
HDL (mg/dl)	36.56 ± 7.35		37.96 ± 9.31	t:7.11	p>0.05

Table 2: The distribution of patients according to clinic characteristics (n:120) Categorical variables were presented as the number (percent), continuous variables were presented as mean ± standard deviation, LDL: Low-density lipoprotein HDL: high-density lipoprotein.

		Experiment Group (n=60)	**Control Group (n=60)**
		Ort ± SS t p	**Ort ± SS t p**
Total PSS score	1. monitoring 2. monitoring	15.63 ± 7.10 7.50 0.00 11.22 ± 6.10	16.33 ± 8.11 -0.83 0.07 17.34 ± 7.13
Perceived stress	1. monitoring 2. monitoring	12.33 ± 5.64 5.98 0.00 6.22 ± 5.09	11.67 ± 5.75 1.02 0.08 9.45 ± 4.96
Perceived coping	1. monitoring 2. monitoring	9.01 ± 2.78 8.67 0.00 4.12 ± 1.98	8.98 ± 3.12 1.85 0.16 7.16 ± 1.87
Total PFS score	1. monitoring 2. monitoring	6.22 ± 2.61 3.53 0.01 3.41 ± 2.44	6.67 ± 2.66 3.57 0.17 5.69 ± 2.34
Behavior/Violence	1. monitoring 2. monitoring	5.19 ± 3.72 2.67 0.01 3.66 ± 2.60	5.19 ± 3.72 -1.67 0.23 5.66 ± 2.60
Mood	1. monitoring 2. monitoring	6.29 ± 2.76 3.98 0.00 3.66 ± 1.02	6.08 ± 2.65 1.96 0.08 5.87 ± 1.02
Sensory	1. monitoring 2. monitoring	4.99 ± 2.16 1.98 0.03 3.54 ± 1.93	3.89 ± 1.85 1.66 0.08 3.14 ± 1.43
Cognitive/Spiritual	1. monitoring 2. monitoring	5.18 ± 2.76 2.99 0.00 3.58 ± 1.95	5.67 ± 2.89 1.54 0.15 4.77 ± 2.65

Table 3: The 1. Monitoring and 2. Monitoring stress and fatigue scores of the patients

The distribution of patients with hypertension is given in Table 2. When the number of patients with hypertension was examined, the rate of phase 1-3 hypertension patients fell from 30% to 8.4% in the first month after the training. In the control group, the rate of phase 1-3 hypertension patients fell from 31.7% to 25% in the second monitoring. As a result of the training, with one month monitoring, patients in the experimental group showed a significantly reduced rate among smoking patients. Between the two groups, significant changes in triglycerides, LDL and HDL levels were observed ($p<0.05$) (Table 4).

	Experiment Group (n=60)		**Control Group (n=60)**	
Hypertension	1. monitoring	2.monitoring	1.monitoring	2.monitoring
Optimal	n (%)	n (%)	n (%)	n (%)
Normal	8 (13.3)	13 (13.3)	11 (18.3)	12 (20)
High-normal	12 (20.0)	22 (20.0)	13 (21.7)	16 (26.7)
Phase 1	22 (36.7)	20 (36.7)	17 (28.3)	17(28.3)
Phase 2	12 (20.0)	4 (6.7)	14 (23.4)	12(20.0)
Phase 3	4 (6.7)	1 (1.7)	3 (5.0)	2(3.3)

	2 (3.3) X2:-9.07	0 (0) p<0.05	2 (3.3) X2 :-3.02	1(1.7) p>0.05
Smoking Yes No	26 (43.3) 34 (56.7) X2:-11.13	12 (20.0) 48 (80.0) p<0.05	22 (36.7) 38 (63.3) X2:-5.02	18 (30.0) 42 (70.0) p>0.05
Triglycerides (mg / dl)	148.66 ± 19.45 t:-8.02	126.5 ± 12.34 p<0.05	157.93 ± 21.90 t:-9.87	138.77 ± 19.23 p<0.05
LDL (mg/dl)	149.91 ± 21.00 t:-9.13	131.43 ± 15.32 p<0.05	148.99 ± 25.11 t:-8.14	131.78 ± 21.13 p<0.05
HDL (mg/dl)	26.73 ± 6.22 t:12.25	36.56 ± 7.35 p<0.05	29.89 ± 10.41 t:9.88	37.96 ± 9.31 p<0.05

