Journal of Positive School Psychology http://journalppw.com
2023, Vol. 7, No. 5, 311-318

Estimation Of Key Parameters Of Liver Among Healthy Volunteers Of Endurance Exercise

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Abstract

Background: Endurance exercises such as walking, jogging, running, dancing etc., are considered beneficial for health, such as cardiovascular fitness, reduction in cardiovascular problems, hypertension, high cholesterol, joint and muscular pain, diabetes and strengthening the bones. **Objective**: the study aimed to estimate the key parameters of the liver among healthy volunteers of endurance exercise. **Methods & Materials:** Study participants were randomly selected from the University of the Punjab, Lahore, Pakistan. The participants were thus categorized into two groups, i.e. control group (CG) and the experimental group (EG). Each group was formed of fifty (50) subjects. A self-made exercise protocol of endurance exercise was applied to EG. Ethical approval was taken from the ethical research and review board of the University of the Punjab, Lahore, Pakistan. Informed consent was taken from every subject before participation in the study, and all subjects were informed about the risks and benefits of participation in the study. Five (05) ml blood sample was collected from all subjects. Each blood sample was marked with a different identification code. **Results & Conclusions:** The pre and post-test results were processed through the statistical package for social sciences (SPSS, version-26). On the basis of data analysis and findings the researcher concluded that endurance exercises such as walking, jogging and running on the biochemical parameters of liver.

Keywords: Liver, Endurance Athletes, Athletes, Health, Sports

INTRODUCTION

The liver is a most significant solid human body organ that performs various functions, such as removing toxins body's blood supply, maintaining blood sugar levels, regulating blood clotting etc. It is placed below the rib cage in the right upper abdomen [1, 2].

There are different biochemical parameters of the liver, such as ALP (alkaline phosphatase), ALT (alanine transaminase), AST (aspartate aminotransferase**),** Bilirubin, lactate dehydrogenase (LD), gamma-glutamyl transferase (γGT), creatine kinase (CK) and myoglobin etc. [3,4]. Exercise-induced changes in these parameters of the liver. AST and ALT are both found to be

altered among high-intensity exercise performers. Likewise, LD, CK, and myoglobin are higher among the exercise performers of high intensity [5,6,7].

AST is also found in the liver, skeletal muscles, kidneys, brain, pancreas, lungs, leukocytes, and erythrocytes [8]20% of AST comes from the cytosol, while 80% comes from the mitochondria [9]. Cytosolic AST has a half-life of 17 hours, while mitochondrial AST has a half-life of 87 hours, although many laboratories do not distinguish between them. Clearance from plasma is performed by hepatocytes, sinusoidal cells, endothelial cells, and kupffer cells [10]. Zone 3 of the hepatic acinus has higher concentrations of AST, so damage to this zone by ischemia or toxins may result in greater levels of AST than ALT [8]. Exercise with different volumes and intensities also alters positively as well as negatively the various biochemical parameters of the liver [11,12].

Previous epidemiological studies have shown many health risks and mortality related to exercise and alcohol consumption [13,14]. Likewise, hundreds of deaths around the globe are reported every year concerning heavy alcohol consumption. Heavy alcohol consumption also causes violence and often leads to alcohol use disorders (AUDs) (alcohol abuse and dependence) [15, 16,17].

According to [18], patients with liver problems need moderate-intensity exercise of at least 150 minutes per week. In addition, resistance exercises such as weight training or activity should be coupled two days with moderate intensity exercise for healthy liver functions. Performing regular exercise is essential for every individual due to health points of view [19,20,25]. Exercise promotes health and reduces health problems such as type 2 diabetes and heart and circulatory diseases [21,22]. Liver problems may cause muscle wasting, and thus people become frail at an earlier age [23,24]. To make the muscle vigorous and healthy, regular exercise is suggested. Training is directly related to non-alcohol-related fatty liver disease (NAFLD). Along with a healthy diet, physical activities are indicated as a treatment for NAFLD [26, 27].

