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Beneficial Health Effect of Aquarobics (Role of Adiponectin on Women with Obesity)

Beneficial Health Effect of Aquarobics (Role of Adiponectin on Women with Obesity)

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Abstract. Background the effects of exercise on adiponectin levels have been reported to be variable. Obesity is associated with adipose tissue inflammation and increased risk of infection. The prevalence of obesity increased in premenopausal women both in developed countries and developing countries, including Indonesia. The purpose of the study to investigate the effect of aquarobics exercise on adiponectin levels in women with obesity. Methods of the research, experimental randomized pretest-posttest control group design performed in twenty four women with obesity (Obese II BMI> 30kg/m2) aged 45-50 years, who were divided into 2 groups, aquarobic exercise group, twice days for 8 weeks (n=12), aquarobic intensity 75%HRmax, and control group (n=12). Percentage of body fat, BMI, adiponectin levels, blood glucose and lipids profile were measured before and after exercise. Data were analyzed using repeated measures and while Pearson's correlations were performed to identify possible relationship among the assessed variables. Results of the study, the percentage of body fat was higher in aquarobic exercises than control group ($p<0.05$). Decreased of BMI on the aquarobic exercises group compared to controls ($p<0.05$) and adiponectin levels in the aquarobic exercise group increase significantly ($p<0.05$). Conclusion: Aquarobic exercise is effective to decreased body weight and increase adiponectin levels.

1. Introduction

Obesity is associated with several morbidities, for example type-2 diabetes, different cancers, cardiovascular disease like atherosclerosis,(1) Especially individuals with abdominal obesity are at risk.(2) In particular, it is the visceral part of the abdominal fat that is most dangerous and high levels in women.(3) Adipose tissue functions as an endocrine organ (4) in addition to its role in fuel storage, thermal insulation, and mechanical protection, releasing biologically active and diverse cytokines, termed adipocytes.(5,6) Adiponectin is a cytokine protein released by human adipose tissue, which modulates various biological functions and its levels exhibit an inverse relationship with insulin resistance (7,8). In addition, modifications in body weight have been shown to influence the levels of adiponectin (6,9). There are studies which have reported no effect of acute exercise on adiponectin levels in healthy, normal weight individuals (10–13). The lack of exercise not only increases fat that stores surplus energy, but also decreases the function of bones and muscles. Adipose tissue is a rich source of

metabolically active molecules, including tumor necrosis factor-alpha (TNF-α), leptin, and adiponectin (14). Adiponectin is a protein hormone, that is produced and secreted exclusively by adipocytes, regulates the metabolism of lipids and glucose, and exhibits anti-inflammatory properties. Adiponectin levels have been reported to rise in response to weight loss (15). Decreased plasma adiponectin has been linked to obesity (4) insulin resistance, type 2 diabetes mellitus (T2DM)), and atherosclerosis (13). By contrast, increased plasma adiponectin is associated with reduced body weight and improved insulin sensitivity (16). Circulating adiponectin levels are modulated by diet and exercise associated with substantial weight loss (17,18) Research on the effects of acute exercise on adiponectin levels has produced conflicting results. Physical activity can be considered and effective factor in improving obesity. However, there is contradictory information on the effect of physical activity on the levels of leptin, adiponectin and inflammatory markers (CRP, IL-6 and TNF-α)(19,20). The effect of exercise on adiponectin concentrations varies among individuals. Kobayashi et al (21) observed that 50 days of walking led to an improvement in the adiponectin level in healthy men with a normal weight (8) whereas observed that two months of participating in an aerobic training program with moderate intensity increased the adiponectin level (15). The purpose of the study to investigate the effect of aquarobics exercise on adiponectin levels in women with obesity.

2. Materials and Methods

2.1. Participants

Twenty-four obese women aged of 46.49±1.41years (Weight 76.41±3.11kg, Height 155.4±1.5 cm, body mass index (BMI) 32.8±.0.92) voluntarily participated in this study in Semarang, a cut-off for obesity BMI ≥30kg/m2, based on Asia-Pacific guidelines (22). Fasting glucose levels and blood pressure were determined in order to exclude the patients with metabolic disease. Postmenopausal women were screened with regards to the mean age of natural menopause in Central Java Province Indonesia women. In addition, the participants filled out questionnaires containing fields such as age, last menstrual day, menopausal status (e.g., last menstrual period occurred 6 months). All participants were informed the possible risk and the testing procedure of the trial before they signed the informed consent document. Participants were informed not to perform vigorous exercise one week before and during the trial. The study was approved by the by the Ethical and Research Committee of the Kariadi Hospitals (RSDK Semarang, Indonesia) before recruitment of the participants.

