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INVESTIGATING LDH LEVEL IN INACTIVE WOMEN WITH SUPPLEMENTATION OF OMEGA-3 FOLLOWING A RESISTANCE TRAINING SESSION

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Abstract:
Lactate is a glycolysis product that can be produced continuously by large cells at rest or even under sufficient oxygen conditions. The main objective of the present study is investigating LDH level in inactive women with supplementation of omega-3 following a resistance training session. In this study, 40 patients with inactive women in Karaj, with an average age of 28.16±2.45 years, height 161.58±3.45 cm and weight 59.97±4/30 kg, randomly targeted in four groups of 10 patients (dose groups 2000, 3000, 4000 and placebo) were enrolled. Initially, the subjects participated in a place of resistance training and then practice immediately and 24 hours after their blood samples to estimate the rate of 5cc, LDH serum was used (pre-test). After a period of thirty days omega-3 supplementation in the form of two doses of thousand mg/day, three doses of thousand mg/day, and four doses of thousand mg/day received in capsule form. During this period, the control group received omega-3 free capsules. One day after the supplementation period, the test subjects were taken. For data analysis used from SPSS version 18. The results showed that omega-3 supplementation at a dose of 2000 no significant effect on the level of LDH in women, disabled, immediately after resistance exercise had (P>0.05). But the effect of supplementation with doses of 3000 and 4000 had a significant effect on the level of LDH in non-active women immediately and 24 hours after a resistance training (P<0.05). The effects of doses higher than the dose in 2000 was 3000 and 4000. According to the results, we can say that omega-3 supplementation for a month with a daily intake of 3000 or 4000mg/day for disabled women to be effective. It is recommended that inactive women use an omega-3 supplement for one month, immediately and 24 hours after intense resistance, with a daily dose of 3000 or 4000 mg/day, to prevent inflammation.

Key Words: *Inactive Women, Lactate dehydrogenase, Omega-3.*

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INTRODUCTION:

Performing appropriate and regular physical activity provides several benefits to human health, the most common of which include reducing anxiety and weight loss, controlling weight, preventing cardiovascular disease, and controlling diabetes and high blood pressure [1.2]. Accordingly, national and international organizations are trying to develop strategies for physical activity appropriate to the age and sex of the individual [3, 4]. Non-contagious diseases occupy a significant share out of the burden of disease all over the world; approximately, 59% of all deaths and 43% of the world's burden of illness are due to noninvasive diseases and these rates are expected to increase up to 73% for the death and 60% for disease burden case [5]. Among chronic non-chronic diseases, cardiovascular disease is the most common cause of death and the most important cause of disability in most countries of the world [6]. 3% of deaths in European countries occur due to cardiovascular diseases; according to the American Heart Association, 32 million people suffer from a heart attack yearly [7, 8]. Cardiovascular risk factors consist of a combination of risk factors including overweight, diabetes, pre-diabetes, lipoprotection, and hypertension [9, 10]. According to the findings of numerous studies, high fat intake of saturated fatty acids, such as those found in Western diets, exacerbates the risk of cardiovascular disease and inflammation of the metabolic syndrome; consequently, reducing the amount of fatty acids in the diet may be an effective preventive and therapeutic treatment strategy for metabolic syndrome [11]. There are three types of omega-3 fatty acids that play essential role in the body; 20: 3 alpha-linolenic acid: ALA is the only essential fatty acid that the body cannot synthesize; Eicosapentaenoic acid: EPA; 20: 5 and Docosahexaenoic acid: DHA; 22: 6, both of which are long chain fatty acids and can be used as a starting point for the synthesis of linoleic acid [12, 13]. Getting high levels of omega 3 fatty acid in your diet is known as a health donor in humans. Omega-3 fatty acid reduces blood lipids and has anti-inflammatory, anti-arrhythmic, and regulation properties. Regular physical exercise has a moderate positive effect on body function, maintaining well-being and preventing illness. All those who engage in a very intense physical activity for the first time, experience pain, burning, or local sensitivity to stress in the muscle and surrounding areas; so, there have always been, and will be, subjects who have stopped physical exercise because of bodily pain and muscle cramp [14]. LDH is an enzyme that is found with different concentrations in the cytoplasm of all tissues of the body; it accelerates the conversion of pyrolytic acid to lactic acid and its rate increases, as a rule, 24 to 48 hours after the assay, because, as shown by the findings of several studies, the main cause of the secretion of this enzyme is changes occurred in tissues during intense muscle activities. During exercise, lactate is excreted from the muscles and is consumed by the heart and all types of oxidative muscle. The release of lactate throughout the cell membrane is facilitated by membrane-bearing proteins, known as MCTS transducers. The main objective of the present study is investigating LDH level in inactive women with supplementation of omega-3 following a resistance training session.

