**THE RESPONSE OF LEPTIN AND LIPID PARAMETERS RELATED TO AN AEROBIC EXERCISE AMONG YOUNG ATHLETE AND NON-ATHLETE WOMEN**

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**ABSTRACT**

Endurance training causes increasing muscle power, increasing power, decreasing fat in body, increasing enzymes involved in aerobic metabolism, increasing energy costs, increasing efficiency in use of fat as metabolism. In the present research, the statistical population consists of the students in Islamic Azad University of Zanjan. 20 athlete (Mean age(20 years old), height(160cm), weight(56 kg), BMI(21), body fat (20)) and non-athlete (Mean age(21 years old), height(158cm), weight(58 kg), BMI(23), body fat(24)) students were selected. Blood samples were taken from every participant before and after training and Lipid and lipoprotein levels of proteins including Triglycercide (TG), total cholesterol (TC), HDL -C, LDL -C and leptin were determined. Then two groups performed endurance activity for one session included of rhythmic aerobic exercise for 60 minutes at intensity of 50-60 percent of heart rate. Findings of research indicated that there is a significant difference on in response to changes in means of leptin, low-density lipoprotein and high density lipoprotein between two athlete and non-athlete groups followed by a session of exercise activity(p>0.05). Further, results indicated that there is not a significant difference on response to the changes in means of total cholesterol and triglycerides between athlete and non-athlete groups followed by a session of exercise activity (p>0.05). In general, increase in variables of LDL, TC, TG and HDL followed by a session of exercise activity in both groups has been found due to needing to energy consumption and energy cost for 60 minute exercise activity.