2.2. Experimental Design

The purpose of the study to investigate the effect of 12 weeks aquarobics exercise program on adiponectin in women with obesity. Participants were randomly divided into two groups including control and aquarobic groups. Before and after the exercise training, anthropometric measurements were examined for all subjects. Height and body weight were recorded and body mass index (BMI) was calculated from the ratio of weight (kg)/height (m2). Body fat (%) was measured and blood pressure was measured on the right arm with the subjects in a sitting position, twice, after a 10 min rest, using a standard mercury sphygmomanometer. Adiponectin plasma were measured before and 1 hours after the aquarobics treatment, as well as immediately after exercise challenge.

2.3. Aquarobics Exercise

Before aquarobics exercises, each subject's maximal oxygen consumption (VO2 max) was measured to establish their exercise training intensity. The subjects were then not familiarized with aquarobics exercises, after which they were told the requirements for the present experiment and their VO2 max was determined following the Bruce Protocol. Metabolic data were collected using open circuit spirometer (Sensor Medics VO2max, USA). Aquarobics exercises,(23) supervised by experienced

aquarobics instructors, was performed three days a week for 8 weeks. Each session consisted of a 10 min warm up session, a 40 min session of aquarobics exercises an intensity of 50-75% of the predetermined. The exercise intensity was controlled using a belt heart rate sensor (polar beat), and at the end of each session, there was a cool-down period consisting of stretching for 10 min.

2.4. Biochemical measurement

Blood sample was collected from antecubital vein using heparin contained tubes and centrifuged at 3,000 rpm for 10 minutes at 4 °C. After centrifuging, supernatant was collected and stored at -80 °C until analysis. Plasma glucose levels were measured with a commercially available kit (glucose hexokinase kit, ADVIA 1650, radioimmunoassay RIA kit, Linco Research, St. Charles, MO, USA) (CV, 1.1% and 7.8–9.3%). Serum adiponectin was measured with a human adiponectin ELISA kit (Bio Vender, Laboratory Medicine, Brno, Czech Republic) (CV,4.8%). Blood samples for adiponectin measurement were drawn into pre cooled glass tubes containing EDTA. The tubes were spun immediately at 2200 g for 15 min at 4°C. The plasma was stored at -80°C until analyses were performed.

2.5. Statistical analysis

Statistical analysis of the data was performed for each group using the means and standard deviations. Then, the Kolmogorov-Smirnov test was used to ensure that the data were normally distributed. All data shown represent the means the standard deviation (SD). Differences in various parameters before and after aquarobics exercises were performed using the paired t-test. To demonstrate the aquarobics exercises-induced changes in adiponectin levels, we adjusted for the change in body weight. Changes in body weight were determined by calculating the difference in the body weights before and after aquarobics exercises. Differences between weight loss and weight gain were performed using independent the t-test, one-way analysis of variance (ANOVA) was performed.(24,25) To eliminate the possible influence of the baseline characteristics on the effects of exercise, adjustments for age, weight, BMI, body fat (%). All statistical analyses were performed using SPSS-PC for Windows (version 20.0, SPSS Inc., Chicago, IL, USA); $p<0.05$ was considered statistically significant.

3. Results

While aquarobics performed twice day sessions of a 60-min and water immersion at 30 °C performed, control group remained at room temperature. The results of the current study showed an increase in serum adiponectin levels among subjects who underwent 8 weeks of aquarobics exercise program, with concurrent reduction in body weight, percent body fat, BMI (26) reduce blood glucose and serum levels of adiponectin in the experimental group relative to the levels in the control group after 8 weeks of aquarobics exercise program. Participant characteristics are presented in Table 1. The result shows that the adiponectin levels in aquarobics exercise was significantly highest than control group (Fig.1 $p<0.05$).

Table 1. Physical, physiological and biochemistry variables in two group

Variable	Aquarobics Group (n=12) (Mean ± SD)	Control group (n=12) (Mean ± SD)	p
Age (year) pretest	46.74±1.30	46.79±1.35	0.450
Height (cm)	1.55± 0.05	1.52± 0.04	0.075
Weight (kg) pre test	75.66±5.54	75.41 ±6.61	0.269
Weight (kg) post test	73.16±4.60	74.32 ± 6.61	0.185
BMI (kg/m2) pre test	31.32±0.97	32.48± 1.56	0.040
BMI (kg/m2) post test	30.24± 1.18	32.48± 1.56	0.000*
Fat percentage (%) pre test	31.58 ± 1.94	31.80 ± 1.57	0.031
Fat percentage (%) post test	27.67 ± 1.22	31.76 ± 1.65	0.001*
Adiponectin (µg/ml-1) pre test	5.11±0.65	4.92±0.45	0.011
Adiponectin (µg/ml-1) post test	7.72±0.65	4.99±0.46	0.000*

The results obtained from the current study showed that 8 weeks of aquarobics exercise program decreased the percent body fat (p=0.01) and decreased the body mass index (p=0.00) relative to the control group. In addition, after 8 weeks of training adiponectin level significantly increased (p=0.00) relative to the level at the pre-test stage (before doing the exercise (p>0.05).