MATERIALS AND METHODS:

The present semi-experimental, applied study was conducted using pre-test and post-test steps. The subjects included non-active women in the city of Karaj, with a BMI of 20kg/m2<BMI<25kg/m2 and an age range of 25 to 35 years old, who were non-smokers, without endocrine disease, diabetes, cardiovascular and immune system and blood pressure disorders, no alcohol, no excessive consumption of fish oil and omega-3 fatty acids, a history of recent tissue damage, and no history of taking suppressive drugs. The study subjects were categorized in four groups of 10, with various dosages of 200, 3000, 4000 mg/day, and placebo. All information about patients, including general condition, health and well-being, medical records and medications, drug use, diet and daily physical activity, was evaluated. Considering the age and sex of subjects as factors affecting the factor studied, the age and sex of subjects were selected in a homogeneous manner. Required information was collected through a researcher-made questionnaire; measurement of body weight was performed at least 3 hours apart from a meal. In order to familiarize the subjects with the instruments and devices used, the subjects were invited to the sports hall to get familiar with the proper method of weight lifting and proper breathing technique one month before the beginning of the study. In order to determine optimal maximal repetition, the training of footprints, knee bending, knee flattening, chest pain, armpit movement and abdominal movement were performed using Technology, Italy Body Building Machine, equipped with a computer system with special software; Brzycki formulation was used for the calculation of required equations. An intensive physical activity session includes knee flexion, chest press, armpit movement, and abdominal movement performed by the subject with a 70% repetition of each movement. The rest interval between stations was 2 minutes. Additionally, 5 cc blood samples of all tested subjects were collected 30 minutes before exercise (at rest and after 12 hours fasting) and, then, immediately, and 24 hours after intense exercise program. In the next stage, supplement-receiving groups received three days of recovery and, then, took omega 3 intakes with two 1000 mg dosages for the first group, three 1000 mg dosages for the second group, and four 1000 mg dosages for the third group. One day after the completion of supplement intake period, the subjects were tested again at the current test site and under the same conditions of pre-test step. Collected data was analyzed through SPSS18 and chi-square tests [15-17], and $P<0.05$ was considered as significance level.

FINDINGS:

40 subjects were examined in the present study; the highest mean age and height turned out to be 29.42±2.11 years and 162.5±3.49 cm and the highest weight and lowest BMI, which were related to the group recipient of two dosages of 4000 mg/day, turned out to be 58.94±4.51 kg and 224.49±2.74 kg/m; the highest BMI was related to the group receiving two dosages of 3000 mg/day (Table 1). The highest mean of Lactate dehydrogenase, 852.91±19.21, immediately after training session in the pre-test step, was related to the group recipient of two dosages of 4000 mg/day; the highest amount of this substance in the post-test step, 579.11±21.74, was related to the group receiving two dosages of 3000 mg/day. The highest mean of LDH during 24 hours after the training session in the pre-test step was related to the group receiving two dosages of 3000 mg/day and in the post-test step was related to the group receiving two dosages of 2000 mg/day (Table 2). The results of the present study, also, showed that the impact of different dosages of omega3 on the level of LDH enzyme of inactive women is quite significant 24 hours after the excessive ($P<0.05$)(Table 3).

Table 1: Information on the age, height, weight, and BMI of studies subjects

Groups	Age (year)	Height (cm)	Weight (kg)	BMI (kg/m^2)
Dose 2000	28.31±2.19	161.29±3.27	59.01±4.19	22.77±2.51
Dose 3000	27.83±2.85	160.74±3.14	60.70±4.43	23.71±2.12
Dose 4000	29.42±2.11	162.5±3.49	58.94±4.51	22.49±2.74
Placebo	27.08±2.67	161.8±3.90	61.23±4.70	23.57±2.80

Table 2: The level of LDH in groups with different doses of omega-3 and placebo

Index	Groups (I)	Groups (J)	Average Comparison	P-value
Lactate Dehydrogenase (IU/L)	Dose 2000	placebo	12.88	0.005
	Dose 3000	placebo	30.88	0.000
	Dose 4000	placebo	31.22	0.000
	Dose 2000	Dose 3000	-18.00	0.003
	Dose 3000	Dose 4000	-0.34	0.410
	Dose 4000	Dose 2000	18.34	0.003