**Keywords:** Lipid, Leptin, Aerobic Exercise

**INTRODUCTION**

Obesity is a chronic disease that is considered as the most common disorder of lipid metabolism in human (Vafaei, 2004). At the end of the second millennium, in parallel with expansion of malnutrition and poor movement at modern and industrial life, prevalence of obesity has increased, such that obesity has been accounted as one of major health care problems in most of developed and developing countries including Iran (Azizi, 2004). Evidences indicate that expansion of obesity in developing countries has occurred due to increase in receiving calories and decrease in body movement (Vafaei, 2004). Health importance of obesity lies on being followed with diseases which result in high mortality and disability. Reduction of Fat mass index is the basis for control and treatment of obesity which is possible through changing and modifying food habits and lifestyle, increasing body activities and sports exercises and/or both (Barata, 2002). Numerous researchers in different countries have examined effect of body activities and sports exercises on avoidance, control and treatment of adverse body changes and acquired different outcomes. Results of these studies indicate that body activities and continuous and regular sports exercises have useful effects on control and treatment of obesity and overweight (Neyman, 2003). Since prevalence of obesity, disability and economic outcome due to it keeps increasing in Iran (Azizi, 2004), attention to physical activities and active lifestyle is required, for which it is required to design and perform extensive studies at the area of effect of body activities, exercise activities and active lifestyle on obesity and its
related factors. Increasing body fat mass which develops due to environmental factors and favorable genetic background is called obesity. Obesity has been regarded as a hazard for health and harm for personal and social welfare which reduces hoping to life (Asgari, 2010), pathogenesis of obesity is so complicated in which a series of factors intervene, that these factors include genetic predisposition, age, gender, eating habits, environmental factors, physical activity and sport, social and psychological factors, endocrine disorders, leptin and so on (Bouchard, 2000). Leptin is a protein hormone that is secreted by adipocytes. In obese individuals, leptin level increases in adipocytes and blood serum. Few human and animal experiences have indicated that treatment with leptin causes decrease in food consumption, decrease in appetite and decrease in body fat. Effect of leptin on brain causes regulating appetite, controlling weight and some of the metabolic processes affiliated to it. Disorder in leptin function causes increase of weight and fat mass followed by obesity (Bouassida, 2004). On the other hand, decrease in energy consumption which results in decrease of body activities and sports exercises plays a major role in obesity (Bouassida, 2004). It seems that two factors of serum leptin levels due to effect on appetite and the ability for decrease in receiving energy and body activity due to the ability for increasing consuming energy have a deterministic role in controlling weight and body fat mass. Little change in concentration of leptin in the bloodstream immediately after exercise for a short while cannot be due to effects of delayed exercise. For instance, decrease in serum leptin levels for 24 to 48 hours after a session of exercise had been affiliated to the changes in fat mass or change in energy absorption. Hence, increase in energy cost due to exercise has been a major reason for substantial decrease in leptin concentration during the period of returning to the early state. These changes probably mediate renewal of energy homeostasis during the period of returning to the early state after a period of increase in energy consumption (Bouchard, 2000). On the other hand the symptoms from effects of a session of acute exercise on serum leptin concentration of obese individuals are available however the status of leptin metabolism in obese individuals has not been properly studied. Information on effects of performing chronic exercise on leptin levels of bloodstream is ambiguous. It has been stated that chronic exercise without decrease in body mass cannot change leptin levels. Hence, it cannot observe any independent effect of chronic exercise on leptin levels of bloodstream among obese participants. It has been accepted that performing chronic exercise reduces fat mass in obese individuals, thus when changes are seen in leptin of bloodstream, it is supposed that such changes indicate secondary effect of exercise on energy balance rather than stimulation of exercise (Bouassida, 2006; Bouchard, 2000). Immediate and delayed effects of acute and chronic exercise on serum leptin levels have remained unknown, that future studies should control acquisition and cost of energy, under which it will be specified that whether the obtained results are independent from changes in energy balance or not. Further, technologically advanced methods should have been used in evaluation of body composition so as to acquire a more accurate evaluation of the relationship between leptin and body fat mass (Bouassida, 2006). On the other hand, chronic exercise studies should have been designed to evaluate effect and relationship affiliated to the dose between rate of exercise and leptin levels as well as the status of this relationship in a special gender. In this regards, this brings us to this question "how aerobic exercise has an independent effect on serum leptin levels and what is the result of these changes?". Ultimately, immediate and delayed effects of aerobic exercise on serum leptin levels which are independent from effect on chronic exercise on reduction of fat mass and as a result serum leptin levels should have been examined properly, because their results have special clinical significance. The present research intends to determine and describe extent and status of response of leptin, blood serum lipoproteins and body composition as lipid factors associated to a session of aerobic exercise activity among young athlete and non-athlete women, and perceive how is the range of probable effect of one session aerobic exercise activity on leptin, blood serum lipoproteins and body composition among young athlete and non-athlete women? Whether increase in rate of physical activity and suitable sports performance workouts can represent a new insight to prevention, control and treatment of obesity and its associated hormones such as leptin?

Significance of such studies renewal when we perceive how range and status of effect of sports performance workouts and physical activity as an active and vital life index and healthy lifestyle on
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Factors contributing in obesity such as leptin hormone can be effective in designing and organizing the early and secondary prevention programs. More specifically, this effect among middle-aged women due to their age and gender which has been drawn into attention in healthcare programs will be examined. Therefore, determination and explanation of effect of sports performance workouts and physical activity on leptin hormone and other related factors among non-athlete women and comparison of leptin concentration and blood serum lipoproteins among control and exercise groups that their distinctive point is physical activity and aerobic sports performance workouts have been regarded as the significance of this research. On the other hand, since Iran has been regarded as a community which keeps growing, conducting such studies with the approach of knowledge creation and main purpose of increase of further recognition and awareness from these factors and the status of effect of exercise and physical activity on them among young Iranian women is an inevitable significance, mentioned with high importance. Under reaching to these aims, it can design and perform prevention and treatment implications based on the information from Iranian community with biological characteristics and life properties. This research aims to determine and describe and compare response of serum leptin and lipid factors associated to one session of aerobic sports activity among young athlete and non-athlete women.

Research Hypotheses

1- Response of serum leptin to one session of aerobic sports activity among young athlete and non-athlete women does not differ.
2- Response of serum concentration of total cholesterol to one session of aerobic sports activity among young athlete and non-athlete women does not differ.
3- Response of serum concentration of total triglyceride to one session of aerobic sports activity among young athlete and non-athlete women does not differ.
4- Response of Serum low-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women does not differ.
5- Response of Serum high-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women does not differ.
6- Response of body mass index to one session of aerobic sports activity among young athlete and non-athlete women does not differ.
7- Response of body fat percentage to one session of aerobic sports activity among young athlete and non-athlete women does not differ.
8- Response of fat mass percentage to one session of aerobic sports activity among young athlete and non-athlete women does not differ.

