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The Effect of Bioenergy Economy on Cardiac Function and Inflammatory Factors in Myocardial Infarction: A Randomized Controlled Trial

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Quantitative Study

Abstract

Background: This study was conducted with the aim to investigate the effectiveness of a psychological bioenergy economy intervention on the cardiac function and inflammatory factors in patients with myocardial infarction (MI).

Methods: This randomized controlled trial (RCT) was performed on 60 post-MI patients who referred to the Cardiovascular Research Institute, Isfahan, Iran, in 2019. The intervention group received an energy-based bioenergetics intervention that consisted of rehabilitation training and nutrition patterns training. In the control group, only rehabilitation training and nutrition pattern training was provided in 8 sessions. Quantitative data were expressed as mean ± standard deviation (SD). Between-group differences of data departing from normal distribution were analyzed using the Mann-Whitney U test. All statistical analyses were performed in SPSS software.

Results: The enrolled patients included 60 post-MI patients (27.3% women in the intervention group, and 18.2% in the control group). We lost 16 patients during the study. Fasting blood sugar was higher in the control group before the intervention (106.7 ± 14.1 vs. 96.3 ± 11.0; $P < 0.001$). Systolic blood pressure was significantly higher in the control group before the intervention ($P = 0.04$). There was no significant difference in total cholesterol, TG, HDL, and LDL after the intervention compared to before the intervention in either groups. Intercellular adhesion molecule 1 (ICAM-1) and vascular cell adhesion molecule 1 (VCAM-1) did not change during the intervention in either groups ($P < 0.05$).

Conclusion: Our results displayed that the psychological intervention based on bioenergy economy has no significant effect on cardiac function and inflammatory factors in patients with MI. However, it is suggested that this study be repeated on a larger population.
Keywords: Psychotherapy; Heart function; Inflammatory factors; Myocardial infarction

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Introduction

With increase in the mean age of the population, the incidence of chronic diseases has increased and this has led to an increase in deaths from chronic diseases (Veras, 2009). Cardiovascular diseases (CVDs) are considered as a global public health problem and have been the leading cause of death in many countries (Lloyd-Jones et al., 2010). Different psychological, physical, and environmental factors can improve the quality of life (QOL) of CVD patients (Hasanpour et al., 2007). QOL is one of the indicators used to evaluate the effect of therapeutic interventions on CVD (Salles, Vannucci, Salles, & da Silva, 2014). It seems that psychological interventions can improve the cardiac and psychological symptoms of CVD and reduce the recurrence of CVD (Adsett & Bruhn, 1968; Lan, Lai, Wong, & Yu, 1996). Complementary medicine can be considered as an effective tool for coping with these challenges (Lan, Lai, Chen, & Wong, 1998). Bioenergy economy (BEE) is an integrative model of treatment toward the supportable expansion of contentment. BEE improves body mindfulness and mind-body reliability by controlling physical, intellectual, behavioral, and attentive modalities. Integrated energy investments are then attuned to the realization of salutogenesis (Goli, 2018). In addition, BEE is based on biosemiotics that investigates bodily and representative signals and roles through a communal meta-language. This is a mind-body model that clarifies how cellular functions can be interpreted as representative and demonstrative purposes/senses and vice versa (Putwain, Langdale, Woods, & Nicholson, 2011) In recent years, the efficiency of BEE has been considered in all areas of well-being and remedy (Goli, 2018; Putwain et al., 2011; Goli, 2016). Previous studies have demonstrated that BEE can improve somatic function, tolerance, and QOL in patients with chronic heart disease by improving heart function (Tavakolizadeh, Goli, Ebrahimi, Hajivosough, & Mohseni, 2021; Naji, Rahnamay-Namin, Roohafza, & Sharbafchi, 2020). Previous studies have demonstrated the efficacy of bioenergy medicine techniques on repairing the body's energy system and activating natural healing processes (Yeh, Wang, Wayne, & Phillips, 2008). To the best of our knowledge, this study is the first in Iran to evaluate the effect of BEE on cardiovascular functional and inflammatory factors and QOL in patients after myocardial infarction (MI), and the effectiveness of psychological interventions in addition to medications. In this study, we aimed to investigate the impact of a bioenvironmental-based psychological intervention course on cardiac function and inflammatory factors in CAD patients.

