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ORIGINAL ARTICLE

The effect of aerobic exercise on serum level of liver enzymes and liver echogenicity in patients with non-alcoholic fatty liver disease

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ABSTRACT

Aim: The aim of this study was to evaluate the effect of an aerobic exercise on serum level of liver enzymes and liver echogenicity in patients with non-alcoholic fatty liver disease.

Background: Non-alcoholic fatty liver disease (NAFLD) has different prevalence in various parts of the world. Obesity and low physical activity are main risk factors for the development of NAFLD.

Patients and methods: Ninety patients diagnosed by ultrasound as NAFLD was evaluated in a clinical trial as case (A) and control groups (B). The effect of aerobic exercise on changing the liver enzymes and liver echogenicity was assessed in cases compared with control group which were only on medical therapy.

Results: The mean age in the sample group was 37.6±8.3 in the 17-56 yrs age range. In group A, fatty liver was in stage I in 26 (57.8%) cases, stage II in 17 (37.8%), and stage III in 2 (4.4%). In group B, fatty liver was in stage I in 30 (66.7%) patients, in stage II in 14 (31.1%) and stage III in 1 (2.2%). After an aerobic exercise, serum level of liver enzymes and liver echogenicity in patients with non-alcoholic fatty liver disease was significant improved in case group (ALT (P= 0.0001), AST (P=0.01).

Conclusion: Considering the present study, we can suggest that a controlled aerobic exercise schedule can be helpful in association of medical therapy in the treatment of NAFLD.

Keywords: Liver enzyme, NAFLD, Aerobic exercise.

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Introduction

Non-alcoholic fatty liver disease (NAFLD) is a liver disorder that is accompanied with accumulation of triglyceride in hepatocyte. Pathologic changes in non-alcoholic fatty liver disease are similar to alcoholic fatty liver disease, but there is not any alcohol consumption or less than limit that can damage the hepatocyte. These changes are in a spectrum from simple steatosis to steatohepatitis and finally fibrosis and then cirrhosis (1-5).

NAFLD has a different prevalence in various parts of the world, though 20-30% prevalence has been reported in epidemiologic studies in western

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countries (2, 6-8). This disease can be seen in all ages but often middle-aged people are affected (8). Now there are multiple methods for the diagnosis of NAFLD in the world. Sonography is one of these methods that are applied to the diagnosis of this disease with ruling out other probable diseases (9).

NAFLD is related to metabolic syndrome such as obesity, diabetes mellitus and hyperlipidemia. Since obesity and low physical activity are main risk factors for the development of NAFLD, life style modification considering weight loss and physical activity is thought to be an important alternative for treatment of this disease (10). A few studies performed regarding the quantity of the physical activity in NAFLD. But the advantages of physical activity have been shown very clearly (11). With considering this reality surveying on specific affects of physical activity on non-alcoholic fatty liver disease in the site of research is necessary. Therefore, the aim of present study was to evaluate the effect of an aerobic exercise on serum level of liver enzymes and liver echogenicity in patients with non-alcoholic fatty liver disease.

Patients and Methods

In this non-randomized clinical trial including 90 patients with established NAFLD divided equally in to case and control groups. The duration of this study was 12 months from December 2011 until December 2012. For the diagnosis of this disease, sonography with acceptable sensitivity and specificity was applied. Before entering a patient to the study the height and weight of patient with minimal cloths was measured in both groups. For measuring of height and weight SECA balance device has been used with the accuracy of 0.5 cm and 0.1 kg. Body Mass Index (BMI) was calculated with using of weight/height^2 in the start of the study in both groups. Also body composition of any patient in each group was determined in the start and the end of the study with the device of ZEUS9 bioelectrical impedance analysis. At the beginning of the study the measuring of liver enzymes (AST, ALT, ALP) and FBS and lipid profile (TG, Total cholesterol, HDL cholesterol) with enzymatic methods was measured. The level of LDL cholesterol was calculated with the formula of Fredwald, but if the level of TG was more than 400 mg/dl, enzymatic methods were applied for the measuring of LDL cholesterol. On the other hand, in control group medical therapy with 1000 mg vitamin C and 400 units vitamin E was prescribed. In case group in addition to the medical therapy similar to control group, thirty minutes aerobic exercise with maximal heart rate three times a week with the duration of three months was performed. At the end of the study, variation of the variables (mentioned above) in cases was compared with control group.

