Journal of Fasting and Health
http://jfh.mums.ac.ir
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Effects of Regular Walking and Alternate Day Fasting on Health-related Factors in Overweight and Obese Females

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ARTICLEINFO

Article type:
Original article

Article History:
Received: 03 Jan 2017
Accepted: 30 Jan 2017
Published: 01 Mar 2017

Keywords:
BMI
Diet
Obesity
Walking

ABSTRACT

Introduction: Obesity is a complex health problem. The aim of this study was to determine the effects of regular walking with alternate day fasting (ADF) on health-related factors of overweight and obese females.
Methods: 30 healthy inactive, overweight and obese women were divided randomly into three equal groups. The groups were: control group (BMI: 30.72±4.40 kg/m^2); the experimental group I: ADF along with regular walking with 50% to 65% maximal heart rate (BMI: 28.69 ±2.81 kg/m^2) and the experimental group II: ADF (BMI: 30.56 ±3.66 kg/m^2). Participants were under the diet for six weeks. The diet ADF means that, they had days of fasting and free day (with regular walking), alternately. Two days before and two days after the end of the study, the participants' fasting blood sugar were measured after 12 hours. Resting heart rate, blood pressure and body composition were assessed in the same day. The collected data were analyzed using paired t-test and ANOVA test.
Results: Body mass index in both experimental groups had significant decrease (P<0.05). Decreasing body fat percent, from pre-test to post test was significant only in the experimental group I (P=0.006). The significant difference was found between groups in this reduction (P<0.05). In the experimental group II, lean body mass showed significant increase and blood glucose showed significant decrease (P<0.05). No significant changes were found in other variables (P>0.05).
Conclusion: The regular walking program and ADF diet is an effective method for improving body mass index, body fat percentage and blood sugar.

Please cite this paper as:
Seighali R, Hojjati Zidashti Z. Effects of Regular Walking and Alternate Day Fasting on Health-related Factors in Overweight and Obese Females. J Fasting Health. 2017; 5(1): 12-19. Doi: 10.22038/jfh.2017.21121.1079

Introduction

Today, lifestyle patterns have changed and obesity rate has experienced an increasing growth. Thus, subsequent changes in diet and physical activity have an effective role in either prevention or control of metabolic diseases related to obesity or reversing its process perhaps. The aim of this study is to evaluate the effect of regular walking along with alternate day fasting (ADF) on health related factors of inactive overweight and obese female. Given the fact that body mass index (BMI) and waist to hip ratio (WHR) provide us with appropriate measures of health status to us, these two indicators should be considered further, since the risk of diabetes is at the lowest level for those with a BMI less than 24. As BMI increases, the relative risk also rises, so that the risk of diabetes is about 40 times for a BMI of about 35 (1, 2, 3, 4). Adding BMI index to blood pressure indicates the signs of health well. In some references, increase in blood pressure due to increase in BMI has been pointed out (3, 5, 6). Studying WHR index should also be taken into account to estimate the amount of visceral fat because with the obesity of the upper body, health risks increase. Control and treatment of obesity and its consequences depend on two indicators (1).

Numerous studies have been conducted on the quality of exercise and diet for people with diabetes and high blood pressure, but few studies have examined blood sugar and blood pressure of obese and healthy people (6, 7). ADF diet includes free days and fasting days. On free days, calorie

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intake is free, but on fasting days, 25-30% of the calories of the free days are consumed by the participants (2, 8).

In the last decade, it became clear that calorie restriction (CR) diet reduces weight (9, 10). However, in recent years, in addition to weight loss, ADF proved to be able to reduce the risk of diseases associated with obesity (2, 11, 12, 13). This diet has been known as a new approach to weight loss and heart protection (12). Concerning the type of diet, the studies by Sawashita et al. (2009) and Pasdar et al. (2012) can be mentioned that are inconsistent with the current study (7,9). Moreover, the studies by Varady et al. (2009 and 2011), Klempel et al. (2013), Eshginia and Mohammadzadeh (2013) can be referred to as similar to the present study (2, 11, 13). In the past, before this study, ADF diet and regular walking were evaluated separately, but there were no studies to examine both of them together and in combination; a purpose fulfilled in this study. Examining regular walking along ADF diet and their effect on improving the BMI, WHR, body fat, blood sugar, blood pressure, and resting heart rate, which are among the variables measured in this study, are of the primary objectives of this study. For this purpose, the present study has been conducted in order to increase awareness in terms of maintaining weight loss and health through its results.