Literature Review

Ruhollah et al., (2014) in a research in University of Tehran examined effect of eight weeks endurance training and high-fat diet (HFD) on appetite-regulating hormones in rat plasma. Twenty eight male Wistar rats were randomly divided into four groups: Control group with standard diet (CSD), endurance training with a standard diet (ESD), and control group with high-fat diet (CHFD) and endurance training with high-fat diet (EHFD). Twenty-four hour after the last training session, the blood samples were obtained and analyzed for hormones levels. The significant increased weight gain and food intake and decreased plasma nesfatin-1 and PYY3-36 levels were observed in CHFD group, while exercise under the HFD antagonized these effects. There were no significant changes in ghrelin, insulin and leptin levels in different groups. These results suggest that exercise can prevent fattening effect of HFD (Haghshenas, 2014).

Akbarpour et al., (2013) conducted a research entitled "The Effect of Resistance Training on Serum Levels of Adipokine and Inflammatory Markers of Cardiovascular Disease in Obese Men". The results of this study showed that regular resistance trainings reduce the potential risk of cardiovascular diseases via improvement of the plasma levels of adiponectin, leptin, CRP, and IL-6, and it can be used as an effective nonpharmacological treatment to prevent these diseases (Akbarpour, 2013).

Ali et al., (2014) in a research examined role of combined power-endurance and endurance- power exercises on body composition and serum lipid profile in obese/overweight women. In this research, the
participants consisted of 30 obese/overweight women who have been divided into three groups. The results indicated that fat profile had improved in both exercise groups, yet no change was observed in control group. Yet, no difference was observed between two exercise groups (Ali, 2014). Gonseth et al., (2014) examined Leptin and smoking cessation. In this research, they measured serum leptin levels among 271 sedentary smokers willing to quit who participated in a randomized controlled trial assessing a 9-week moderate-intensity physical activity intervention as an aid for smoking cessation. Results indicated that Serum leptin levels significantly increased after smoking cessation, in spite of substantial weight gain. The leptin dynamic might be different in chronic tobacco users who quit smoking, and physical activity might impact the dynamic of leptin in such a situation. Kim et al., (2014) conducted a research entitled "effect of walking exercise on changes in cardiorespiratory fitness, metabolic syndrome markers, and high-molecular-weight adiponectin in obese middle-aged women". The exercise program involved walking at 50–60% of the maximum oxygen consumption, 3 times a week, for 24 weeks. The results showed that after 24 weeks in the exercise program, the obesity indices and metabolic risk factors, namely, weight, body fat, body mass index, waist circumference, systolic blood pressure, diastolic blood pressure, and triglycerides decreased significantly, whereas HDLC, a metabolic improvement factor, increased significantly. Additionally, VO_{2max} increased significantly, together with the level of total and HMW adiponectins.

MATERIALS AND METHODS

Research Method
The present research is a quasi-experimental research which is conducted via comparison of mean of variables in the groups under study as well as the pre-test and post-test.

Sample Group and Sampling Method
In the present research, the sample group which consists of two groups consisting of 10 individuals among athlete and non-athlete women was selected via purposive sampling method and divided into two athlete and non-athlete groups. The athlete group consisted of the students at the field of Physical Education and Sport Sciences with the activity in the aerobic exercise for over two years. A questionnaire was given to all the students who had received one in the half semester of physical education unit so as to select control group. This questionnaire consisted of aim of research and how to perform research, consent form, health questionnaire, risk of disease, and rate of physical activity. The questionnaires which had been filled based on American College of Sports Medicine (ACSM) and Physical Activity Readiness Questionnaire were selected.

Independent Variable
Independent variable includes a session of rhythmic aerobic exercises for 60 minutes at intensity of 50-60 percent of heart rate.

Dependant Variables
Dependant variables include fasting concentration of leptin, total cholesterol (TC), Triglyceride (TG), low-density lipoprotein and high density lipoprotein, body composition as the lipid factors among young athlete and non-athlete women.

