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Research Article

Investigating the Effect of Continuous Aerobic Exercises on the Enzymes in Women with Non-Alcoholic Fatty Liver

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Abstract

Background and goal: *Fatty liver disease in obese, sedentary and people with diabetes and dyslipidemia was seen more. In 1970 liver disease associated with obesity in adults is detected, while increasing physical activity are associated with reduced liver fat. So, the aim of the present study was investigating the effect of continuous aerobic exercise on enzymes in women with nonalcoholic fatty liver.*
Materials and methods: *In this quasi-experimental study, 12 women with non-alcoholic fatty liver disease were randomly assigned to a continuous exercise group. Each of the samples running aerobic exercise on a treadmill during three times a week for 12 weeks and 30 to 40 minutes per session with a mean intensity of 60% to 70% heart rate recorded that was gradually applied in the exercise program. Laboratory biosystems kit was made in Spain used to determine the level of liver enzymes; data were analyzed using t-test in SPPS software version 20.*
Findings*: The results showed that p value of AST and ALT enzymes considering after 12 weeks of continuous exercise had a significant decline. Also, the variables CHOL, TG, LDL, and HDL were not significantly changed after 12 weeks of continuous exercise.*
Conclusion: *According to the results, it can be concluded that blood lipids, due to the mean reduction in pre and post-test but any statistically significant change observed, it seems if the time of exercise more than 12 weeks has significant possibility of greater change.*

Keywords*: Continuous aerobic exercise, liver enzymes, non-alcoholic fatty liver*

1. Introduction

Fatty liver disease due to reason divided into two types of non-alcoholic and alcoholic fatty liver. Alcoholic fatty liver observed in people with alcoholism and excessive alcohol consumption. With alcohol withdrawal, its complications and symptoms improve going forward. Non-alcoholic fatty liver disease is the most common chronic liver condition that in today's society is emerging. Non-alcoholic fatty liver disease is one of the most common liver disease (Davoodi *et al*., 2012). According to research it can be concluded that increased physical activity is associated with reduced liver fat. The results show an inverse relationship between cardiorespiratory fitness with non-alcoholic fatty liver disease (Ogawa *et al*., 2007)

Also the results of other study show that fatty liver disease in obese, sedentary and people with diabetes and dyslipidemia was seen more. In 1970 liver disease associated with obesity in adults is detected, the first reports of liver fibrosis in obese children 28 years ago by Moran *et al* were reported in three children 10 years old (Moran *et al*., 1983).

Five enzyme that is common in liver disease can be measured and used in the diagnosis of these diseases include aspartate aminotransferase (AST), alanine aminotransferase (ALT) , Alkaline phosphatase (ALP), gamma-glutamyl transferase (GGT) and lactate dehydrogenase enzyme (LDH). Liver disease is the most important activity factor of increasing transaminase in serum.

Most of disease, ALT activity is higher than AST. Enzymes activity of both ALT and AST serum, although whenever the integrity of hepatocytes are under the influence of disease are rising, but ALT is more specific enzyme for the liver. Increased ALT activity lasts longer than an increase in AST activity (Burtis *et al*., 2012).

In most cases, patients have a slow and benign process. Although it should be noted that the small number of patients with liver cell inflammation and tissue destruction and then there may be replace scar tissue (phybrosis) and progressive and chronic liver disease (cirrhosis) and lead even to malignancy liver cells (Merv, *et al*., 2002).

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In a study of the progression of liver damage and cirrhosis in 32 to 50 percent of patients were reported in 20% of patients (Harrison *et al*, 2003). Now the best criterion to evaluate the course and severity of liver is histology; so that the extent of the inflammation and the formation of liver cells is higher, the disease process will be faster (Jamali and Daryani, 2010). Fatty liver disease is probably the most common cause of unknown cirrhosis (Ponavala and Tolot, 2002). In a study to compare the effects of cirrhosis and hepatocellular malignancy among patients with cirrhosis due to hepatitis c virus and fatty liver was performed, it was observed that mortality and complications of cirrhosis in both groups of patients were similar, but the risk of malignancy cells of the liver in patients with cirrhosis due to fatty liver than patients with cirrhosis from hepatitis c is less (Hui *et al*. 2003).

But there is no research on the role of continuous aerobic exercise and determine the exercise optimal intensity to improve fatty liver disease, according to the existing controversies in numerous studies given that continuous aerobic exercise need less time with less fatigue than endurance exercise, so in this study, the aim of the present study was investigating the effect of continuous aerobic exercise on enzymes in women with nonalcoholic fatty liver.