Material and methods

This study is quasi-experimental. The population of this study was healthy inactive women of Rasht who responded to advertise-ments in the city, 50 people volunteered to participate in the study. The inclusion criteria were being overweight or obese, having a BMI between 25 and 35 kilograms per square meter (1), physical inactivity (less than 150 minutes of physical activity per week) (13), the absence of menopause and diseases, and not taking medicine. Exclusion criteria were having a normal BMI, having a disease, and taking medication. After reviewing the standards, 30 volunteers aged 30 to 45 years old were selected to participate in the study for six weeks. Selection of samples was targeted, non-randomized and convenient. Subjects were divided into three groups of ten, five obese and five overweight people, in a simple random method. The control group has an average age of 40.60±65.15, experimental group one had an average age of 38.00±6.82, ADF along with regular walking and second experimental groups had an average age of 38.60±44.22 with ADF. A week before the implementation of exercise program and diet, after learning the purpose of the study, the participants completed consent form to participate in the study. Before the launching of the walking program and diet and two days after finishing them, blood glucose test was taken from both groups after 12 hours of fasting. Their resting heart rate and blood pressure, the thickness of subcutaneous fat (14), and height and weight were measured and recorded in two stages, at the beginning and the end of six weeks period (4, 11) (two days after the last exercise and without fasting). Pre-test and post-test measurements were completed after menstruation and before starting the next cycle. Based on the information obtained, participants had normal menstruation from three previous cycles.

At the beginning of the week balance, the experimental group participated in aerobic exercise; they walked in the park in Rasht three times a week. For each participant in two experimental groups, calorie intake and consumption were measured and recorded for two working days and one day of rest (1, 15). The first phase (balance week): In this week, calorie intake and use were considered the same and controlled for both groups in order to maintain weight as fix. Second phase: For two weeks, on fasting days, they received 30% of calories and on non-fasting days, they received calories freely. They were strictly controlled on fasting days. The third phase (self-control): for three weeks, recommendations were implemented for maintaining the diet in general, similar to the second phase (2, 11, 12, 13). For both experimental groups, nutrition programs and recommendations were considered the same, but the experimental group who participated in aerobic exercise had regular walking on non-fasting days (three sessions per week lasting from 20 minutes at the start to 60 minutes at the end of sixth weeks, with 50% to 65% of maximum heart rate) (3). The control group continued their normal life style without any intervention, and at the end of the study were compared with the other two groups.

ADF diet

In this study, the diet was based on 60%

carbohydrate, 30% fat, and 10 to 15% protein. (4). It was implemented every other day. On fasting days, 30% of the total calorie intake was intended for participants, and 70% of total calorie intake was cut (11, 12, 13). First, for each of the participants, the daily calorie intake and consumption were recorded by recalling food intake and physical activity in two working and one resting days, which usually included recalling the diet and physical activity during 24 hours. Often dietary patterns was used by means of measurements (cups and spoons, and sometimes by weighing the food) and patterns of physical activity (10 hours of sleep and rest, 2 hours working at home or 8 hours of light office work) to meet this goal (1). To estimate the total daily caloric intake of participants, basal metabolic rate was calculated using Harris-Benedict formula for women and was multiplied into thermogenesis of the food. Based on this formula, in women aged 30 to 59, using weight in kilograms, basal metabolism was estimated (11, 15).

Formula 1
Basal Metabolism= 829+ weigh (kg) × 8.7: Harris-Benedict formula for women of 30 to 59 years of age.

