



Impact of Low Intensity Exercise on Liver Enzymes (ALT & ALP)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

This particular research study was basically carried out for the purpose to examine the impact of low intensity exercise on two particular liver enzymes i.e. alanine transaminase (ALT) and alkaline phosphate (ALP). 20 Non sportsmen were selected as subjects of the study (n=20, age 20 to 30 years (20.95±3.79), Body Mass Index (BMI) from 18 to 30 (25.90±5.54). Similarly the subjects were divided into two groups (Experimental Group and Control Group) through the application of International Physical Activity Questionnaire (IPAQ) and measurement of Maximum Heart Rate (MHR). 12 weeks self-made low intensity exercise protocol was applied to an experimental group.

5ml blood was collected from all subjects to measure the effect of low intensity exercise on ALT and ALP. The data of pre and post-test were processed through SPSS version 24. Based on analysis and findings, the researcher concluded that in experimental group (EXG) the level of ALT and ALP was found significantly higher ($p < 0.05$) as compared to control group (CG). Based on conclusion, it is hereby recommended by the researcher that for the purpose to promote the functional capacity of liver, low as well as moderate intensity exercise should be performed on daily basis. In addition, in this study due to lack of financial resources, two basic liver enzymes i.e. ALT and ALP were measured, therefore the other enzymes like as AST and bilirubin also need to be examined in such other research studies.

Keywords: Liver; enzymes; alanine transaminase; alkaline phosphate; low intensity exercise.

1. INTRODUCTION

1.1 Scientific Background and Explanation of Various Rationale

Alanine transaminase and alkaline phosphate (ALT and ALP) both are more sensitive and most functional enzymes, generated by the liver [1]. These enzymes activity is affected by the intensity, duration and type of exercise. The liver is a vital organ, playing a key role in the execution of many chemical processes in the body [2, 3]). Preservation and adequate formation of liver enzymes are contemplated necessary because disturbance of liver enzymes can cause various health complications [4].

The term exercise refers to a specific subset of physical activity performed for the improvement and maintenance of fitness and wellness [5]. Exercise may be performed for in a manner that is health enhancing like physical exercise, if relevant muscle groups are involved, the intensity is sufficient, and recovery appropriate. With this reference all kind of exercise is not suitable for health because exercise promote fitness and wellness if it performed according to the need and type of the body [6].

Regular exercise helps in reducing fatty liver disease (FLD) and obesity. In addition it greatly assist in maintenance of liver functions [7]. Little or mild alteration in liver enzymes are evident among low intensity exercise performers. Similarly, high intensity exercise negatively influences the functional capacity of liver. The high level of liver enzymes causes liver injury, which is found among high intensity exercise performers, alcohol users, non-alcoholic fatty liver disease persons, hemochromatosis, hepatitis B, hepatitis C, illegal drug use and dietary supplements users[7,8].

Temporary elevations of the liver enzymes have been seen during and immediately after a routine exercise including daily walk and jogging. However, dehydration and heat strokes are the key word problems with over exercising [8]. Thirty (30) minutes of regular exercise helps in prompting and maintaining a stable body mass index [9]. Exercise strengthens the functional capacity of whole body systems, similarly, liver functions are also effected by exercise, depending on nature of exercise and nutritional supplementations.

It is also indicated that high intensity, short duration exercise increases the level of liver enzymes than low intensity, long term exercise and the longest increase corresponds to the perception of muscle soreness [10, 11, 12]. High intensity exercise as well as strength training more likely to cause increase in ALT and ALP than aerobic exercise. Similarly, long distance runners have the potential to increase or to alter the level of liver enzymes (Tiidu & David, 2014). Excessive intake of nutrients and high intensity physical activities cause damage of liver cells which leads a person towards death [13,14]. The author further stated that over time, excessive drinking can lead to several chronic conditions, such as fatty liver disease and cirrhosis. But there is new evidence that aerobic exercise may protect the liver ==incomplete??