Methods

This randomized controlled trial (RCT) was performed on MI patients who were referred to Isfahan Cardiovascular Research Institute, Iran, in 2019. The study protocol was explained to all patients and they were recruited only if they provided informed consent. The inclusion criteria were age of 35-65 years, a minimum reading and writing literacy, lack of any debilitating chronic illnesses, management of underlying heart conditions and non-symptomatic, and lack of severe heart failure and a threatening arrhythmia, major depression, and severe mental illness, immunodeficiency and autoimmune disorder, and cancer. The exclusion criteria included being scheduled for coronary artery bypass surgery, not having sufficient compliance to participate, and having a history of suicide.

The sample size was calculated using the mean comparison formula and taking into account the values related to the emotional dimension of QOL in the study by

Putwain et al. (2011). In this study, 60 post-MI patients who referred to rehabilitation training were enrolled based on the inclusion and exclusion criteria. Individuals were randomly divided into intervention and control groups (each including 30 individuals). The patients and counselors did not know the type of grouping of patients. A consent form was signed by every patient after explaining the study design.

The intervention consisted of bioenergy economy training rehabilitation and nutritional patterns training. In the control group, only rehabilitation and nutrition pattern training was provided. Psychological intervention based on bioenergy economy methods is a macro bio-psychosocial model that quantitatively and qualitatively quantifies bio-energetic phenomena in the matrix and examines the bio-psycho-social-spiritual matrix. These exercises consisted of 8 weekly 90-minute clinical and educational sessions based on the bioenergy economy therapeutic package and the subjects performed the exercises throughout the week. A written summary and a compact disk were provided 2 days after each session for feedback and potential problems with the exercise. The variables were assessed before the intervention, after the eighth session (2 months later), and 4 months after the sessions.

The control group received 8 training sessions (90 minutes each) based on the training package provided by Isfahan Cardiovascular Research Center which includes a healthy lifestyle, aerobic exercise, rehabilitation techniques, nutritional instructions, cardiovascular risk factors, and CVD medications. The exercises and information were provided in the written and CD format (Table 1). After the training, a phone call is made to obtain feedback.

Statistical analysis: The normality of distribution of data was assessed using the Kolmogorov-Smirnov test. Quantitative data were expressed as mean ± standard deviation (SD). Differences between the intervention and control groups were evaluated through t-test. Between-group differences of data departing from normal

Table 1. Content of the energy-based psychological intervention sessions

Sessions	Energy-based psychological interventions
1	Getting to Know the Whole Program and Group Members / The Role of Stress in Health / The Cycle of Feeling-Feeling-Thinking / Stress-Exercising-Releasing / Feedback / Presenting the Schedule for the Week
2	Getting to Know the Energy-Based Psycho-Energy-Energy / Energy / Satisfaction Circuit / Generation of Satisfaction / Happiness Working Group / Attention to Happiness and Life Values / Release Practice / Feedback
3	Reviewing Life Experiences and Happiness / Sustainable Happiness Working Group / Sustainable Happiness Review / Practicing the Control Key in Times of Stress / Feedback / Weekly Presentation
4	Reviewing Experiences / Stimulating Happiness and Processing Levels of Energy, Impulsivity, Reaction, and Action / Workshop Examples of Each Form of Energizing and Its Results / Conditional Exercise / Feedback / Weekly Schedule
5	Reviewing weekly experiences/tons of memory and happiness/ tons of free energy/tons of vibrational energy and posture practices/feedback/ week schedule
6	Reviewing the experiences of the week / emphasizing free energy flow, awareness, and relaxation/ enhancement of happiness through thankfulness/thanksgiving reflection/barriers to self-esteem, otherness, and existence/acquaintance with energy coherence, and role of mind-body coordination /vibrational energy exercises, posture, alignment, and arrangements/feedback / weekly presentation
7	Reviewing Weekly Experiences / Group Practice / Modifying Methods / Feedback / Presenting the Schedule for the Week
8	Reviewing Experiences of the Week / Group Practice / Modifying Techniques / Feedback / Presenting the Schedule for the Week / Encouraging the Continuation of Exercises

distribution were analyzed using the Mann-Whitney U test. Categorical variables were presented as frequency counts and compared using χ^2 test. *P*-values of less than 0.05 were considered as statistically significant. All statistical analyses were performed using SPSS software (version 17.0; SPSS Inc., Chicago, IL, USA).