2. Theoretical foundation and literature review

Liver enzymes include Serumglotamate- Oxaloacetate transaminas (SGOT) or aspartate aminotransferase (AST), Serm- glutamate- pyruvate transaminas (SGPT) or alanine aminotransferase (ALT), alkaline phosphatase, glutamyl trans-peptidase (GGT), albumin and bilirubin. The research showed that AST and ALT are the best indicators for assessing the status of liver (Levent C-Lehmann T, 2004).

These enzymes are part of Transaminase category. AST transfer amino agent of amino acids to alpha-amino acids column (transfer of an amino group of the Alpha-Ketoglutaric acid catalyzed and it is also called aminotransferase). ALT also create amino agent of Alpha-Ketoglutaric acid or does opposite action of the reaction. Level of this enzyme in many tissues of the body scattered however, it has higher concentrations in the liver and more as liver transaminase considered. The damage and lesions increased in the tissues and the level of this enzyme increased (Mellati, 1996).

Prothrombin is blood clotting factors produced by the liver and reduces it lead to increase in tendency to bleed in the body. Other laboratory parameters of liver function were normal in the early stages of fatty liver and only in the advanced stages (cirrhosis) are impaired; however, some patients has advanced liver disease as cirrhosis but liver enzymes are normal. In fatty liver disease, B and C hepatitis indicators are negative (Jamali *et al*., 2008).

Of course, coincidence of fatty liver disease with hepatitis C accelerating damage compared situation each disease exist alone. Elevated levels of blood fats increase "triglyceride" "Cholesterol" and especially the “Oxidized low-density cholesterol" as well as blood sugar levels can be observed in fatty liver disease which is evidence of the existence of metabolic syndrome (Wong *et al*., 2010). Serum iron levels in the advanced stages of the disease can be high that is a sign of liver disease severity. Increase "ferritin" which is sign of the body's iron reserves, in half of all cases of fatty liver can be seen and in fact is a sign of insulin resistance (Jamali and Jamali, 2010).

2.1 Literature review

With respect to continuous exercise, recent studies in healthy young women with continuous exercise with comparable adaptations to endurance exercise by spending less time suggested. Many studies on the effect of physical exercise, including aerobic exercise, resistance exercise, parallel exercise (aerobic and resistance) has been carried out on improving fatty liver disease.

In this regard, Kristin *et al* don’t founded relationship between moderate activity and recovery in alcoholic fatty liver, on the contrary, the possibility of a significant reduction in liver fat in connection with intense activity reported (Kristin , 2011).

Michela *et al* in a study examined the effects of endurance exercise on liver fat, enzymes and obesity in both men and women, in this study the size of waist, liver, percentage of body fat, bilirubin, Glutamyl transferase alanine aminotransferase in 20 male and female obese and 21 men and women with normal-weight before and after 12 weeks of endurance exercise measured, the results of this study shown no change in liver size, body weight, body fat percentage, bilirubin, alanine aminotransferase due to endurance exercise and eventually lack of short-term effects of endurance exercise without weight loss on liver fat reported (Michela *et al*., 2008).

Chen *et al* in a study concluded that 77 percent of obese people show the evidence of liver steatosis by ultrasound. In this study, considering the two indicators steatosis on ultrasound and increased alanine amino transferase levels to determine liver disease was seen in 24 percent of obese individuals (Chan *et al*., 2004).

Shojaee and Moradi *et al* in a study on 17 healthy men with an mean age of 53 years and BMI = 25-30 three times a week for 20 minutes per session with $VO2_{max=}60$ to 80% for 6 weeks were trained, significant changes in improving metabolic parameters insulin without changes in BMI, fat, muscle and liver were reported (Shojaee *et al*., 2007).

A number of studies shown lower levels of liver fat in relation to increase in physical activity and the fatigue caused by long-term aerobic exercise increased (Zalbrsagy *et al*., 2008).

Michela *et al* (2008) in a study examines correlation between cardiovascular fitness and fatty liver, their

research on 293 men and correlation between cardiovascular fitness with fatty liver (r = - 0.24) was reported (Kaljl, 2009)

Straznicky *et al* in a study examined the effect of 12-week weight loss with diet and exercise with moderate intensity on the liver enzymes in 36 overweight men and women with metabolic syndrome aged (55±6) and BMI= (41 ± 7.32) and it concluded that weight loss in diet group show reduction 45% and in the diet group plus exercise 49% and reduction of liver enzymes in the diet group 20% and in the diet group plus exercise group 24% reduction (Straznicky *et al*., 2011).

