

A randomized controlled trial on the impact of moderate-intensity continuous aerobic exercise on the depression status of middle-aged patients with congestive heart failure

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Abstract

Background: Depression prevalence rates in congestive heart failure (CHF) patients have increased in the last few years. Depression is a leveled and independent risk factor for hospital readmission, decreased function, and patient mortality for patients with CHF. Major depressive disorder can be diagnosed in CHF patients who frequently suffer from sleeplessness, fatigue, and neurovegetative manifestations that extend to depressed patients.

Objectives: The aim of this study was to investigate the influence of moderate-intensity continuous aerobic exercise (MICAЕ) on the depression status in patients with CHF.

Methods: Between June and September 2017, 46 patients with CHF who suffered from depression were selected for this study. These patients aged 40 to 60 years, were medically diagnosed with CHF-related illnesses, and physical disabilities. The participating patients were selected from the psychological medicine unit of the University Hospitals. They were randomly classified into 2 groups, each group included 23 patients. The study group underwent MICAЕ (MICAЕ) 3 times weekly for 12 weeks, whereas the control group received traditional intervention without any physical exercise.

Results: There were no significant differences between the 2 groups regarding baseline characteristics ($P > .05$). Patients in both groups had a significant decrease in their depression levels. The study group had a greater reduction of 80.9% ($P < .05$) when compared to a reduction in the control group 46.46% ($P < .05$).

Conclusions: According to the study outcomes, it was concluded that 12 weeks of MICAЕ has positive effects on the depression status in patients with CHF. The study group who underwent moderate-intensity aerobic exercise had a greater decrease in the depression status of CHF patients when compared to the control group.

Abbreviations: CHF = congestive heart failure, MDD = major depressive disorder, MICAЕ = moderate-intensity continuous aerobic exercise, PHQ-9 = patient health questionnaire-9, SPSS = statistical package for social sciences.

Keywords: depression, heart failure, moderate-intensity continuous aerobic exercise, PHQ9

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All the study procedures which carried out including human participants were based on the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

The authors have no conflicts of interest to disclose.

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1. Introduction

Major depressive disorder (MDD) can be diagnosed in the congestive heart failure (CHF) patients who frequently suffer from sleeplessness, fatigue, and neurovegetative manifestations that extend to depressed patients. Pathophysiological mechanisms such as conflagration, dysfunction of the nervous system, heart arrhythmias, and platelet dysfunction associate CHF with depression.^[1]

The prevalence of depression in patients with CHF is high, ranging from 24% to 42%.^[2] Depression has been shown to be significantly associated with a declined function, increased hospital readmission, and higher mortality rates in people with CHF.^[2] In addition, CHF risk is increased by depression^[2], specifically in those previously at risk for CHF such as systolic hypertension.^[3] A recent study has examined the medical records of 7719 CHD patients, in which depression was found to be related to an increased risk of CHF.^[4] Therefore, it's clear that previous findings indicate that depression and its symptoms are an independent risk factor for CHF patients.

Giving the high prevalence of depression, exercise can provide a new modality of treatment for patients suffering from

depression, whether as a secondary treatment planning to formal modalities or an additional modality, in short-term or long-term.^[5] However, studies that have examined the effectiveness of exercise intervention on depressed patients with CHF are limited. Therefore, the main purpose of the present study was to examine the effect of the moderate-intensity continuous aerobic exercise (MICAE) program on the depression status in patients with CHF.

2. Methods

2.1. Overview

A 12-week single-blind randomization pilot exercise intervention study to examine the effect of MICAE on the depression status in patients with CHF. This study was approved by the ethical committee in the department of physical therapy at Prince Sattam bin Abdulaziz University [No.:RHPT/017/008]. The study was conducted in accordance to the Helsinki Declaration.^[6] A written consent form was signed by all participants before starting the study.

2.2. Participants

Between June and September 2017, 46 patients with CHF-related depression were referred by the psychological medicine unit at the University Hospital for this study. Patients were included in the present study with age of 40 to 60 years and medically diagnosed with class II-III of CHF according to the criteria committee of the New York Heart Association (NYHA) who exhibited a left ventricular (LV) ejection fraction <40% and were clinically stable at least 30 days. Class II was described as a slight limitation of physical activity and usual activity leads to fatigue, palpitation, and dyspnea, while class III was described as a marked limitation of physical activity and less than usual activity leads to fatigue, palpitation, and dyspnea.^[7] Also, all patients were diagnosed with mild to moderate depression based on validated Patient Health Questionnaire-9 (PHQ-9).^[8] Mild depression was totally scored (5–9), while moderate depression was scored (10–19). Patients with severe depression (total score ≥ 20), musculoskeletal limitations, impaired cognition function, or severe life-limiting illness such as cancer, and renal failure were excluded from the study. All participants had a medical clearance to receive exercise intervention.