For example, consumed calories of a 35 year old woman who is 85 kilograms- with seven hours of sleep a day, eight hours of office work, one hour walking (light), an hour of study, an hour of driving, three hours of watching TV, two hours of cooking, and an hour of household chores- will be equal to 2585 kcal. To estimate the daily calorie intake of the participants, the table of calories in 100 grams of food was resorted to. For example, total calories in one sample of Iranian food are about 907 calories (1). After obtaining average received and consumed calories in these three days (two working days and one day of rest), energy balance for the first phase was considered as a week each for the participants. Due to the fact that the participants were overweight or obese and their calorie intake was greater than the calories consumed, the difference between calorie intake and use was the calories that had to be reduced from participants' daily food in balance week not to be overweight. In the second and third phase for a period of five weeks, 30% of daily calorie intake of the balance week was considered for each participant on the days of fasting and on non-fasting days, they received free and favorite food.

Regular walking

The walking program was conducted in "Rasht Women Park" three days per week (Saturday, Monday, and Wednesday) for six weeks. Before and after main training, warm up and cool down exercises were performed respectively for 5 to 10 minutes. Walking intensity was 50% to 65% target heart rate from first to last sessions. Table 1 shows the summary of exercise training (7, 13).

In the first session, walking rhythm and heart rate was explained to each participant, so that they knew how their heart should beat at any rate using radial pulse measurement device and then gradually increase the intensity and duration of their walking. Target heart rate for each individual was exclusively calculated by Karvonen formula at the intended intensities (16). During the walking program at every turn, one of the participants was taken out of the group in order to control target heart rate. Moreover, the breathing status of participants was monitored, so that they be excluded from the walking exercise, if necessary.

For instance, target heart rate of a 45-year-old participant whose resting heart rate was 75 beats per minute was calculated as follows.

Formula 2
Maximum heart rate = 220- age = 220-45=175
Target heart rate = maximum heart rate – rest heart rate= 175-75=100
50% target heart rate: (50% × 100) +75=125
65% target heart rate: (65% × 100) +75= 140

Table 1. Walking exercise program

Week	Frequency of turns	Duration(min)	Target heart rate percent	Approximate length of session (min)
First	4	2-3	50- 55%	20
Second	4	2-4	50-55%	24
Third	4	4-5	55-60%	36
Fourth	5	4-5	55-60%	45
Fifth	5	5-6	60-65%	55
Sixth	5	5-7	60-65%	60

Participants' height were measured with tape meter, and their weight were measured with Clatronic scales model 2622, with 0.01 accuracy rate, made in Germany. BMI was measured by dividing weight (kg) to the square of height (m^2). Waist circumference (approximately 2 to 2.5 cm above the umbilical region) and hip circumference (the largest cross-sectional area of the pelvis). WHR was calculated by dividing waist to hip circumference (1). Percentage of body fat was measured by three points skinfold method (triceps, suprailiac and hip) with Seahan fat caliper (SH5020 Korea) sum of skin folds of the three points was placed in body density formula by Jackson-Pollock (J-P) (14).

Formula 3
(age×0.0001392) – [(sum of skin folds)^2× 0.0000023] + (sum of skin folds × 0.0009929) – 1.0994921 = body mass density (For females).

Body density was placed in Siri equation to get percent of body fat. Resting systolic and diastolic blood pressure were measured by ALP K2, models K2-1702, digital blood pressure gauge made in Japan. Resting heart rate was measured early in the morning and in fasting state when the bladder was drained and after five minutes of sitting.

Blood sugar was measured using "On Call Plus" glucometer made in America after 12 hours of fasting two days before the start and two days after the end of the study.

Statistical methods

Descriptive statistics were used in the report of central tendency, mean, and standard deviation. Kolmogorov - Smirnov test was used to ensure the data's normality. The significant differences of the means of the variables in pre-test and post-test were measured by paired t test, if the distribution were normal. If the distribution was not normal, Wilcoxon test was used. One-way ANOVA was used to calculate the significance of differences between the three groups. If significant differences were observed between the three groups, *Tukey's post hoc* test was used to determine the exact differences.

The significance level was determined $P<0.05$, SPSS software was used for statistical analysis, and Excel software was used for diagramming.

Results

As illustrated in Table 2, in each of the two experimental groups, BMI had a significant reduction in the pre-test and post-test (P= 0.001).