In another study Nathan *et al* studied 15 obese men and 8 women, they investigating the effect of four weeks of aerobic exercise on the reduction of visceral fat and liver fat and research results show that regular aerobic exercise reduces liver fat without changes in body weight (Nathan & Johnson, 2009).

In short, fatty liver in obese, sedentary and people with diabetes and dyslipidemia was seen more. Of course, certain medications can also cause fatty deposits in the liver; rapid weight loss in those who are already obese can have the problem (Chan *et al*., 2004).

Exercise is a big part of treatment and it is recommended to patients with nonalcoholic fatty liver disease, this offer is based on the relationship between nonalcoholic fatty liver disease and obesity and insulin resistance. However, there is very little information on the effect of exercise on nonalcoholic fatty liver treatment. Exercise has principles that include the manipulation of several variables, including the type of exercises in the exercise program, order of movement or activity, exercise intensity (exercise times), rest between rounds, activities and exercise sessions (Faoud *et al*., 2007). According to research, it can be said generally, more research suggests reduction of fat and liver enzymes due to the effect of physical activity but what is most effective exercise method is not well documented.

3. Methodology

The aim of the present study was investigating the effect of continuous aerobic exercise on enzymes in women with nonalcoholic fatty liver. This study is quasi-experimental. The population of this research was all women who carried ultrasound for liver, kidney, bladder or other radiology centers and fatty liver were notified among them. Among the volunteers participating in the study, 12 patients were selected for the exercise protocol. The samples using convenience sampling selected. After holding a coordination session and anthropometric included indicators height; if a person's height without shoes standing perfectly upright, weight, with a minimum of clothing, waist, using a tape from the bottom of the ribs at the least prominent belly, hip circumference, with the tape measure from the highest ridge, measured and then to determine their aerobic capacity through aerobic power was estimated and they were asked to perform an ultrasound and blood tests due date to specified refer to the respective centers.

The participants were asked to determine the precise amount of fat in the liver are at least 10 to 12 hours of fasting. Liver ultrasound of all samples, one stage before of exercise protocols and a stage after more than 24 hours of the last exercise session was conducted.

In this study exercise program included running for 12 weeks with a repeat three day a week on the treadmill, exercise intensity based on heart rate (HRmax - HRrest%) + HRrest is the equivalent of $VO_{2\max}$, by polar heart-rate model was controlled and for the work-rest periods (three minutes activity and three minutes rest) were considered. To prevent too much pressure on the participants and also observe the principle of overload volume and exercise intensity gradually increased (30 to 40 minutes). Each of the 7 minute warm-up exercise sessions started and finished 7-minute cool-down. They were asked to exercise but do not do the above exercise program (Table 1)

Table 1: Exercise 12-week protocol, increasing intensity and time gradually

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Continuous exercise	30 minutes 48%	31 minutes 49%	32 minutes 50%	33 minutes 51%	33 minutes 51%	34 minutes 60%	35 minutes 68%	36 minutes 68%	36 minutes 69%	37 minutes 70%	39 minutes 71%	40 minutes 72%
Exercise (3 minutes)	52%	52%	54%	55%	60%	65%		68%	69%	69%	70%	72%
Active rest (3 minutes)	40%	40%	44%	44%	48%	48%	52%	52%	60%	66%	68%	70%

3.1 First hypothesis test

Research first hypothesis: 12 weeks of continuous exercises has a significant effect on liver enzymes (ALT, AST).

H0: 12 weeks of continuous exercise has not a significant effect on liver enzymes (ALT, AST).

H1: 12 weeks of continuous exercise has a significant effect on liver enzymes (ALT, AST).

In order to compare the mean of liver enzymes (ALT, AST) after 12 weeks of continuous exercise, t-test was used and the results are presented in Table 2.

Table 2: Results of t-test to compare the mean liver enzymes after 12 weeks of continuous exercise

Group	Feature	Mean ± SD	T	Df	P
Continuous exercise	AST (IU/L)	5.45 ± 1.56	0.67	9	0.01 *
	ALT (IU/L)	5.98 ± 10.12	4.35	9	0.01 *

* Signs statistical significance (p <0.05)

As shown in Table 2 according to p value of AST and ALT enzymes after 12 weeks of continuous exercise had a significant reduction, so the null hypothesis rejected and the alternative hypothesis will be accepted.