Patients with alcohol consumption more than 20cc per day, drug usage, viral hepatotropic positive or Wilson's disease, autoimmune disease, cholestatic disorders, renal, cardiovascular or thyroid disease, and patients with history of gastric bypass surgery, parenteral nutrition or cachexia were excluded from this study.

Statistical analysis

The results of the study represented as mean ± standard deviation (SD), percentage and abundance using SPSS software version 16. For the comparison of quantitative variables student t-test and for the comparison of qualitative variables chi-square has been applied and in the cases in which predictive value was less than 0.05, the result was recognized significant.

Results

Totally 57 subjects (63/3%) were male and 33 subjects (36.7%) were female. In group A (case

group) 29 (64/4%) were male and 16 (35/6%) were female and in group B (control group) 28 individuals (62/2%) and 17 persons (37/8%) were male and female respectively. The mean age of entire patients was 37.6±8.3 ranged between 17-56 years old. The mean age in cases and control was 35.6±9.2 (17-54) and 39.5±6.9 (26-56) years old respectively. The statistical analysis showed a significant difference regarding mean age in two groups (P=0.02). Basic data in studied groups are presented in table 1. Table 1 showed no statistically difference in cases compare to controls. Also table 2 showed that the mean of biochemical test in cases before and after an aerobic exercise only for ALT and AST was significant.

Table 1. Basic data in case and control groups

	Case (n=45)	Control (n=45)	P-value
Height	169.7±11.8* (120-188)	168.3±9.9 (147-189)	0.56
Weight	84.2±1.3 (50-115)	83.9±1.3 (59-120)	0.91
BMI†	28.9±3.2 (22.4-36.8)	29.5±4.1 (23-46.6)	0.47
DBP‡	72.8±8.1 (60-90)	76.2±9.8 (60-100)	0.08

* Mean± standard deviation (range); † Body mass index; ‡ Diastolic blood pressure

Table 2. The result of biochemical test in cases before and after an aerobic exercise

Variables*	Before	After	P Value
FBS	95.2±19.6 (62-193)	95.2±16 (66-160)	P=0.98
TG	218.2±12 (82-687)	188.6±8.6 (36-398)	P=0.18
Total Chol	190.6±35.5 (124-294)	194.9±38.8 (90-284)	P=0.58
LDL	108.1±31.3 (49-184)	112.2±36.1 (38-197)	P=0.57
HDL	42.4±9.7 (27-71)	45.3±8.8 (29-71)	P=0.14
AST	41.5±2.7 (13-137)	29±9.5 (15-53)	P=0.006
ALT	61.1±3.6 (14-185)	44.9±2.4 (13-119)	P=0.01
Alk.P	165.9±61.4 (29-338)	185±56.2 (45-400)	P=0.12

*Mean±SD; FBS: fasten blood sugar; TG: triglyceride; Chol: cholesterol; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; ALP: Alkaline phosphatase

After the completion of aerobic exercise duration in both groups, serum level of liver enzymes and liver echogenicity in patients with non-alcoholic fatty liver disease was decreased.

The degree of fatty liver in group A showed fatty stage 1 in 35 patients (77.8%), stage 2 in 4 patients (8.9%) and 6 patients (13.3%) without sonographic fatty liver. In group B fatty liver degree of 33 patients (73.3%) was in stage 1, 9 patients (20%) in stage 2 and fatty liver of 3 patients (6.7%) had been resolved by sonography. The difference in both groups was not statistically significant (P=0.23).

Weight, BMI FBS, TG, HDL, AST, ALT and VFM, kg was statistically significant by comparison of basic information description before and after trial in group A (P<0.05) (Table 3). This result was statistically significant in control group for weight, BMI, SBP, DBP, TG and LBM (P<0.05) (Table 4).