Moreover, the percentage of body fat, as can be seen in Figure 1, showed a significant reduction (P = 0.006) in the experimental group I after six weeks of walking and diet, and fasting blood sugar levels had a significant reduction (P=0.001) after six weeks of diet in the experimental group II. Other results are shown in Tables 2 and 3.

Based on one-way ANOVA, body mass index (Table 4) and body fat percent (Figure 1) were

Table 2. Results of paired t test in the three groups

variable	Group	Mean ± SD		(P)
		pre-test	Post-test	
BMI(kg/m^2)	Ex I	28.69±2.81	28.26±2.73	0.001*
	Ex II	30.56±3.66	29.99±3.45	0.001*
	Control	30.72±4.40	30.74±4.30	0.499
WHR	Ex II	0.80±0.05	0.81±0.05	0.260
	Control	0.81±0.04	0.80±0.04	0.743
BF%	Ex I	40.50±02.68	38.60±2.01	0.006*
	Ex II	40.30±1.77	39.20±2.53	0.200
	Control	42.10±2.85	42.10±2.96	1.000
LBM(Kg)	Ex I	42.43±3.40	44.19±3.79	0.105
	Ex II	44.34±5.36	44.86±5.53	0.023*
	Control	44.86±5.46	44.80±5.80	0.593
FBS (mg/dl)	Ex I	95.40±5.50	90.70±5.62	0.221
	Ex II	93.50±40.90	90.80±5.39	0.001*

* Significant change within group (P <0.05). Ex (experimental group), BMI (body mass index), WHR (waist to hip ratio), BF% (body fat percent), LBM (lean body mass). FBS (fasting blood sugar)

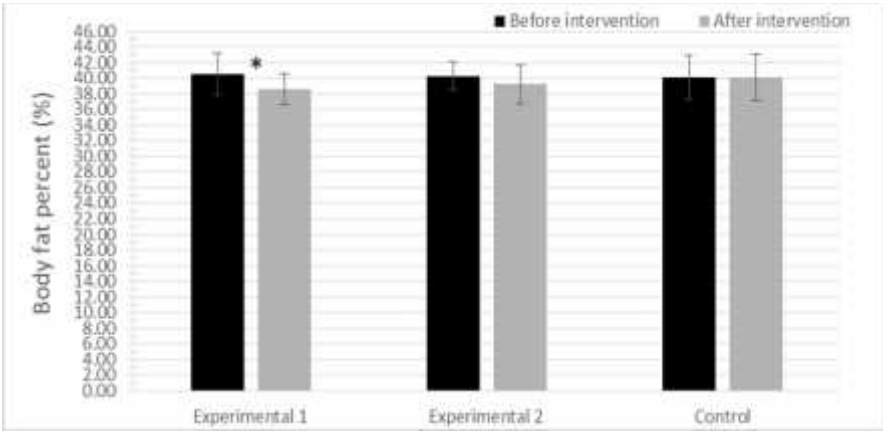

Figure 1. Body fat percent in three groups at pre-test and post-test
* Significant difference between the groups (P<0.05)

Table 3. Results of Wilcoxon test in the experimental group I and control

Variable0	Group	Mean ± SD		(P)
		pre-test	Post-test	
WHR	Ex I	0.80±0.05	0.81±0.05	0.260
FBS (mg/dl)	Control	95.80±6.63	93.10±7.11	0.286

Ex (experimental group), WHR (waist to hip ratio), FBS (fasting blood sugar)

Table 4. Results of one-way ANOVA for comparison between groups

variable	Group	Mean differences ± SD	(P)
BMI(kg/m²)	Ex I	-0.44±0.29	0.000*
	Ex II	-0.62±0.39	
	Control	-0.01±0.16	
WHR	Ex I	-0.01±0.03	0.204
	Ex II	0.00±0.02	
	Control	0.00±0.02	
LBM(Kg)	Ex I	0.77±1.35	0.053
	Ex II	0.62±0.55	
	Control	-0.09±0.34	
BF%(%)	Ex I	-1.90±1.66	0.0007*
	Ex II	-1.22±2.63	
	Control	0.00±0.63	
SBP(mm Hg)	Ex I	-4.9±9.94	0.866
	Ex II	-3.66±12.74	
	Control	-2.45±8.59	
DBP(mm Hg)	Ex I	0.10±9.47	0.694
	Ex II	-2.78±4.05	
	Control	-1.72±7.40	
MBP(mm Hg)	Ex I	-1.90±8.09	0.887
	Ex II	-3.33±5.48	
	Control	-1.91±7.83	
HR(Beats per minute)	Ex I	-2.20±12.05	0.231
	Ex II	5.56±8.69	
	Control	0.18±8.23	
FBS(mg/dl)	Ex I	-4.70±5.96	0.654
	Ex II	-2.78±2.86	
	Control	-2.64±6.73	