Procedure
After returning the questionnaires filled by the participants and announcing consent for attendance in this research, the responses to the questionnaires were examined and some invitations based on a scheduled program were sent to the participants to fill and correct questionnaires and perform the considered practical tests of research, in which necessary recommendations and exact time and place of performing test had been mentioned. All the measurements and blood samplings were made in the early morning (7-8 am) at the clinical laboratory. For this purpose, two specialized experts at nursing and clinical laboratory acted under supervision of the researcher for facilitation and accuracy in blood sampling and recording the results, mentioned that blood sample was taken before performing the protocol and also after ending the exercise activity. After recording results of all the variables in the forms for each group, the process of calculations and statistical analysis was made.
Statistical Methods
Data analysis is made via descriptive and inferential statistical methods. In addition to use descriptive statistics to determine measures of central tendency and dispersion, Kolmogorov–Smirnov and Levene tests were used to test normality of distribution of variances. Dependant two-way t-test will be used to compare variables in pre-test and post-test in each group and independent two-way t-test will be used among groups. All the calculations will be made via software SPSS-20 at significance level (P≤0.05).

Statistical Analysis
Hypotheses Testing
The first hypothesis: Response of serum leptin to one session of aerobic sports activity among young athlete and non-athlete women does not differ.

With regard to the data in table and figure, the first hypothesis concerning lack of difference on response of serum leptin to one session of aerobic sports activity among young athlete and non-athlete women has been rejected, whereby the results indicate that the difference between means of response of serum leptin to one session of aerobic sports activity among young athlete and non-athlete women is significant (t(38)=-5.56, p≤0.001**). Hence, change of mean of leptin in athlete group (-5.70) in comparison with change mean of leptin in non-athlete group (2.90) has been significantly different, indicating that response of serum leptin to one session of aerobic sports activity differs among young athlete and non-athlete women.

Table 1: Results of independent t-test concerning comparison of response of serum leptin to one session of aerobic sports activity among young athlete and non-athlete women

<table>
<thead>
<tr>
<th>Variable</th>
<th>group</th>
<th>difference of means</th>
<th>standard deviation</th>
<th>freedom degree</th>
<th>t-value</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>leptin</td>
<td>athlete</td>
<td>-5.70</td>
<td>4.53</td>
<td>1</td>
<td>5.563</td>
<td>p≤0.001**</td>
</tr>
<tr>
<td></td>
<td>non-athlete</td>
<td>2.90</td>
<td>5.22</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1: Response of serum leptin to one session of aerobic sports activity among young athlete and non-athlete women

To sum up, change of mean of leptin in athlete group (-5.70) differs from change mean of leptin in non-athlete group (2.90).

The second hypothesis: Response of serum concentration of total cholesterol to one session of aerobic sports activity among young athlete and non-athlete women does not differ.

With regard to the data in table and figure, the second hypothesis concerning lack of difference on response of serum concentration of total cholesterol to one session of aerobic sports activity among young athlete and non-athlete women has not been rejected, whereby the results indicate that the difference
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between means of response of serum concentration of total cholesterol to one session of aerobic sports activity among young athlete and non-athlete women is not significant (t(38)=0.10, p=0.91). Hence, change of mean of serum concentration of total cholesterol in athlete group(14.15) in comparison with change mean of serum concentration of total cholesterol in non-athlete group(10.10) has not been significantly different, indicating that response of serum concentration of total cholesterol to one session of aerobic sports activity does not differ among young athlete and non-athlete women.

Table 2: Results of independent t-test concerning comparison of response of serum concentration of total cholesterol to one session of aerobic sports activity among young athlete and non-athlete women

<table>
<thead>
<tr>
<th>Variable</th>
<th>group</th>
<th>difference of means</th>
<th>standard deviation</th>
<th>freedom degree</th>
<th>t-value</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>serum concentration of total cholesterol</td>
<td>athlete</td>
<td>14.15</td>
<td>10.10</td>
<td>1</td>
<td>.104</td>
<td>.918</td>
</tr>
<tr>
<td></td>
<td>non-athlete</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

Figure 2: Response of serum concentration of total cholesterol to one session of aerobic sports activity among young athlete and non-athlete women