Table3. The comparison of basic information description before and after trial in group A

Variable*	Pre Trial	Post Trial	P Value
Weight	84.2±1.3	82.1±11.9	0.0001
BMI	28.9±3.2	28±2.8	0.0001
SBP	112.7±14.9	110.2±11.7	0.06
DBP	72.8±8.1	71.9±14.4	0.35
FBS	95.2±19.6	90.6±14.4	0.01
TG	218.2±12	176±5.2	0.002
Total Chol	190.6±35.5	183.2±25.6	0.09
LDL	108.1±31.3	100±26.2	0.06
HDL	42.4±9.7	46.5±8.1	0.0001
AST	41.5±2.7	34.3±15.1	0.01
ALT	61.1±3.6	43.5±2.4	0.0001
Alk.P	165.9±61.4	157.9±54.2	0.12
VFM, kg	3.8±1	3.7±1.1	0.0001

* Mean± standard deviation FBS: fasten blood sugar; TG: triglyceride; Chol: cholesterol; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; ALP: Alkaline phosphatase

Discussion

As our results showed that NAFLD's pathologic changes are similar to pathologic changes that are seen in alcoholic fatty liver

disease but there is no alcohol usage in NAFLD (1). NAFLD's prevalence is different worldwide, though 20-30% prevalence has been reported in epidemiologic studies in western countries (2). This disease can be seen in all ages but often middle-aged people are more affected (8).

Table 4. The comparison of basic information description before and after trial in group B

Variable*	Pre Trial	Post Trial	P Value
Weight	83.9±1.3	83.3±12.9	0.02
BMI	29.5±4.1	29.4±4.1	0.04
SBP	127.2±18.3	123.4±17.7	0.0001
DBP	76.2±9.8	72.8±10.8	0.006
FBS	95.2±16	94.3±13.4	0.2
TG	188.6±8.6	172.4±7.6	0.04
Total Chol	194.9±38.8	193.8±34.3	0.6
LDL	112.2±36.1	115.8±26.9	0.6
HDL	45.3±8.8	46±8.4	0.5
AST	29±9.5	28±9.9	0.2
ALT	44.9±2.4	39.9±2.2	0.07
Alk.P	185±56.2	193.2±46.8	0.2
VFM, kg	3.5±1.5	3.3±1.5	0.7
WHR	0.9±0.1	0.9±0.07	0.2
Body Fat, kg	23.2±6.1	22.9±6.8	0.6
LBM	55±9.9	54.9±8.9	0.005

*Mean±SD; FBS: fasten blood sugar; TG: triglyceride; Chol: cholesterol; AST: Aspartate aminotransferase; ALT: Alanine aminotransferase; ALP: Alkaline phosphatase

Sotodeh et al. in 2006 studied the effect of aerobic exercise in patients with non-alcoholic fatty liver disease. The finding of this study followed this kind of exercise and showed the decrease of liver enzymes level (12). In this study we showed the statistical significant decrease of AST, ALT and ALP level in NAFLD patients after an aerobic exercise. In addition to the decrease of liver enzymes in our study, the decrease of lipid profile in cases was statistically significant.

In another study by Chen et al. in 2008, 23 patients with established NAFLD did intense cycling in duration of 2 hours a week for 10 weeks and they showed that in the end of study the significant decrease in topography index, insulin resistance and sonographic findings (13). Also, in our study body composition components such as body fat mass, visceral fat mass and body mass index and waist to hip ratio had statistical meaningful decrease but we couldn't show the statistically significant decrease in sonographically fat component in our patients. In a cross sectional study by Perseghin et al., the relation between physical activity and the component of liver's fat was reverse (14).

In a meta-analytic survey in 2008, physical activity (aerobic or anaerobic) in 375 patients with NAFLD had protective effect such as decrease in lipid profile and body composition (15).

In conclusion, with respect to result of this study and comparison with the studies, which is mentioned above we, could conclude that in addition to medical therapy, controlled exercise trial can be helpful in the cure of non-alcoholic fatty liver disease.

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