* Significant differences between groups (P<0.05). Ex (experimental group), BMI (body mass index), WHR (waist to hip ratio), BF% (body fat percent), LBM (lean body mass). SBP (systolic blood pressure), DBP (diastolic blood pressure). MBP (mean blood pressure), FBS (fasting blood sugar)

compared in the three groups and significant differences were observed (respectively P=0.000, and P=0.007). According to the test results of *Tuckey post hoc* test, a significant

decrease was seen in body mass index between the experimental group I and the control group and the experimental group II and the control group (respectively, P=0.004 and P=0.000). Moreover, according to the test results of Tukey *post hoc* test, a significant decrease was seen in fat percent between experimental group one and the control group (respectively, P=0.029 and P=0.011). However, no significant differences were observed in these two indices between the experimental group I and the experimental group II. Furthermore, in one-way ANOVA test, no significant difference was seen in other variables (Table 4).

Discussion

Based on the results of the study, six weeks of intervention cause a reduction in BMI in the experimental group I 1.49% and in the experimental group II 1.86%. Moreover, in comparison between groups, this index had dropped significantly in both experimental groups compared to the control group. However, based on Wilcoxon test, this intervention had no effect on WHR index.

These results corresponds to the results by Varady et al. (13), Pasdar et al. (9); however, they were inconsistent with the results of Zarneshan (17), and Moradi et al. (18). In the present study, participants underwent six weeks of ADF diet and regular walking program at 50% to 65% targeted heart rate. Aerobic exercise training, like brisk walking, may cause muscular adaptations. One of these adaptations is myoglobin increase that leads to better activity of oxidative enzymes and mitochondrial function (19). Fat oxidation enzymes increase free fatty acid availability and force the body to use fat storage to provide muscle glycogen (20).

In some studies whose results were in contrast with the present findings, participants only used combined or resistance exercises for eight to 10 weeks without diet which can account for the existing inconsistency (17, 18).

In the present study, ADF and regular walking caused significant reduction in BMI. But there were no significant differences between 3 groups in WHR while other studies had different results. For example, the study by Pasdar et al. (2012) can be noted in which physical activity along with diet reduced WHR significantly. Pasdar et al. study duration was six months (9). Perhaps, the significant reduction of WHR needed a longer time period than what was ascribed in the present study.

Within group results in BF% showed 1.9% reduction in the experimental group I. In addition, in between group results, there were reduction in Bf% between experimental (I and II) and the control groups. These results are in line with Eshginia and Mohammadzadeh (11), Vedadi et al. (2), Suri et al. (5) findings, but in contrast to Gayda et al. (21). In this study, in the experimental group I, physical activity along with diet reduced body fat percentage. However, in the study by Gayda et al. (21), which is inconsistent with the present study, only physical activity was applied and had less effect on decreasing body fat percentage. Fat storage in adipose tissue plays a major role in the metabolism of glucose, fatty acids, and cholesterol. Positive energy balance increases fat stores, and negative energy balance reduces it (1, 22). In this study, weight loss and reduction in body fat percentage have been created by using body fat reserves, due to cell metabolism through ADF diet and with regular walking in order to increase the basal metabolic and through negative energy balance.