To sum up, change of mean of serum concentration of total cholesterol in athlete group (14.15) differs from change mean of serum concentration of total cholesterol in non-athlete group (10.10). The third hypothesis: Response of serum concentration of total triglyceride to one session of aerobic sports activity among young athlete and non-athlete women does not differ. With regard to the data in table and figure, the third hypothesis concerning lack of difference on response of serum concentration of total triglyceride to one session of aerobic sports activity among young athlete and non-athlete women has not been rejected, whereby the results indicate that the difference between means of response of serum concentration of total triglyceride to one session of aerobic sports activity among young athlete and non-athlete women is not significant (t(25.051)=1.05, p=0.30). Hence, change of mean of serum concentration of total triglyceride in athlete group(5.35) in comparison with change mean of serum concentration of total triglyceride in non-athlete group(10.10) has not been significantly different, indicating that response of serum concentration of total triglyceride to one session of aerobic sports activity does not differ among young athlete and non-athlete women. Since result of Levene test in
equality of variances of two groups is significant, the results have been proposed based on inequality of variances.

Table 3: Results of independent t-test concerning comparison of response of serum concentration of total triglyceride to one session of aerobic sports activity among young athlete and non-athlete women

<table>
<thead>
<tr>
<th>Variable</th>
<th>group</th>
<th>difference of means</th>
<th>standard deviation</th>
<th>freedom degree</th>
<th>t-value</th>
<th>sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>serum concentration of total triglyceride</td>
<td>athlete</td>
<td>5.35</td>
<td>10.06</td>
<td>1</td>
<td>1.058</td>
<td>.300</td>
</tr>
<tr>
<td></td>
<td>non-athlete</td>
<td>10.10</td>
<td>24.88</td>
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</tbody>
</table>

Figure 3: Response of serum concentration of total triglyceride to one session of aerobic sports activity among young athlete and non-athlete women

To sum up, change of mean of serum concentration of total triglyceride in athlete group (5.35) differs from change mean of serum concentration of total triglyceride in non-athlete group (10.10).

The fourth hypothesis: Response of Serum low-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women does not differ.

With regard to the data in table and figure, the fourth hypothesis concerning lack of difference on response of Serum low-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women has been rejected, whereby the results indicate that the difference between means of response of Serum low-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women is significant ($t(23.647) = 2.647$, $p=0.020$).

Hence, change of mean of serum low-density lipoprotein cholesterol in athlete group(12.35) in comparison with change mean of Serum low-density lipoprotein cholesterol in non-athlete group(-13.35) has been significantly different, indicating that response of serum low-density lipoprotein cholesterol to one session of aerobic sports activity differs among young athlete and non-athlete women. Since result of Levene test in equality of variances of two groups is significant, the results have been proposed based on inequality of variances.
Table 4: Results of independent t-test concerning comparison of response of serum low-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Difference of means</th>
<th>Standard deviation</th>
<th>Freedom degree</th>
<th>t-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>serum low-density lipoprotein cholesterol</td>
<td>athlete</td>
<td>12.35</td>
<td>18.87</td>
<td>1</td>
<td>2.497</td>
<td>.020</td>
</tr>
<tr>
<td></td>
<td>non-athlete</td>
<td>-13.35</td>
<td>42.26</td>
<td></td>
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</tbody>
</table>

To sum up, change of mean of serum low-density lipoprotein cholesterol in athlete group (12.35) differs from change mean of serum low-density lipoprotein cholesterol in non-athlete group (-13.35).

The fifth hypothesis: Response of serum high-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women does not differ.

With regard to the data in table and figure, the fifth hypothesis concerning lack of difference on response of Serum high-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women has been rejected, whereby the results indicate that the difference between means of response of Serum high-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women is significant ($t(29.162)=2.647, p \leq 0.001^{**}$). Hence, change of mean of serum high-density lipoprotein cholesterol in athlete group (0.450) in comparison with change mean of serum high-density lipoprotein cholesterol in non-athlete group (7.35) has been significantly different, indicating that response of serum high-density lipoprotein cholesterol to one session of aerobic sports activity differs among young athlete and non-athlete women. Since result of Levene test in equality of variances of two groups is significant, the results have been proposed based on inequality of variances.

