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Research Paper

Effects of an 8-Week Aerobic Exercise Program on Some Indicators of Oxidative Stress in Elderly Women

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ABSTRACT

Objectives Oxidative stress has an important role in the pathogenesis of diseases such as cardiovascular disease, cancer, diabetes and aging. The present study investigated the effects of 8 weeks of aerobic training on 8-hydroxy-2'-deoxyguanosine and body composition in elderly women.

Methods & Materials This was a quasi-experimental study. The study participants were selected by convenience sampling method. In total, 21 subjects with the age range of 60-70 years were assigned into 2 groups (experimental [n=11] and control [n=10]). The 8-week aerobic training program were demonstrated 3 sessions a week, for 45-60 minutes per session, with the intensity of 50% to 70% of maximum heart rate. The blood samples were obtained 24 hours after the intervention to measure the serum levels of 8-OHdG. For comparison of within and between group mean scores, Paired t test and Independent samples t test were used, respectively.

Results Eight weeks aerobic training significantly reduced the weight, BMI and body fat percentage in elderly women. Moreover, the levels of serum 8-OHdG after an 8 weeks aerobic training significantly reduced. However, the levels of 8-OHdG urine reduced at the end of the training, but it was non-significant. There were significant differences between active and inactive elderly woman in terms of weight and serum 8-OHdG variables.

Conclusion This study suggests that aerobic training decreases serum 8-OHdG. Regular aerobic physical activity with moderate intensity improves the body anti-oxidative capacity and can prevent the incidence of atherosclerosis disease.

Extended Abstract

1. Objectives

Oxidative stress plays an important role in the pathogenesis of aging and some diseases such as cardiovascular disease, cancer, and diabetes. Production of various types of oxygen causes biological damage, and potentially exacerbates these complications [1-2]. There is a close relationship between the production of Reactive Oxygen Species (ROS) and the analysis of antioxidant systems [1]. Structural changes in DNA as a result of exposure to ROS, can accelerate aging, and cause atherosclerosis and diabetes [3]. One of the factors that has been studied in recent years is 8-hy-

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droxy-2'-deoxyguanosine (8-OHdG), which is an index of oxidative DNA damage [4]. The positive role of exercise and physical activity in the prevention of cardiovascular diseases have been already proven [5]. The current study examined the effect of an 8-week aerobic exercise program on 8-OHdG level and body composition of inactive elderly women.

2. Methods and Materials

In this quasi-experimental study, 21 elderly women with the mean age of 60-70 years, and Body Mass Index (BMI) of 29-30 kg/m^2 participated. The samples were selected using convenience and purposeful sampling methods. The subjects were then randomly divided into test (n=11) and control (n=10) groups. Aerobic training were held for 8 weeks; 4 sessions per week. The duration of each session was 45-60 minutes. The intervention program for those in test group included: 1. A 10-minute warm-up; 2. Aerobic training for 45-60 minutes with an intensity of 50-70% of the maximum heart rate. The training time gradually increased from 30 minutes at the beginning to 45 minutes at the end; and 3. A 10-minute cool-down. The intensity of training was measured by a heart rate sensor (Polar, Finland).

The blood samples were collected 24 hours before initiating the training and 24 hours after the last training session to measure the serum and urine levels of 8-OHdG. To determine the 8-OHdG level, ELISA method was employed using related assay kit (Cusabio, Japan). Bioelectrical impedance analysis was used for estimating the body composition of the samples. SPSS was used for data analysis. In addition, within group and between group comparisons were performed using Paired t test and Independent t test, respectively. The significance level was set at P>0.05. This study was a registered project (code: 2.32123), which was conducted with the financial support of the Vice Chancellor of Research and Technology Department of Ferdowsi University of Mashhad.

3. Results

According to the obtained results, there were no significant differences between the test and control groups in terms of height, weight, BMI, body fat percentage, and the serum and urine levels of 8-OHdG. The obtained results revealed that an 8-week aerobic training program significantly reduced Mean±SD scores of body weight from 68.68±10.44 to 67.48±10.23 kg (P=0.001), BMI Mean±SD scores from 29.52±3.37 to 28.83±3.23 kg/m^2 (P=0.01), and body fat percentage Mean±SD scores

Table 1. Between-group and within-group comparisons of changes in body composition and the serum and urine levels of 8-OHdG

Variables	Groups	Mean±SD		Changes	
		Pre-Test	Post-Test	Within Group*	Between Group**
				P	P
Weight, kg	Test	68.68±10.44	67.48±10.23	0.00***	0.00*
	Control	71.79±10.40	72.13±9.86	0.27	
BMI, kg/m^2	Test	29.52±3.37	28.83±3.23	0.01*	0.06
	Control	30.18±4.02	30.13±3.93	0.84	
Body fat, %	Test	43.20±6.98	41.36±7.24	0.02*	0.06
	Control	41.51±6.35	41.38±6.73	0.80	
8-OHdG serum level,ng/mL	Test	329.00±191.81	271.00±143.34	0.012*	0.048*
	Control	366.20±146.92	422.50±97.76	0.273	
8-OHdG urine level, ng/mL	Test	8.14±4.17	6.01±1.08	0.118	0.305
	Control	14.61±11.40	13.16±9.23	0.591	

** Paired t-test; *** Independent t test, * Significant at P<0.05

from 43.20±6.98 to 41.36±7.24 (P=0.02) in the samples. Reduction in the Mean±SD scores of serum levels of 8-OHdG from 329±191.81 to 271±143.34 ng/mL was significant at the end of intervention (P=0.012). However, reduction in the Mean±SD scores of urine levels of 8-OHdG from 8.14±4.17 to 6.01±1.08 ng/mL was not significant (P>0.05).

The Independent t test results regarding between-group comparison of post-test mean scores revealed significant differences between the 2 groups in terms of body weight (P=0.01) and the serum levels of 8-OHdG (P=0.04). However, in terms of BMI (P=0.06), body fat percentage (P=0.06), and the urine levels of 8-OHdG (P=0.305), no significant differences were observed between them (Table 1). In other words, the aerobic exercise significantly reduced the serum levels of 8-OHdG in the test group. Therefore, an 8-week aerobic training program had a significant effect on the serum level of 8-OHdG.

4. Conclusion

Given the effect of 8 weeks of aerobic training on reducing weight, BMI, and the serum level of 8-OHdG in elderly women, It can be concluded that aerobic exercise is an appropriate treatment for the elderly women. In addition, due to the significant reduction in the serum levels of 8-OHdG, regular aerobic exercises with moderate intensity improved antioxidant function. However, considering the important role of physical activity in the prevention and treatment of many diseases, and increasing the sense of satisfaction in the elderly, specialists should suggest a combination of pharmacotherapy, training and nutritional counseling for the treatment of cardiovascular diseases. Thus, we recommend aerobic exercises to prevent the adverse effects of increased atherosclerosis, and it can be considered as a vital part in the lifestyle of inactive elderly women.

Ethical Considerations

Compliance with ethical guidelines

This study is a research project registered at Ferdowsi University of Mashhad (code: 2.32123).

Funding

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Authors contributions

Conceptualization and investigation: Keyvan Hejazi, Mahdi Ghahremani Moghaddam, and Teimour Darzabi; Editing: Keyvan Hejazi; Project administration: Keyvan Hejazi and Mahdi Ghahremani Moghaddam; Funding acquisition: Mahdi Ghahremani Moghaddam.

Conflict of interest

The authors declared no conflict of interest.