Results

In this study, 44 Iranian patients with CVD were enrolled (27.3% women in the intervention group and 18.2% in the control group).

Table 2 displays the demographics of patients with MI in both intervention and control groups. No significant differences were observed between the study groups regarding mean age (53.54 ± 5.7 vs. 55.36 ± 10.45; P = 0.48).

Table 3 shows clinical and laboratory characteristics of study subjects. Fasting blood sugar was higher in the control group before the intervention (106.7 ± 14.1 vs. 96.3 ± 11.0; P < 0.001). The triglyceride level was higher in the control group (177.7 ± 93.03 vs. 153.5 ± 51.94; P = 0.71). Systolic blood pressure was higher in the control group before the intervention (P = 0.04). There was no significant difference between the study groups in total cholesterol, HDL, and LDL before and after the intervention. Moreover, there were no significant differences in terms of anthropometric measurements (such as BMI, Waist Circumference, and WHR) between the two groups (P < 0.05). Intercellular adhesion molecule 1 (ICAM-1) and vascular cell adhesion molecule 1 (VCAM-1) have not changed during the intervention in either groups (P < 0.05).

Table 4 demonstrated the relationship between ICAM-1, VCAM-1, and the psychological intervention. We could not find any significant relationship between these factors and the interventions in either crude or adjusted models.

Discussion

This study was conducted with the aim to investigate the impact of a bioenvironmental-based psychological intervention course on cardiovascular function, inflammatory factors, and QOL in MI patients. The results of our study demonstrated that psychological intervention based on the bio-energetic circuit has no significant effect on cardiac function and inflammatory factors in MI patients. According to guidelines developed by various cardiovascular associations worldwide, the treatment of patients with CAD through invasive treatments as well as pharmacological treatment is most recommended (Carney, Freedland, Veith, & Jaffe, 1999).

Cardiac rehabilitation programs are considered as one of the most important non-pharmacological treatments in patients with CVD (Bagherian, Sanei, & Kalantari, 2011). Dickens et al. (2013) have shown that cardiac rehabilitation is a cost-effective

Table 2. Baseline characteristics of study subjects

	Intervention (n = 22)	Control (n = 22)	P-value
Women [n(%)]	6 (27.3)	4 (18.2)	0.72
Age (Year) (mean ± SD)	53.54 ± 5.73	55.36 ± 10.45	0.48
Education (Year) (mean ± SD)			
0-6	12 (54.5)	10 (45.4)	
6-12	6 (27.3)	9 (40.9)	0.62
>12	4 (18.2)	3 (13.6)	
Married [n(%)]	22 (100.0)	20 (90.9)	0.49

Table 3. Clinical and laboratory characteristics of study subjects (Part I)

	Intervention		
	Pretest	Posttest	P-value*
Systolic Blood Pressure (mmHg) (Mean ± SD)	118.1 ± 14.9	125.1 ± 18	0.06
Diastolic Blood Pressure (mmHg) (Mean ± SD)	81.9 ± 10.62	83.4 ± 9.9	0.49
Total Cholesterol (mg/dl) (Mean ± SD)	151.3 ± 25.97	158.9 ± 31.5	0.17
Triglyceride (mg/dl) (Mean ± SD)	154.1 ± 35.59	152.6 ± 36.81	0.89
HDL-C(mg/dl) (Mean ± SD)	30 (25.3-38.3)	33 (27-39.8)	0.90
LDL-C (mg/dl) (Mean ± SD)	86.1 ± 25.48	89.2 ± 28.38	0.49
Fasting Blood Sugar (mg/dl) (Mean ± SD)	117.5 (153.3 ± 94)	106 (-13094)	0.64
BMI* (Kg/m^2)	28.3 (24.8-30.8)	28.6 (26.7-32)	0.026
Waist Circumference (cm) (Mean ± SD)	99.6 ± 9.79	99.8 ± 9.26	0.87
WHR (Mean ± SD)	1 ± 0.07	1 ± 0.05	0.13
ICAM-1	1086 (958.2-1358)	1058 (897.4-1691.3)	0.08
VCAM	11 (8.4-13.2)	9.1 (8.1-14.4)	0.35
METS	2.75 ± 1.25	2.84 ± 1.16	0.96