Research studies have shown that exercise positively affect fatty lover in different ways. Maximum peripheral insulin resistance reduces the excessive delivery of free fatty acid and glucose to synthesise free fatty acid in the liver. Exercise increases the oxidation of fatty acids, which helps to avoid mitochondrial and hepatocellular mutilation by reducing the release of damage-associated molecular patterns. In short, practice reduce the disease of rich liver problems [28, 29].

Long-term liver damage causes scar tissue formation, which harmfully affects liver health and leads to chronic liver damage cirrhosis. People with cirrhosis often suffer the loss of muscle mass and muscle strength. Consequently, physical exercise may be helpful to people with cirrhosis [31].

The liver plays a central role in converting one chemical species to another; thus, this process or function is the primary source for making drugs for defecation from the body. During the metabolism of drugs, many chemical species are formed, which cause hepatic injury. Likewise, medications, exercise and diet also play a role in producing antioxidants and reactive oxygen species. Therefore these two factors also need to consider important [32,33].

Strenuous exercise causes rhabdomyolysis [34,35]. The nature of rhabdomyolysis concerns the volume, intensity and frequency of training or exercise [36]. In addition, rhabdomyolysis is linked with training experience [35]. Low creatine kinase (CK) and myoglobin levels are observed in well-trained weightlifters. Hot environments, electrolyte imbalances, nutritional deficiencies, creatine supplements, alcohol, and gender are among the causative factors of rhabdomyolysis [35].

NAFLD is a leading cause of chronic liver problems. Increased physical activity is essential for NAFLD treatment and prevention.

Similarly, many NAFLD patients have sedentary and have poor fitness [36,37]. Regular exercise is crucial in managing NAFLD and other health-related problems such as extrahepatic cancer, cardiovascular events, and hepatocellular carcinoma [38,39,40]. Moderate-intensity exercise like brisk walking and light cycling help in improving histologic endpoints in patients with NAFLD [41].

As a result of all the above critical assessments of previous studies, it is clear that exercise significantly impacts various body functions. So what is the effect of exercise, particularly endurance exercise, upon the key parameters of the liver? To discover the facts, the researcher decided to conduct a research study titled "Estimation of Key Parameters of Liver among Healthy Volunteers of Endurance Exercise". The study used a quantitative research approach, showing its strength. In addition, based on anthropometric attributes such as age, gender and health status, the subject was recruited and examined, which proved the generalization of the study. Along with these, there were some limitations of the study, such as the study was only carried out among male student-athletes, and only endurance protocols were applied to the recruited subjects as a research intervention. These limitations may provide new insight for researchers to carry out such studies with new anthropometric attributes of subjects and other natures of the exercise.

MATHODS & MATERIALS:

The researcher adopted the below procedures to reach specific findings and conclusions.

Research Design

The study was associated with endurance exercise and assessment of key liver parameters among health volunteers; therefore, the researcher applied the experimental research design.

Participants

Study participants were randomly selected from the University of the Punjab, Lahore, Pakistan. The participants were thus categorized into two groups, i.e. control group (CG) and the experimental group (EG). Each group was formed of fifty (50) subjects. Moreover, all subjects were recruited and placed in a desired group based on inclusion criteria, i.e. Subjects aged more than 20 and less than 30 years, subjects with no chronic health problems and only male student-athletes were included.

Instruments & Instrumentation

Five (05) milliliter blood sample was collected from all subjects. Each blood sample was marked with a different identification code. The collected blood samples were registered to a local homecare laboratory to estimate the key parameters of the liver.

Exercise Intervention

The researcher made a self-made exercise protocol of eight weeks and thus applied it to the experimental group. The exercise protocol was comprised of regular walking and jogging. The researcher followed the total time duration of the exercise as per international guidelines of physical activities (150 minutes up to 300 minutes of daily physical activities with moderate to vigorous volumes and intensities for maintaining a healthy lifestyle)

Ethical Consideration

Ethical approval was taken from the University of the Punjab Lahore, Pakistan. All the subjects were informed about the risk and benefits of participation in the study, and thus written informed consent was taken from each subject.