According to Kim et al. (2008) the level of mortality associated with higher ALT. They further stated that High level of ALT may cause mortality. In men, nine percent of subjects had ALT ≥ 40 U/L, while only five of women had ALT ≥ 30 U/L. It means that ALT cause higher mortality associated with different liver problems. ALT has much larger effect on liver-specific mortality. For example, compared to those with ALT < 20 U/L, men with ALT ≥ 100 U/L had 59 times the risk of death from liver disease. In women, a similar trend was seen, but the number of subjects and events in the highest ALT

category was small, making the risk estimation in this group lower. the purpose of this study was to examine the impact of low intensity exercise on two particular liver enzymes i.e. alanine transaminase (ALT) and alkaline phosphate (ALP).

2. METHODOLOGY

2.1 Design of Research Trails

Randomized controlled trails were conducted to evaluate the effect of low intensity exercise session on two particular liver enzymes i.e., ALT and ALP by following CONSORT guidelines. The study was conducted in Department of Sports Sciences and Physical Education, Gomal University, Dera Ismail Khan, KP, Pakistan. The whole procedures of the study were carried out in accordance with the principles of the Declaration of Helsinki (1975) and was accordingly approved by Gomal University Ethical & Research Board (ref no:05/ERB/GU), KP, Pakistan. The trail was registered as clinical Trails (ref no:137/ERB/GU/19).

2.2 Selection of Participants for Exercise

The study was conducted in Department of Sports Sciences and Physical Education, Gomal University, Dera Ismail Khan, KP, Pakistan. Thus participants of this research study included non-sportsmen (n=20, age 20 to 30 years (20.95±3.79), BMI from 18 to 30

(25.90±5.54)divided in two groups i.e. Control Group (CG) and Experimental Group (EG). Each group was comprised of ten (10) subjects. For the measurements of activity level of subjects all participants of the study were selected through the application of International Physical Activity Questionnaire (IPAQ) and measurement of Maximum Heart Rate (MHR). Study objectives were explained to the participants and those who consented and fulfill the inclusion criteria were included in the study. During the selection process of the subjects all those subjects were included in the study that represents the exercise-trained cohort, and age- and sex-matched sedentary control.

2.3 Blood Collection Procedures for the Measuring the Level of liver Enzymes

Before including the participants in the study, all subjects were informed about risk and benefits of participation in study and then written informed consents were taken from the subjects. Prior to participation in the study with all other measurement, medical history was reviewed and, similarly, proper medical checkup was also taken for the purpose to detect the health problems and contraindications to exercise. Participants of the study were asked for overnight fast and thus they were restricted from using medications and drugs before the collection of blood samples.5ml blood was collected from the subjects.