Table 3. Clinical and laboratory characteristics of study subjects (Part II)

	Control			P-value
	Pretest	Posttest	P-value*	
Systolic Blood Pressure (mmHg) (Mean ± SD)	127.4 ± 21.96	124.6 ± 19.16	0.36	0.04
Diastolic Blood Pressure (mmHg) (Mean ± SD)	81.3 ± 12.45	80.3 ± 11.76	0.59	0.17
Total Cholesterol (mg/dl) (Mean ± SD)	159.7 ± 30.73	164.3 ± 37.87	0.51	0.74
Triglyceride (mg/dl) (Mean ± SD)	177.7 ± 93.03	153.5 ± 51.94	0.17	0.71
HDL-C(mg/dl) (Mean ± SD)	32.5 (27.5-39)	37 (31.5-42.3)	0.017	0.05
LDL-C (mg/dl) (Mean ± SD)	79.4 ± 27.78	86.5 ± 32.36	0.42	0.83
Fasting Blood Sugar (mg/dl) (Mean ± SD)	113 (95-174)	98.5 (87.8-178.3)	0.12	0.25
BMI* (Kg/m^2)	29 (27.3-30.5)	28.9 (27.3-31)	0.55	0.19
Waist Circumference (cm) (Mean ± SD)	102.6 ± 9.21	103.4 ± 8.39	0.46	0.66
WHR (Mean ± SD)	1 ± 0.05	1 ± 0.05	0.32	0.07
ICAM-1	821.2 (745-1047.8)	811 (688.3-1046.9)	0.80	0.25
VCAM	11.2 (9.6-12.6)	10.4 (9-11.3)	0.46	0.75
METS	2.90 ± 1.30	2.50 ± 1.26	0.39	0.57

HDL-C: high density lipoprotein cholesterol; LDL-C: low density lipoprotein cholesterol; WHR: Waist-to-hip ratio; ICAM-1: Intercellular adhesion molecule 1; VCAM-1: Vascular cell adhesion molecule 1; METS: Metabolic equivalent of task

$P < 0.05$ considered as significant

*used paired t-test and Wilcoxon Signed Ranks test for nonparametric variables

Program in the treatment of patients with CVD. Tavakolizadeh et al. (2021) have conducted an RCT to evaluate the efficacy of a bioenergy economy-based psycho-education package on the improvement of vegetative function, forgiveness, and QOL of patients with coronary heart disease (CHD) (Tavakolizadeh et al., 2021). They indicated a significant difference in heart rate, forgiveness, and QOL and its physical and psychological dimensions between the case and control groups after training ($P < 0.05$).

Table 4. Relationship between intercellular adhesion molecule 1, vascular cell adhesion molecule 1, and bioenergetics intervention in the study population

	OR (95% CI)	P-value
Crude Model		
ICAM-1	1.000 (0.999-1.002)	0.927
VCAM-1	0.991 (0.962-1.021)	0.555
Adjusted Model		
ICAM-1	1.000 (0.999-1.002)	0.741
VCAM-1	0.994 (0.965-1.025)	0.711

ICAM-1: Intercellular adhesion molecule 1; VCAM-1: Vascular cell adhesion molecule 1
Adjusted for age, sex, and baseline values

The post hoc test showed that heart rate decreased significantly in the posttest compared to the pretest, and forgiveness, and QOL and its physical and psychological dimensions increased significantly ($P < 0.05$). However, heart rate increased significantly in the follow-up compared to the posttest, and forgiveness, and QOL and its physical and psychological dimensions decreased significantly ($P < 0.05$).

Various indicators associated with ischaemic heart disease (IHD) symptoms, including mental, physical, and environmental indiators, and myocardial dysfunction, may be associated with improved QOL of CVD patients (Friedman et al., 1986). Life expectancy is one of the indicators used to evaluate the effects of treatment interventions on chronic diseases, including CVD. Today, life expectancy is no longer the only measure of patient response to treatment; QOL and quality-adjusted life years (QALY) are also important measures of success in treatment procedures. Health-related quality of life (HRQoL) is an indicator that measures a person's sense of health in various health, physical, mental, social, and environmental areas (Behnammoghadam, Alamdari, Behnammoghadam, & Darban, 2015). A review study evaluated the QOL of patients with CVD in Iran. The mean score of QOL in these patients was 53.19, with the highest score in the social domain. Sex, age, education, marital status, employment status, duration of illness, and frequency of hospitalization were the most important factors affecting the QOL (Yammine, Frazier, Padhye, Burg, & Meininger, 2014). Appropriate psychological interventions improve the cardiac and psychological symptoms of CVD patients by improving respiratory capacity and muscle (Mayou et al., 2000; Roest, Martens, Denollet, & de Jonge, 2010; Roest, Martens, de Jonge, & Denollet, 2010; Schoemaker & Smits, 1994). Previous studies have also shown that mind-body exercises can reduce blood pressure in CVD patients by reducing heart oxygen consumption, and thus, can have a positive effect on the disease process (Wann et al., 2007).