Data Analysis

The results obtained during the pre and post-test were processed through the statistical package for social sciences (SPSS, version 26). Thus suitable statistical tools were applied for the analysis of data.

RESULTS

Table no.1 showing the anthropometric characteristics of both CG) and EG in term of age

Testing Variable	N	Rang	Mini	Max	Mean	SD
Age/Year	100	6.00	22.00	32.00	22.95	4.79

The above table no.1 shows the anthropometric characteristics of both CG) and EG in term of age. The total number of subjects in both groups was hundred (N-100). The minimum value was 22.00; the maximum value was 32.00. The mean and standard deviation was 22.95 ±4.79

Table 2. Descriptive analysis of Both CG and EG in term of ALT, ALP and AST

Testing Variable	N	Mini	Max	Mean	SD	Variance
ALT	100	26.00	36.00	30.35	4.11	10.71
ALP	100	112.00	162.00	142.25	15.50	211.30
AST	100	23.00	41.00	34.60	5.87	24.72
Valid N (List wise 50)						

The above table no.2 shows the deceptive analysis of all three biochemical parameters of the liver (ALT, ALP, AST). The total number of subjects in both CG and EG was 100. The mean and standard deviation of both groups in term of ALT was 30.35±4.11, the minimum range was 26.00, the maximum range was 36.00, and the variance was 10.71. likewise, the level of ALP in both groups shown by mean and standard deviation was 142.25±15.50, the minimum range was 112.00, the maximum range was 162.00, and the variance was 211.30, while the level of AST as shown by the mean and standard deviation of 24.60±5.87, the minimum range was 23.00, maximum range was 41.00 and variance was 24.72.

Table no.3 showing the Comparison of CG and EG in term of ALT

Testing Variable	N	Mean	SD	T	Sig
ALT (CG)	50	31.36	2.60	82..75	.000
ALT (EG)	50	33.10	4.11		

The above table shows the comparison of both CG and EG in term of ALT. The total number of subjects in both groups was 100. Data were expressed as mean and standard deviation. The mean and standard deviation of CG in term of ALT was 31.36±2.60. Likewise, the mean and standard deviation of EG was 33.10±4.11 t value was 82.75, and the level of sig was .000.

Table no.4 showing the Comparison of CG and EG in term of ALP

Testing Variable	N	Mean	SD	T	Sig
ALP (CG)	50	130.00	11.00	33.68	.000
ALP (EG)	50	142.25	15.50		

The above table shows the comparison of both CG and EG in term of ALP. The total number of subjects in both groups was 100. Data were expressed as mean and standard deviation. The

mean and standard deviation of CG in term of ALP was 130.00±11.00. Likewise, the mean and standard deviation of EG was 142.25±15.50, t value was 33.68, and the level of sig was .000.

Table no.3 showing the Comparison of CG and EG in term of AST

Testing Variable	N	Mean	SD	T	Sig
AST(CG)	50	31.31	5.40	17.83	.001
AST(EG)	50	34.61	5.88		

The above table shows the comparison of both CG and EG in term of AST. The total number of subjects in both groups was 100. Data were expressed as mean and standard deviation. The mean and standard deviation of CG in term of AST was 31.31±5.40. Likewise, the mean and standard deviation of EG was 34.61±5.88, t value was 17.83, and the level of sig was .001.