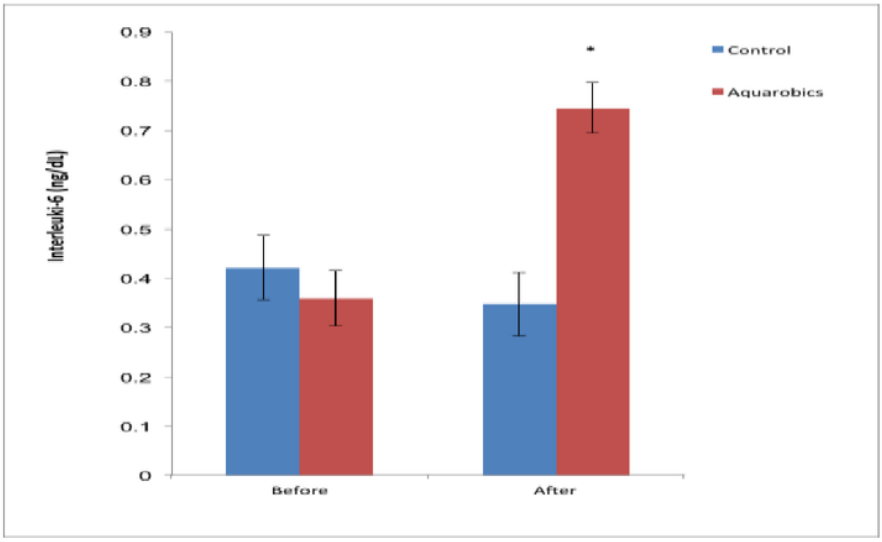

Figure 1. The effect of exercise on adiponectin level

4. Discussion

Previous studies reported aerobic training showed variable effects on changes in adiponectin levels. Numerous studies have found that exercise could increase adiponectin concentrations during weight loss (27). The present findings that an aquarobics exercise results a significant increase in plasma adiponectin levels with weight loss and even in the presence of weight gain in obese women. On the other hand, several studies found that aerobic training showed no effect on adiponectin levels under stable body weight (28) or even mild weight reduction (8,20). These findings confirm those of previous studies that

found improvement in insulin sensitivity after exercise training in obese and healthy individuals (20) Several mechanisms have been proposed to be responsible for the increases in insulin sensitivity after exercise training (29). These include increased post-receptor insulin signaling (30), increased glucose transporter protein and mRNA (31), increased activity of glycogen syntheses and hexokinase (15), increased muscle glucose delivery and changes in muscle composition (32). Restoring insulin sensitivity by circuit weight training might be mediated mainly by mechanisms other than adiponectin, for instance, by the AMP-activated protein kinase pathway (33).

Further, three sessions of aquarobics exercise within a one-week period were sufficient to maintain this increase for 1–3 days after the final exercise session. Study occurred in the absence of any changes in weight. As such, these findings add to the growing body of evidence showing that exercise results in important health benefits irrespective of changes in body weight(34,35).

The present research demonstrated a significant increase in the plasma level of adiponectin due to 12 weeks of aquarobics exercises in the experimental group compared with the control group. Moreover, a significant difference was observed in the plasma level of adiponectin in the experimental group between the pre-test and post-test stages. The increase in the plasma level of adiponectin as a result of 12 weeks of aquarobics exercises was most likely a preventive factor for diseases related to adiponectin (32,36). In this research, the increase in the level of adiponectin after adjusting to the aquarobics exercises was similar to the results of a number of previous studies. In a previous study, eight young obese women exhibited a significant decrease in fat after participating in an aerobic training programmer for seven weeks; moreover, their level of adiponectin increased (10). Other studies found that training had no effect on the level of adiponectin. This discrepancy may be due to differences in age, sex, the type of training program and the intensity and duration of the training (37).

5. Conclusion

Aquarobic it was benefits to the health, increasing adiponectin and appearance characterized by decreased body fat percentage and skin fat lipolysis is more active than the fat from other deposits. Aquarobics exercise can be used as effective non-pharmacological treatment to prevent diseases.

6. Acknowledgments

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PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8