Table 5: Results of independent t-test concerning comparison of response of serum high-density lipoprotein cholesterol to one session of aerobic sports activity among young athlete and non-athlete women

<table>
<thead>
<tr>
<th>Variable</th>
<th>Group</th>
<th>Difference of means</th>
<th>Standard deviation</th>
<th>Freedom degree</th>
<th>t-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>serum high-density lipoprotein cholesterol</td>
<td>athlete</td>
<td>.450</td>
<td>3.34</td>
<td>1</td>
<td>4.370</td>
<td>**0/001p≤</td>
</tr>
<tr>
<td></td>
<td>non-athlete</td>
<td>7.35</td>
<td>6.21</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
To sum up, change of mean of serum high-density lipoprotein cholesterol in athlete group (0.450) differs from change mean of serum high-density lipoprotein cholesterol in non-athlete group (7.35).

Discussion and Conclusion

Leptin is one of a number of proteins secreted from white adipocytes, serving as an agent in a negative feedback cycle to hypothalamus. This message feedback causes a balance in the received energy during a certain period of time. Serum leptin concentration is determined by means of amount of body fat tissue, so that serum leptin concentration in obese individuals is more than that of in slim individuals for four times. This higher leptin concentration associates to obesity gene in the fat mass of obese individuals. In addition, gender affects serum leptin in the equal volume of fat mass, such that women compared to men have higher concentrations of serum leptin, which such differences remain after lipid assimilation in different adipose tissue depots. During recent years, several studies have examined effects of exercise on leptin metabolism, found with contradictory results. Most of studies did not observe significant effect on levels of leptin and serum lipoproteins after exercise with average intensity and period, yet other studies observed immediate or delayed reduction in the days after exercise. The present research has shown significant differences in the variables of Maximum Oxygen Uptake (Vo2 max), serum leptin, serum concentration of total cholesterol, serum concentration of total triglyceride, Serum low-density lipoprotein cholesterol, Serum high-density lipoprotein cholesterol among young athlete and non-athlete women after aerobic exercise during a long period. Yet, differences on variables of body mass index, body fat percentage and total cholesterol have not been significant among young athlete and non-athlete women. As the results of the present research indicated, there is a significant difference on rate of changes in leptin among young athlete and non-athlete women (p<0.001). Studying means indicated that mean of leptin was reduced among athlete group and this mean was increased among non-athlete group. Results of this research in athlete group are inconsistent with the results of Izadi (2012) and consistent with the results of Ellio (2001) and results of this research in non-athlete group followed by a session of endurance activity are inconsistent with the results of Ellio (2001) and consistent with the results of Izadi (2012). It seems that performing activity in the present research has enabled to cause energy imbalance. In some studies, the threshold level of energy cost to observe immediate and delayed effects of exercise has been defined independent from other factors equaled to 800kcal. This threshold might seem necessary for stimulation of an unknown hormonal or neural message which can reduce secretion of leptin. Since early levels of leptin are high among obese and non-athlete individuals due to resistance to leptin or disorder in its receptors, increased levels of leptn might associate to impairment of endothelial tissue, arterial
occlusion, proliferation of vascular smooth muscle, platelet aggregation and clot formation, induction of oxidative stress in endothelial cells (Ravasi, 2012). High levels of leptin especially at the early periods of life predict incidence of cardiovascular disease in adulthood, thus currently leptin has been considered as one of the hormonal risk factors for cardiovascular disease. Some researchers have stated that leptin blood concentration reduces followed by one session of exercise activities over 60 minutes concurrent with stimulating release of free fatty acids and/or followed by the activities which result in energy consumption over 800 kcal, whereby this reduction can be attributed to increase of lipolysis. Indeed, some studies support the delayed reduction in serum leptin followed by exercise activity. In another research, leptin levels had reduced after 24 hours recovery under lack of change in serum leptin immediately after stopping a session of exercise activity. Researchers have known this delayed reduction in leptin levels by means of exercise activity due to the required time for change in ob gene expression (Mouler, 1998). These findings can be explanatory; to know why no change was observed in plasma leptin levels after stopping exercise in some studies, study by Gordon et al indicated that the response of leptin depends on rate of exercise intensity in exercise activity (Gordon, 2006). The changes in leptin concentration after endurance exercise might be due to changes in plasma volume under having exercise. Yet, findings of the present research pertaining to rest of variables are as follows. Rate of TG was increased in both athlete and non-athlete groups. Results of the present research are consistent with the results of research by Goldberg (1989), Waltz and Mills (1999), Linda et al., (2000), Alyawm (2000) and inconsistent with the results of research by Takuma (2004). It seems that lack of a significant difference on TG among athlete and non-athlete groups lies on a significant difference on rates of HDL-C after one session of activity between groups (P<0.05). Despite this increase in non-athlete group, endurance activity does not enable to change this factor among athlete group. Results of the present research are consistent with the results of the research by Farib et al., (1997), Volek et al., (2000), Song et al., (2002), Ki et al., (2004), and inconsistent with the results of research by Nash et al., (2001), that the reason for inconsistency lies on workout and gender and age group of participants. This lack of change among athlete group might be due to lack of change in Vo2 max, type of appetite, low consuming energy cost, basic level of body fat and its changes in result of activity.