2.3. Sample size and randomization

This current pilot clinical trial included a sample size of 46, based on available resources rather than power analysis. The 46 patients were randomly classified into 2 groups; each group consisted of 23 patients. The study group included 23 patients (18 males 5 females) and underwent MICAE 3 times weekly for 12 weeks, while the control group included 23 patients (17 males 6 females) and received traditional treatment without any physical exercise. Forty-six patients were recruited for this study. Seven individuals (4 orthopedic limitations, 2 renal diseases, and 1 severe depression) were excluded as they did not meet the inclusion criteria and 4 individuals refused to conduct the study without specific reason. Assignment occurred before intervention. The flow diagram exhibiting the individuals who participated in the present study is described in Figure 1.

2.4. Intervention

The study group has undergone a MICAE that was performed 3 times per week for 40 to 50 minutes for 12 weeks. Each session

included a 5 to 10 minutes warm up, followed by 30 minutes of moderate aerobic exercise (treadmill walking exercise) with constant intensity at 60% to 70% of maximum heart rate (max HR) and 5 to 10 minutes cool down. On the other hand, the control group has received only patient recommendations given by psychosocial unit to do home program protocol that includes being active, staying with helpful or supportive people, doing fun work each day, relaxing, and setting simple goals for 12 weeks.

2.5. Outcomes

Patients underwent Kuppaswamy's scale and the PHQ-9 before starting the study, after 6 weeks and finally after 12 weeks after completing the study by the previously psychiatrist who was blinded regarding the group to which each individual was appointed. Patients have been randomly divided into 2 groups; study group and control group.

2.6. Data analysis

Data were analyzed using statistical software statistical package for social sciences (SPSS) version 20.0 (SPSS, Chicago, IL). Descriptive data for subject demographics and clinical characteristics were reported. For continuous variables, the mean and standard deviation were reported, and numbers with percentages were used for categorical variables. The normality of data was assessed by the Kolmogorov–Smirnov test. Statistical inference evaluated the changes of depression status using independent *t* tests between the 2 groups including aerobic exercise and control groups and 1-way analysis of variance (ANOVA) applied within each group, with a level of significance at *P* value $\leq .05$.

3. Results

Out of 57 patients, 46 patients (35 males and 11 females) have participated in the study. As presented in Table 1, no statistically significant difference was observed between the study and control groups at baseline characteristics affecting results such as age, gender, and depression level. However, the post-intervention measures exhibited a statistically significant difference between the 2 groups (*P* < .05) in favor of the study group (aerobic exercise group). Comparing the mean values of depression status in pre- and post-intervention in the 2 groups indicated that the study and control groups showed significant differences (*P* < .05) as described in Table 2.

The depression level showed statistically significant improvements in each group and between the 2 groups. Before the intervention, the depression scale mean was 16.34 ± 2.58 in the study group and 15.95 ± 3.14 in the control group. Six weeks after the intervention, the depression scale lowered to 7.83 ± 3.22 , with a percent of change of 52.1% in the study group which lowered to 11.65 ± 3.28 , with a percent of change of 26.95% in the control group. At the end of the intervention, after 12 weeks, the depression scale was 3.12 ± 1.18 , with 80.9% in the study group, and was 8.54 ± 2.14 and 46.46% in the control group.

4. Discussion

Congestive heart disease is one of the common causes in depressive disorder. This psychological disorder should be controlled to obtain efficient treatment of CHF.^[1]

The aim of the present study was to ascertain the effect of MICAE on the depression status in patients with CHF. The