On the other hand, the results revealed that six weeks of diet increases 1.17% of lean body mass in the experimental group II. These results corresponds to the results of Pasdar et al. (9) and inconsistent with the results of Gayda et al. (21). In the results of Gayda et al. (2009) despite eight weeks of combined and aerobic training, there were no reports of any increases in lean body mass (21). However, in the research by Pasdar et al. (2011), where nutritional interventions with physical activity were applied to the participants, a significant increase in lean body weight was observed (9). It is clear that an increase in muscle mass without exercise and a high protein diet is impossible (1, 15). However, due to an increase in lean body mass and a decrease in BMI, the participants in the experimental group II apparently had more activity compared to start of the research, and reduction of calorie intake on fasting days is likely to lead to consuming more calories, preferably proteins, on non-fasting days (23). One of the limitations in present study was that the participants were not fully monitored.

Based on the results obtained from this study, six weeks of diet and walking had no significant effect on mean, systolic, and diastolic blood pressure and resting heart rate. There were not any changes in blood pressure because the amounts were in normal range (2, 6). It seems that the regular walking did not import enough intensity to decrease resting heart rate (3). Precise control of diet and physical activity were from the most important study limitations.

There was 2.89% decrease of fasting blood glucose in the experimental group II. This finding is consistent with the research by Esfarjani et al. (24), Arazi et al. (25), Eshginia and Mohammadzadeh (11) and inconsistent with the research by Alizadeh et al. (26), and Naqii et al. (27). Some researchers believe that obesity is the most important factor in the development of insulin resistance. Consequently, weight loss can lead to an increase in insulin sensitivity which is important for prevention and treatment of diabetes (24). In this regard, in a study, Eshginia and Mohammadzadeh (2013) reported similar results in reducing blood glucose due to ADF diet without physical activity (11). On the other hand, in their study, which is corresponds to the current study, Arazi et al. (2012) reported that due to combined and aerobic exercises, a significant change in maximum oxygen consumption and blood glucose was observed. As in the experimental group, after six weeks of ADF diet, significant increase was observed in muscle mass, it is likely that increase in muscle mass has led to an increase in the muscle usage of glucose amount and a decrease in the blood sugar level.

In conclusion the main finding of this study is that ADF and regular walking may be effective methods for favorable changes in body composition and blood sugar in overweight and obese women.

Conclusion

According to the findings of this study, it is suggested that more attention be paid to the regular walking in daily program of the middle-aged women to improve their body composition. Moreover, to control and reduce blood sugar, using ADF diet for at least six weeks is recommended.

Acknowledgments

Hereby, the authors wish to thank Islamic Azad University of Rasht and all participants who helped us in conducting the study. The proposal approval code for this study at research board of Rasht Branch, Islamic Azad University, was 11721404932015 (3/ 29/ 2015).

References

1. Rahmani-Nia F, Hojjati Z. Prevention and treatment of obesity. Tehran: Hatmi; 2013 (Persian).
2. Varady KA, Bhutani S, Church EC, Klempel MC. Short-term modified alternate-day Fasting: a novel dietary strategy for weight loss and cardioprotection in obese adults. Am Soc Nutr. 2009; 90(5):1138-43.
3. Ehrman JK, Gordon PM, Visich PS, Keteyian SJ. Clinical exercise physiology. Australia: Human Kinetics; 2013.
4. Attarzadeh Hoseini S, Rahimiyan Mashhad Z. Comparison the effect of aerobic training and diet on Body Composition and Metabolic Syndrome Indexes in overweight and obese women. Appl Res Sport Manag. 2012; 3(1):27-36 (Persian).
5. Souri R, Ravasi AA, Gaeini A, Aminian Razavi T, Kordi M. The Effect of training intensity on cardiovascular risk factors in non-athlete students. Res Sport Sci. 2007; 5:133–45 (Persian).
6. Bambaeichi E. Effect of regular walking on cardiovascular risk factors and risk of prevalence cardiovascular disease in postmenopausal females with history of menstrual cycle Irregularity during reproductive years. Sport Physiol. 2013; 5(17):131–49 (Persian).
7. de Azevedo FR, Ikeoka D, Caramelli B. Effects of intermittent fasting on metabolism in men. Rev Assoc Méd Bras. 2013; 59(2):167-73.
8. Sawashita J, Onitsuka S, Gen-no H, Ishikawa S, Iino F, Tateishi N, et al. Effects of mild calorie restriction and high-intensity interval walking n middle-aged and older overweight Japanese. Exp Gerontol. 2009; 44(10):666-75.
9. Pasdar Y, Moridi S, Najafi F, Niazi P, Heidary M. The effect of nutritional intervention and physical activities on weight reduction. J Kermanshah Univ Med Sci. 2012; 15(6):427-35 (Persian).
10. Ross KM, Milsom VA, Rickel KA, DeBraganza N, Gibbons LM, Murawski ME, et al. The contribution of weight loss and increased physical fitness to improvements in health-related quality of life. Eat Behav 2009; 10(2):48-88.
11. Eshghinia S, Mohammadzadeh F. The effects of modified alternate-day fasting diet on weight loss and CAD risk factors in overweight and obese women. J Diabetes Metab Disord. 2013; 12(1):4.
12. Klempel MC, Kroger CM, Norkeviciute E, Goslawski M, Philips SA, Varady KA. Benefit of a low-fat over high-fat diet on vascular health during alternate day fasting. Nutr Diabetes. 2013; 3:e71.
13. Varady KA, Bhutani S, Klempel MC, Kroger CM. Comparison of effects of diet versus exercise weight loss regimens on LDL and HDL particle size in