The reasons for increase of HDL-C among non-athlete group resulting in a significant difference compared to athlete group can be due to different factors cindlugin difference in body composition, consuming energy cost, different diet, basic level of HDL-C which affect HDL-C through intervention via exercise. Further, it has been specified that aerobic exercise increases Lecithin: cholesterol acyltransferase (LCAT; EC 2.3.1.43) that esterification increases intra muscular cholesterol to HDL-C, and this can be another reason for increase of HDL-C.

These changes and reduction in rate of LDL-C among non-athlete groups might be the changes mentioned in TC, that they can be due to the changes in body composition and body fat percentage (Niemann, 2003; Elev, 2001; Baratta, 2006). The significant change under endurance activity can be found in findings of research by Hurley and colleagues (1988), Galdberj et al., (1994), Fripp et al., (1997), Ulrich et al., (1997), Hakarn (1999), Nash (2001), yet the significant change under endurance activity is inconsistent with the findings of research by Hurley (1991), Manning and colleagues (1991), Boyden et al., (1993), Volek et al., (2000 ) Ray et al., (2002) and Elliott (2002). The reason for these contradictories can be due to use of different exercises with different intensity and period and difference in groups in sake of general health and basic levels of LDL-C and different energy costs. Significant decrease of LDL-C in non-athlete group is consistent with the findings of research by Richar et al., (1991), Mahtab (2003), Julia et al., (2004), Powell et al., (2004) and George (2004), that the reason for more change lies on the effect of endurance exercise on body fat percentage, body composition, VO2 max and high energy cost, yet research by Lion et al., (2000) and Brocha et al., (2001) are inconsistent with the results of this finding. In general, numerous factors including physiological and metabolic factors which can affect metabolism including lower muscular mass, more fat, different fat distribution, basic levels of serum lipids and other factors including gender, socioeconomic status, individuals’ health level, race, diet, weight, BMI, intensity of workout, volume of workout, period of workout, individuals’ physical status, number of individuals,
difference in cost of consuming energy, individuals' physical activity level out of exercise program can affect response of lipids to activity and exercise to a large extent. Another issue lies on this fact that all the lipid variables as mentioned previously associate to each other, so that it cannot examine them separated from each other. Hence, we must take more precaution in interpretation of results. In general, increase in variables of LDL, TC, TG and HDL followed by one session of exercise activity in both groups is due to needing to energy consumption and energy cost for 60 minutes exercise activity. Indeed, the increase of variables in blood of the athlete and non-athlete participants that take last long followed by long term exercises causes improvement in indicators of health and reduction of blood fats and body fat percentage and loss of weight, that their mechanism might be considered through increase of VO2 max. This can be due to increase of LPL, that this enzyme causes release of fatty acids degraded from TG in fatty tissue and increase of TG and lipoproteins enriched with triglyceride and facilitation of extraction of TG from bloodstream. Lack of change in body composition raises reduction in TG, and this has been considered as a point emphasized in this mechanism (Anisa, 2006).

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