Atherosclerotic plaque instability occurs when inflammatory mediators inhibit collagen synthesis and cause collagenases to be expressed by the foam cells inside the wound. Tissue coagulation factors that are expressed within the atheroma then stimulate thrombogenesis, block the veins, and cause clinical manifestations (Norlund, Olsson, Burell, Wallin, & Held, 2015). Binding molecules such as ICAM-1 and VCAM-1 plays an important role in the process of atherosclerosis and facilitates the entry of leukocytes without veins. CAMs are secreted in response to cytokines, they play an important role in atherogenesis, and their local expression can be observed in atherosclerotic plaques. Soluble forms of ICAM-1 and VCAM-1 have been found in the plasma of patients with unstable angina and acute coronary syndromes and may remain elevated in patients with unstable angina for up to 6 months (Rabito & Kaye,

2013). In this regard, Hasanpour et al. (2007) demonstrated an increase in the risk of MI by 1.6 times in men with high ICAM-1 concentrations. They also found that ICAM-1, VCAM-1, and E-selectin in CAD patients were significantly associated with cardiovascular mortality (Hasanpour et al., 2007). Similar studies have revealed that the values of VCAM-1 and ICAM-1 were significantly higher in patients with acute coronary syndrome than in the control group (Diaz-Rodriguez, Arroyo-Morales, Cantarero-Villanueva, Fernandez-Lao, Polley, & Fernandez-de-las-Penas, 2011; Barnes, Bloom, & Nahin, 2008; du Quebec, Chi, Master, & Kung, 2007; Ackerman & Cameron, 2002).

Bioenergy economy techniques are considered as methods for repairing and improving the body's energy system, which can activate natural healing processes. These processes include relaxation, which can improve many health problems (Friedman, Burg, Miles, Lee, & Lampert, 2010). A case-control study on CVD patients has shown that bio-energy economy techniques can reduce blood pressure in these patients (Grant, Bin, Kiat, & Chang, 2012). Another study has also shown that meditation and Reiki techniques can reduce anxiety and stress in patients with CVD, which in turn lowers blood pressure (Yeh, Davis, & Phillips, 2006). A study on 66 hypertensive patients has shown that using energy medicine techniques can significantly lower blood pressure, and it has been suggested that this technique be used as a complementary method in the treatment of hypertension (Salles et al., 2014). Other studies have shown that mind-body exercises have been an effective and cost-effective method in patients with recent cardiovascular events (Goli, 2010).

The bioenergy-based psychological intervention method is an integrative health system that differs from the conventional medicine system; bioenergy economy is a disease-centered and person-centered approach. It is also not based on pathogenesis, but on salutogenesis, it has a holistic view of humans, and its effects are based on their effects on the homeostasis systems. This method is based on body-centered psychotherapy, mindfulness, and bioenergy economy treatments. It is a way of removing blocks and flowing energy through the body. Our results indicated that the energy-based psychological intervention method had no effect on ICAM-1 and VCAM-1 in the study patients.

Conclusion

Although, our results displayed that the psychological intervention based on the bio-energetic circuit has no significant effect on cardiac function and inflammatory factors in patients with MI, we suggest the repetition of this study on a larger population.

Limitation: A limitation of the present study was its small sample size that reduces the power of the study. In addition, as this study was a nonrandomized clinical trial, obtaining consent for randomization was often difficult. In bioenergy economy interventions, blinding is often impossible because patients may have a preconceived notion of what treatment they wish to receive. Furthermore, the technical nature of bioenergy economy can make randomization difficult.

Conflict of Interests

Authors have no conflict of interests.

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