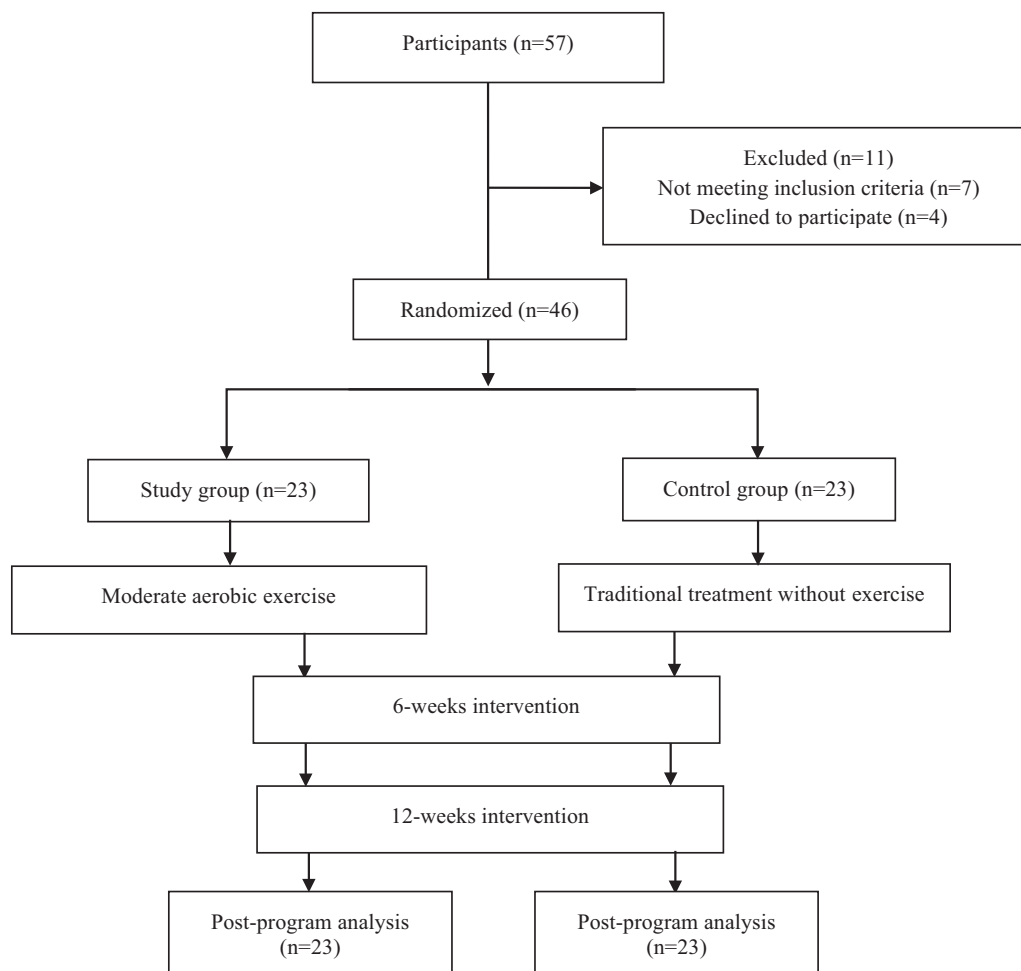


Figure 1. Flowchart of subjects who participated in the study.

outcomes of the study showed that MICAIE leads to a significant reduction in depression status and positive effects in patients with CHF.

Several studies explained how aerobic exercise showed beneficial impacts in the treatment of depression manifestations, particularly in CHF patients. Also, other studies approved that

aerobic exercise had a significant effect on mood. Another recommendation endorsed that the intensity and frequency of exercise should be maintained to be sufficient providing a positive decreasing in MDD symptoms.^[9]

Physical exercise stimulates 4 molecules negating the MDD effect causing neurogenesis. In addition, the beneficial effects of

Table 1

Baseline characteristics of both study and control groups.

Variable	Study group (n=23)	Control group (n=23)	P value
Age, yr	53.4±6.3	52.9±7.8	.812
Gender, n (%)			
Men	18 (78)	17 (74)	.965
Women	5 (22)	6 (26)	.889
Level of education, n (%)			
No formal education	5 (21.7)	3 (13)	.706
Primary school	4 (17.4)	5 (21.7)	.864
Middle school or more	14 (60.9)	15 (65.3)	.957
Marital status, n (%)			
Single	19 (82.6)	17 (73.9)	.931
Married	4 (17.4)	6 (26.1)	.761
BMI, kg/m ²	29.4±3.5	30.2±2.4	.371
Number of comorbidities	1.67±0.83	1.72±0.68	.824

BMI=body mass index.

Table 2
Differences between the study group A and control group B pre-and post-intervention (6 and 12 weeks).

Items	Study group	Control group (n=23)	P value (n=23)
Depression Scale			
Pre-intervention	16.34±2.58	15.95±3.14	.647
After 6 weeks	7.83±3.22	11.65±3.28	.002*
After 12 weeks	3.12±1.18	8.54±2.14	.001*
P value	<.001	.002	

* Significant level at $P < .05$; values are mean ± standard deviation.

exercise to patients suffering from depression contain; reduction of stress, improved attitude, outlook improves, self-reliance, self-confidence, and better mentality.^[10]

In this study, MICAE has been developed to give a conservative, a cultural advantage, achievable, and evidence-based physical therapy enrolling for CHF patients' related depression with a low socioeconomic state.

In agreement with the present study, Dimeo et al reported that a 30-minutes walking exercise for 10 days had a significant decrease in depression status in patients with MDD using a depression rating scale.^[11] These outcomes were supported by Knubben et al, where a placebo exercise had a greater reduction of depression status than standard antidepressant intervention.^[12]

In addition, previous studies have documented that supervised aerobic exercise was more effective than home-based exercise in improvements of the functional capacity and energy expenditure which associated with a higher decrease of depression symptoms.^[6,13,14]

The main limitation of the study was the lack of the pharmacological description of CHF and depression in the study participants. Also, further studies are still needed to assess the effect of different intensities of aerobic exercise training on depression status in patients with chronic heart failure.

5. Conclusions

According to the study outcomes, it was concluded that 12-week MICAE has positive effects on depression status in patients with CHF. The study group (MICAE) has a greater decrease than the control group in depression status in CHF patients' related-depression.

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