The second hypothesis test

The second hypothesis: 12 weeks of continuous exercise has significant effect on the blood CHOL, TG, LDL, HDL enzymes.
H0: 12 weeks of continuous exercise has not significant effect on the blood CHOL, TG, LDL, HDL enzymes.
mH1: 12 weeks of continuous exercise has significant effect on the blood CHOL, TG, LDL, HDL enzymes.
To compare the mean CHOL, TG, LDL, HDL variables after 12 weeks of continuous exercise, t-test was used and the results are presented in Table 3.

Table 3: Results of t-test to compare mean CHOL, TG, LDL, HDL variables after 12 weeks of continuous exercise

Group	feature	Mean ± SD	T	Df	P
Continuous exercise	TG (mg/dl)	88.12 ± 42.23	1.12	8	0.32
	LDL (mg/dl)	12.45 ± 3.25	0.25	8	0.52
	HDL (mg/dl)	6.70 ± 1.90	0.45	8	0.20
	CHOL (mg/dl)	21.21 ± 8.63	1.12	8	0.36

As can be seen in Table 3 with respect to p value of the CHOL, TG, LDL, HDL variables was not significantly changed after 12 weeks of continuous exercise, null hypothesis is rejected and the alternative hypothesis is confirmed

4. Discussion and conclusion

The aim of the present study was investigating the effect of continuous aerobic exercise on enzymes in women with nonalcoholic fatty liver. In this quasi-experimental study, 12 women with non-alcoholic fatty liver disease were randomly assigned to a continuous exercise group (mean age, 35.80±7.94 years, weight 94.83 ± 17.23kg and height 173±0.06 cm). Each of the samples running aerobic exercise on a treadmill during three times a week for 12 weeks and 30 to 40 minutes per session with a mean intensity of 60% to 70% heart rate recorded that was gradually applied in the exercise program. Laboratory biosystems kit was made in Spain used to determine the level of liver enzymes; data were analyzed using t-test in SPPS software version 20.

According to the results of first hypothesis test after 12 weeks of continuous exercise in the liver enzymes (ALT, AST) were seen significantly reduced. The results of the research are consistent with study Nikroo, Straznicky *et al* (2011) (Nikroo *et al*., 2011). Serum aminotransferases can be reduced thereby reducing pathogens and damaged cells, improve liver cells and decrease hepatocytes inflammation. The significant decrease in serum levels of ALT and AST can be attributed to increased insulin sensitivity of liver tissue. Insulin resistance associated with various factors of metabolic syndrome and at present time, even in the absence of obesity and type II diabetes, the most important characteristic and reasons cause NASH disease is known (Jeffrey R. 2010) and (Shen *et al*, 2003). Appropriate exercise with sufficient intensity and duration, has beneficial effect on improving insulin sensitivity, changes in skeletal muscle receptor levels deep.

According to the results of second hypothesis test after 8 weeks of continuous exercise on blood lipids (TG, CHOL, LDL, HDL) no significant changes.

The results of the research is consistent with results Michel *et al*. (2006) and Wu *et al* and results is inconsistent with Kin Isler *et al* (2001) (Kin Isler 2011), (Woo R, 1985) and (Michel, L., 2006) that the possible causes of the gender difference is because in his study all participants were women. VLDL is main carrier of triacylglycerol in the absorption situation. Reference distance depends on gender and age, reference level particularly high level, increases with age, and generally in men than in women is higher (Muge Yoes, 2010).

Much research shows a variety of exercises and physical activity influence on blood lipids. The effect of aerobic exercise on HDL levels in some research, especially research that their intensity is between 70 to 90 percent of HRmax been reported (Gordon, DJ, 1977). Linder *et al* also showed that the intensity of exercise increases HDL (Linder, 1983). Reaction responses that are given to exercises, related to activities, which means that if the activity is less than the threshold, there cannot be meaningful response, if the activity is greater than the threshold increases the likelihood of significant response in all variables (Tarnopolsky, 2008). Many factors affect blood HDL level changes, such as diet, personal characteristics and drug use. According to the results, it can be concluded that blood lipids, due to the mean reduction in pre and post-test but any statistically significant change observed, it seems if the time of exercise more than 12 weeks has significant possibility of greater change.

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