obese adults. Lipids Health Dis. 2011; 10:119.
14. Beam W, Adams GM. Exercise physiology laboratory manual. 2nd ed. New York: McGraw-Hill Higher Education; 2013.
15. Hojati Z. Nutrition. 1st ed. Rasht: Dehsara; 2012 (Persian).
16. Francis D, Hali E. Book facts about the readiness of sports and fitness. Rasht: University of Guilan; 2000 (Persian).
17. Zarneshan A. Synergic effect of aerobic exercise training (moderate intensity) and soya intake on blood pressure & rest heart rate in obese postmenopausal women. Bio J Hoemozgan Univ Med Sci. 2014; 18(1):55–63 (Persian).
18. Moradi H, Kolahdozi S, Ahmadi Kani Golzar F, Arabzade Ghahyazi Hasjodi F, Rezvan K. The Effects of eight weeks resistance training and green tea supplementation on cardiovascular risk factors in overweight men. J Shahrekord Univ Med Sci. 2014; 16(4):77–87 (Persian).
19. McArdle WD, Katch FI, Katch VL. Exercise physiology: energy, nutrition, and human performance. Philadelphia: Lippincott Williams & Wilkins; 2010.
20. Maughan RJ, Gleeson M, Greenhaff PL. Biochemistry of exercise & training. Trans: Gaeini A, Hamedinia M, Kaoshkijahromy M, Fathi M. Tehran: Daneshgahi Publication; 2006 (Persian).
21. Gayda M, Choquet D, Ahmadi S. Effects of exercise training modality on skeletal muscle fatigue in men with coronary heart disease. J Electrom Kinesol. 2009; 19(2):32-9.
22. Ramzani Nejad R. Motor Development. Rasht: University of Guilan; 1999 (Persian).
23. Karimi M, Eshrati B. The effects of health promotion model-based training on promoting students' physical activity. J Kermanshah Univ Med Sci. 2012; 16(3):192-200.
24. Esfarjani F, Rashidi F, Marandi SM. The effect of aerobic exercise on blood glucose, Lipid Profile and Apo. J Ardabil Univ Med Sci. 2013; 13(2):132–41.
25. Arazi H, Jorbonian A, Asghari E. Comparison of concurrent (resistance-aerobic) and aerobic training on VO_2max lipid profile, blood glucose and blood pressure in middle-aged men at risk for cardiovascular disease. Shahid Sadughi Univ Med Sci Health Serv. 2012; 20(5):627–38 (Persian).
26. Alizadeh Z, Kordi R, Hossein-Zadeh Attar MJ, Mansournia MA. The effects of continuous and intermittent aerobic exercise on lipid profile and fasting blood sugar in women with a body mass index more than 25 kg/m^2: a randomized controlled trial. Tehran Univ Med J. 2011; 69(4):253–9 (Persian).
27. Naghi MR, Almadadi M. Effect of regular physical activity as a basic component of lifestyle modification on reducing major cardiovascular risk factors. J Know Health. 2001; 6(1):27-35.