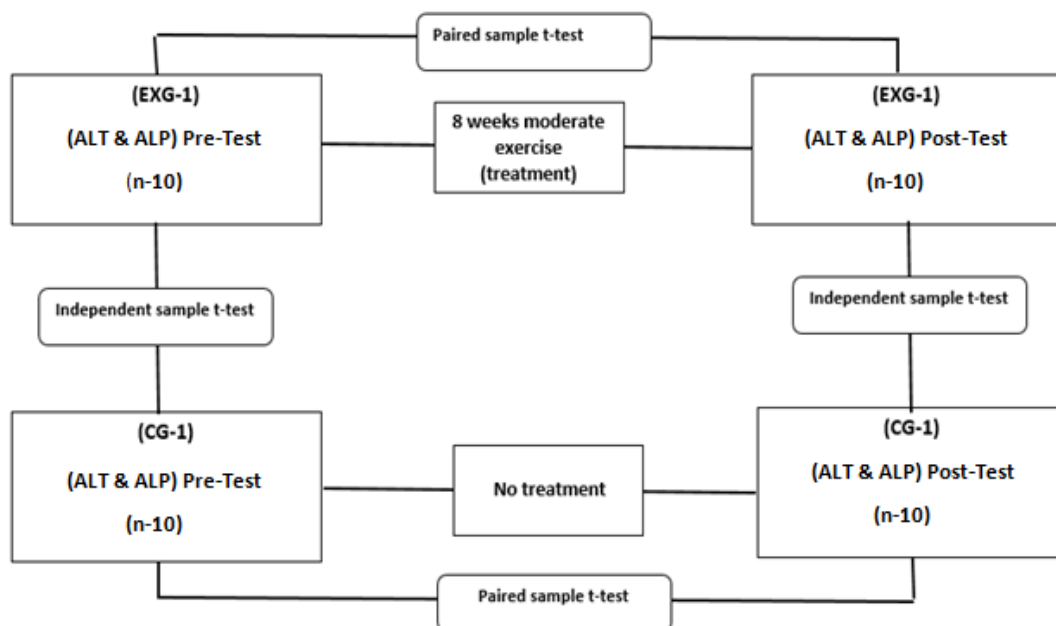


Fig. 1. Showing the Flow of the study Protocols

2.4 Instrument and Instrumentation

A Self-administrated 12 weeks low intensity exercise protocols was developed and applied on the participants. Participants of Experimental Group (EXG) were acquiesced to a 50 minutes low intensity exercise session of twelve week (initial 5 minutes warm up including normal jogging and stretching exercise, training session lasted for 35 minutes and ended with 10 minutes relaxation phase (Cooling down). The volume and intensity of exercise were kept accordance with criteria of Maximum Heart Rate (Low intensity exercise is that which gets you to about 40-50 percent of your Maximum Heart Rate (MHR).

2.5 Ethical Approval

The procedure of the study was carried out in accordance with the principles of the Declaration of Helsinki (1975). Ethical approval was taken

from Gomal University Ethical & Research Board (ref no: 05/ERB/GU), KP, Pakistan.

2.6 Statistical Analysis

The anthropometric characteristics of the study were measured before and after 12 weeks of the prescribed exercise protocols. In addition the scores of Physical activity calculated by following the procedures for data processing and analysis of the International Physical Activity Questionnaire. Continuous scores were articulated as MET-minutes per week (MET level x minutes of activity/day x days per week) (IPAQ). Maximum Heart Rate was estimated in accordance with criteria of Maximum Heart Rate (Low intensity exercise is that which gets you to about 40-50 percent of your Maximum Heart Rate (MHR). The mean values of ALT and ALP obtained from both groups i.e., control group and experimental group were processed in SPSS version 24.0 and were analyzed by using One Sample-Statistics, Paired Sample Statistics and Independent Sample T-test.

3. RESULTS

Table 1. Showing the anthropometric characteristics of both control group (CG) and experimental (EXG) in term of age, weight, height and BMI

Testing Variable	N	Range	Mini:	Maxi:	Mean	SD
Age/Year	20	6.00	20.00	30.00	20.9500	3.79106
Weight	20	8.00	50.00	80.00	55.5000	4.11511
Height	20	6.00	5.500	5.900	5.700	4.123
BMI	20	152.00	18.00	30.00	24..9000	5.54548
Valid N (List wise)	20					

Table. 1 Indicates the Anthropometric Characteristics of both Control Group (CG) and Experimental Group (EXG) and consequently the values are expressed in mean ± standard deviation (SD)

Anthropometric Characteristics of both Control Group (CG) and Experimental Group (EXG) and consequently the values are expressed in mean ± standard deviation (SD) (Table 1)

Table 2. One-sample statistics showing the comparison of the alanine transaminase (ALT) among control and experimental group in pre and posttest with internal standard level of ALT

Testing variables	N	Mean	Std. Deviation	Testing value	t-calculated	t-tabulated	Sig. (2-tailed)
ALTCPR	10	29.9000	.73786	31	-4.714	1.833	.001
ALTCPO	10	33.2000	3.15524	31	2.205	1.833	.055
ALTEPR	10	30.0000	.81650	31	-3.873	1.833	.004
ALTEPO	10	25.8000	.91894	31	-17.894	1.833	.000

Table 2. Indicates, ALTCPR= Alanine Transaminase (ALT) of CG in pre-test, ALTCPO= Alanine Transaminase (ALT) of CG in posttest, ALTEPR= Alanine Transaminase (ALT) of EXG in pre-test, ALTEPO= Alanine Transaminase (ALT) of EXG in posttest.