Table 4: The 1. Monitoring and 2. Monitoring distribution of patients with hypertension and Smoking (n: 120)

Discussion

Breathing exercises, which form one of the mind-body based approaches among CAM methods, decrease the breathing speed, oxygen consumption, heart rate, and systolic and diastolic blood pressure, while increasing the feeling of well-being in an individual [18,19]. In the literature, the number of studies examining the effects of breathing exercises on stress and fatigue in CAD is very limited. However, these two factors greatly affect the physical and mental status of patients during the formation and follow-up of CAD. In our study, the group that had breathing exercises taught to them was found to have improvements in hypertension values, stress levels, and fatigue levels compared to the control group.

Breathing exercises is one of the non-pharmacological modalities. It is known that the regular practice of breathing exercise increases parasympathetic tone, decreases sympathetic activity, improves cardiovascular and respiratory functions, decreases the effect of stress and strain on the body and improves physical and mental health [20-22].

Though relevant research topics are rare, we examined studies of the effects of breathing exercises and stress on the heart and blood vessels, and fatigue and exercise capacity. D'silvia et al. [23] also reported breathing exercises to be an effective method of decreasing anxiety and diastolic blood pressure in a study they performed with patients with coronary artery disease. In the Inter heart study, AMI patients were compared with healthy individuals. More than 11,000 patients from 52 countries participated in this research. They examined stress in the patient's home and the overall stress experienced at work, financial stress, acute stress and depression parameters for the previous one year. Psychosocial risk and stress were observed significantly more among people who had experienced acute myocardial infarction [24]. Matthews et al. [25] evaluated the risk of blood pressure changes and subsequent coronary calcification during psychological stress in young healthy adults and they determined that after 13 years coronary calcification was increased. Mori et al. [26] and Jagomagi et al. [27] examined the effect of deep breathing exercises on blood pressure, and found that deep breathing reduced blood pressure. Darnley et al. [28] examined the effects of resistive breathing on exercise capacity and diaphragm function in patients with ischemic heart disease, and found an increase in the exercise capacity of the patients as well as a reduction in shortness of breath. Bernardi et al. [29] examined the effect of slow breathing on arterial baroreflex sensitivity in patients with chronic heart failure, and showed that slow respiration increased oxygen saturation and exercise tolerance. In Efe and Olgun's study [30], a training including breathing exercises for patients with heart failure was applied, and a reduction in the fatigue levels of the patients in the study group was found after two months. Kaushik et al. [18] also reported that breathing exercises caused reductions in heart and respiration rates and systolic and diastolic blood pressure in patients with essential hypertension. As can be seen, our findings are consistent with the literature.

Breathing is considered to be a regulator of the autonomic nervous system and consequently of mental processes. Controlling the breath and thus calming the nerves is a prerequisite to controlling the mind and the body. Breathing techniques provide a gateway to the autonomic communication network through which the individual can, by changing the breathing patterns, specific messages send to the brain using the body language, and the body responds to it. Messages from the respiratory system have rapid, powerful effects on major brain centers involved in thought, emotion, and behavior [31,32].

Deep breathing increases blood and oxygen flow to the brain to function in its optimal state. It creates a connection between mind and body that can lead to greater self-awareness, mindfulness and clear thinking, improves circulation, which improves heart health, energy levels and helps the body eliminate toxins, as well as reduces stress [33]. Hence, practicing deep breathing exercise influence autonomic functions and has therapeutic benefit to hypertensive patients [34].

Conclusion

We determined that breathing exercises in individuals with CAD, which is a very easy application, increased the positive effects of conservative treatment. In our study, we found that breathing exercises are an important training that helps reduce stress and fatigue in patients with CAD, which is a patient group that often experiences stress and fatigue. Thus, breathing exercises in patients with CAD can be suggested to be implemented in routine trainings to improve their physical and mental well-being and speed recovery.

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