Table 3: Comparison of the difference between the mean LDH levels after 24 hours, in different groups training in different groups

Test steps		LDH level with a dosage of 2000	LDH level with a dosage of 3000	LDH level with a dosage of 4000	Placebo
Immediately after training	Pre-test	568.11±18.29	579.11±21.74	582.91±19.21	561.23±17.36
	Post-test	559.61±17.80	551.61±19.35	555.73±20.80	567.19±18.99
24 hours after training	Pre-test	375.21±11.80	381.21±12.52	372.14±15.39	375.10±12.76
	Post-test	361.70±11.51	349.70±10.38	340.29±14.14	357.73±12.70

DISCUSSION:

Cardiovascular Atherosclerosis disease is the main cause of the annual incidence of more than 19 million deaths in the world [18]. New medical results emphasize the key role of inflammation in the occurrence of atherosclerosis, from the early stages to the onset and the incidence of thrombosis. Nowadays, atherosclerosis is considered not only in terms of a lipid accumulation disease, but also as a chronic inflammatory process [19]. Fatigue is the most important factor affecting the ability of a person to perform better, especially during short periods of exercise. Excessive fatigue usually limits the performance of the athlete and delays the desired outcome [20]. One of the causes of local fatigue is the accumulation of lactic acid in active stones and the concentration of hydrogen ion in the blood [21]. Lactic acid addition following intense activities due to impaired energy production and favorable muscle contractions have led researchers to find ways to release LDH faster and reduce its production in the bloodstream and involved muscles [22]. In fact, unsaturated omega3 fatty acids that are essential for the health of the body cannot be synthesized by body; therefore, they should be obtained through food or dietary supplements, the best source of which is fish, which contains more levels and groups of fatty acids [23]. Therefore, the present study examined LDH level in inactive women with supplementation of omega-3 following a resistance training session. Based on the results of the present study, although 2000mg/day dosage of omega3 does not have significant impact on the level of LDH enzyme in inactive women immediately after resistance training session, it is significantly effective on these subjects 24 hours after the exercise session; it is, even, more effective that other dosages of omega3. The majority of studies have shown that fish oil is rich in omega-3 fatty acids which, in turn, play an important role in reducing inflammatory parameters [24]. In fact, based on the findings of the present study, one session of severe resistance activity results in a significant increase in LDH enzymes as an indicator of cell damage in the recipient group. The LDH enzyme represents a degree of fuel compatibility and physical exercises in skeletal muscle, whose serum concentrations are very low in normal conditions, and may increase as a result of the physiological rupture of cells [25]. The results of Suzuki et al study 2006, which was conducted on athlete men performing intense physical activity, showed that the level of LDH index increases significantly after an intense triple competition period, which is consistent with the findings of the present study [26]. Based on the statements of Ferri et al study 2006, performing a 10-set of 10-replicate planar Flexion that strengthens the twin and nasal muscles, with an intensity of 70%, increases LDH levels significantly in older men [27]. Based on Rodrigues et al study 2010, which was conducted to measure the effect of upper resistance exercise activity with different rest periods on cell damage, 2 sessions of resistance activity, with an intensity of 80% and including 3 sets of 5 upper trunk movement, increased serum LDH levels significantly in untrained men [28]. However, the findings of Parsian et al study 2010, showed that after 70-80% strength training and 90% of maximum power, there is no change in the level of CRP, which is a type of inflammatory index [29]. It seems that the use of food supplements can modify and avoid the significant increase in the concentration of enzymes for cellular and maxillary damage in athletes. As reported in mentioned studies, omega-3 fatty acid consumption reduces cellular damage after ischemic conditions in adult mice [30].

CONCLUSION:

The findings of the present study showed that one session of resistance training did not increase the level of LDH in inactive women who did not use to train or exercise. However, the intake of omega-3 fatty acids of 3,000 and 4000 mg/day prevents further increase of this index in supplemented athletes; thus, it cannot be a good way to prevent inflammatory and cell-mediated reactions in women. It is recommended for people who have not been trained to receive omega-3 supplements for a daily for an amount of 3000-4000 mg per day in order to prevent inflammatory reactions and cellular damage.

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