Table 3. One-sample statistics showing the comparison of the alkaline phosphatase (ALP) among control and experimental group in pre and posttest with international standard level of ALP

Testing variables	N	Mean	Std. Deviation	Testing value	t-calculated	t-tabulated	Sig.
ALPCPR	10	90.6000	8.19485	140	-19.063	1.833	.000
ALPEPO	10	91.9000	7.57848	140	-20.071	1.833	.000
ALPCPO	10	132.9000	16.36018	140	-1.372	1.833	.203
ALPEPR	10	92.3000	7.58727	140	-19.881	1.833	.000

Table 3. indicates **ALPCPR**=Alkaline phosphatase of CG in pre-test, **ALPCPO**=Alkaline phosphatase of CG in posttest, **ALPEPR**=Alkaline phosphatase of experimental group in pre-test, **ALPEPO**=Alkaline phosphatase of EXG in posttest

Table 4. Paired samples statistics showing the comparison of control and experimental group in pre-test and posttest score of ALT and ALP

Pair	Sample	Mean	N	Std. Deviation	Df	t-calculated	Sig. (2 tailed)
Pair 1	ALTCPR	29.9000	10	.73786	9	-3.161	.012
	ALTCPO	33.2000	10	3.15524			
Pair 2	ALPCPR	90.6000	10	8.19485	9	-9.933	.000
	ALPCPO	132.9000	10	16.36018			
Pair 3	ALTEPR	30.0000	10	.81650	9	10.804	.000
	ALTEPO	25.8000	10	.91894			
Pair 4	ALPEPR	92.3000	10	7.58727	9	.113	.913
	ALPEPO	91.9000	10	7.57848			

Table 4. Showing the results of control group and experimental group in ALT score before and after the treatment. The data shows that there is significant difference between the ALT score of control group in pretest (29.00 ± .737) and posttest (33.20 ± 3.15) the control group ALT in pretest was better from posttest ALT score $t(9) = -3.161, P < .05$. In the same way, data indicates that there is significant difference between the ALP score of control group in pretest (90.60 ± 8.19) and posttest (132.90 ± 16.36) the control group ALP in pretest was better from posttest ALP score $t(9) = -9.933, P < .05$. In respect of treatment group, the Table indicates that there is significant difference between the ALT score in pretest (30.00 ± .816) and posttest (25.80 ± .918). The experimental group score better in ALT after the exercises $t(9) = 10.804, P < .05$. On the other hand there is no significant difference between the ALP score of experimental group before (92.30 ± 7.58) and after (91.90 ± 7.57) the exercises $t(9) = .113, P > .05$.

Table 5. Independent sample t-test showing the mean difference between control and experimental group in ALT and ALP during pretest

Testing Variables	Group	N	Mean	Std. Deviation	Std. Error Mean	Df	T	Sig.
ALT	CG-Pre	10	29.9000	.73786	.23333	18	-.287	.777
	EG-Pre	10	30.0000	.81650	.25820			
ALP	CG-Pre	10	90.6000	8.19485	2.59144	18	-.481	.636
	EG-Pre	10	92.3000	7.58727	2.39931			

Table 5 indicated significant difference in ALT of both CG. ALT of both groups CG and EXG during pre-test was (CG, 29.90±.737, EXG, 30.00±.25) t value was-.287, therefore, $P < .05$.

Similarly, significant difference was found in ALP of both CG and EXG. ALP of both groups CG and EXG during pre-test was (CG, 90.60±8.19, EXG, 92.30±7.58) t value was -.481 therefore $P < .05$.

Hence, the researcher concluded that control and experimental group were similar and balanced in ALP and ALT before the exercises.

Table 6. Independent sample t-test showing the mean difference between control and experimental group in ALT and ALP mean score during posttest

Testing	Group	N	Mean	Std.	Mean	Df	T	Sig.
ALT	CG- Post	10	33.2000	3.15524	.99778	18	7.121	.000
	EG-Post	10	25.8000	.91894	.29059			
ALP	CG Post	10	132.900	16.36018	5.17354	18	7.191	.000
	EG Post	10	91.9000	7.57848	2.39653			

Table 6 indicated significant difference in ALT of both CG. ALT of both groups CG and EXG during post-test was (CG, 33.20 ±3.15, EXG, 25.80±.918) t value was 7.121, therefore, P < .05. Similarly, significant difference was found in ALP of both CG and EXG. ALP of both groups CG and EXG during post-test was (CG, 132.90±16.36. EXG, 91.90± 7.57) t value was 7.111 therefore P< .05. However, the researcher concluded that exercises put significant positive effect upon ALP and ALT of the youth mean age 20-30 and mean BMI 18-24

4. DISCUSSION

Based on analysis, it is find out that there is significant difference in ALT of both CG. ALT of both groups CG and EXG, during pre-test was (CG, 29.90 ±.737, EXG, 30.00±.25) t value was -.287. (P < .05). This emerging concept is supported by Rudberg et al. [14] by indicating that higher mean serum concentration of ALP (260.23±121.50 Vs 179.51±110.28) was reported in the subjects after exercise when compare with the pre-exercised values (P<0.05). The increase in the mean serum ALP activity in the subjects after the exercise could be as a result of haemo absorption that happened during the exercise because of increased sweating, body temperature or splenic contraction. It is also indicated that high intensity, short duration exercise increases the level of liver enzymes than low intensity, long term exercise and the longest increase corresponds to the perception of muscle soreness [15,16].

The study also revealed that there is significant difference in ALP of both CG and EXG. ALP, during pre-test was (CG, 90.60±8.19. EXG, 92.30± 7.58) t value was -.481 (P < .05). Hence, the researcher concluded that CG and EXG were similar and balanced in ALP and ALT before the exercises. Finding of the study conducted by Debourdeau et al. [17] indicated significant difference in the mean serum activity of AST in the subjects after exercise than before exercise (P>0.005). Therefore, these findings also linked with present study finding. Exercise strengthens the functional capacity of whole body systems, similarly, liver functions are also effected by exercise, depending on nature of exercise and nutritional supplementations [17,18] Exercise increase serum level of alanine aminotransferase (ALT) and aspartate aminotransferase (AST) [22].

5. CONCLUSION

Based on analysis, the researcher arrived at conclusion that in experimental group (EXG) the level of ALT and ALP was found significantly higher (p<0.05) as compared to control group (CG). The researcher further concluded that exercise with low intensity improve the functional capacity of liver in term of ALT, ALP and AST.

6. RECOMMENDATIONS

On the basis of findings and conclusion, the researcher recommended that;

1. For promoting the functional capacity of liver in term of ALT, ALP and AST, suitable exercise should be performed.
2. Exercise should be performed according to the nature of the body.
3. Body mass index should be calculated and accordingly performed the exercise.
4. For maintenance of liver function and avoiding the negative effect of exercise, proper dietary supplements such as grains, fruits, vegetables, meat and beans, milk, and oil.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The whole procedures of the study were carried out in accordance with the principles of the Declaration of Helsinki (1975) and was accordingly approved by Gomal University Ethical & Research Board (ref no:05/ERB/GU), KP, Pakistan. The trail was registered as clinical Trails (ref no:137/ERB/GU/19).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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