CONCLUSION

The study was carried out to assess the impact of endurance exercises such as walking, jogging, running, on the biochemical parameters, so this research, therefore, the study's finding, contributes a first insight to evaluate the exercise and biochemical changes of the liver. Based on the results, the researcher concluded that endurance exercise has a significant positive impact on the biochemical parameters of the liver, i.e. ALP (alkaline phosphatase), ALT (alanine transaminase) and AST (aspartate aminotransferase**)**. In line with this finding, the study conducted by [42] among low-intensity exercise performers with single-time posttest data analysis showed that exercise with moderate intensity influenced ALT, ALP and AST. The result of the study conducted by [43] among 12-week moderate-intensity aerobic exercise (jogging and walking) at 65%-70% of HR max did not affect liver function without modulating hepatic enzymes and lipid profiles in overweight among 50 years old age women, whereas cardiorespiratory fitness (CRF) by modifying VO_2max, WJTE, and SBP was developed. The result [44] states that resistance and aerobic training are equally practical for patients with liver problems. The study conducted by [45] concluded that there are no changes resulting from exercise in terms of liver enzymes such as alanine aminotransferase, aspartate aminotransferase and γ-glutamyl transpeptidase.

LIMITATIONS AND STRENGTH

The study used a quantitative research approach, showing its strength. In addition, based on anthropometric attributes such as age, gender and health status, the subject was recruited and examined, which proved the generalization of the study. Along with these, there were some limitations of the study, such as the study was only carried out among male student-athletes, and only brisk walking was applied to the recruited subjects as a research intervention. These limitations may provide new insight for researchers to carry out such studies with new anthropometric attributes of subjects and other natures of the exercise.

CONFLICTS OF INTREST

The researcher shown no conflict of interest.

FUNDING

This study is part of research project approved and financially supported by University of the Punjab, Lahore, Pakistan.

REFRENCES

1. Song, M., Xia, L., Sun, M., Yang, C., & Wang, F. (2018). Circular RNA in liver:

health and diseases. Circular RNAs: Biogenesis and Functions, 245-257.
2. Gao, B., Jeong, W. I., & Tian, Z. (2008). Liver: an organ with predominant innate immunity. Hepatology, 47(2), 729-736.
3. Singal, R., Singal, R. P., Sandhu, K., Singh, B., Bhatia, G., Khatri, A., & Sharma, B. P. (2015). Evaluation and comparison of postoperative levels of serum bilirubin, serum transaminases and alkaline phosphatase in laparoscopic cholecystectomy versus open cholecystectomy. Journal of Gastrointestinal Oncology, 6(5), 479.
4. Soyinka, O. O., Adeniyi, F. A., & Ajose, O. A. (2007). Biochemical parameters of liver function in artisans occupationally exposed to "vat dyes". Indian Journal of Occupational and Environmental Medicine, 11(2), 76.
5. Pettersson, J., Hindorf, U., Persson, P., Bengtsson, T., Malmqvist, U., Werkström, V., & Ekelund, M. (2008). Muscular exercise can cause highly pathological liver function tests in healthy men. British journal of clinical pharmacology, 65(2), 253-259.
6. Kim, J. V., & Wu, G. Y. (2020). Body Building and Aminotransferase Elevations: A Review. Journal of Clinical and Translational Hepatology, 8(2), 161.
7. Fernández-Lázaro, D., Mielgo-Ayuso, J., Seco Calvo, J., Córdova Martínez, A., Caballero García, A., & Fernandez-Lazaro, C. I. (2020). Modulation of exercise-induced muscle damage, inflammation, and oxidative markers by curcumin supplementation in a physically active population: a systematic review. Nutrients, 12(2), 501.
8. Kim, J. V., & Wu, G. Y. (2020). Body Building and Aminotransferase Elevations: A Review. Journal of Clinical and Translational Hepatology, 8(2), 161.
9. Giannini, E. G., Testa, R., & Savarino, V. (2005). Liver enzyme alteration: a guide for clinicians. Cmaj, 172(3), 367-379.
10. Garekani, E. T., Mohebbi, H., Kraemer, R. R., & Fathi, R. (2011). Exercise training intensity/volume affects plasma and tissue adiponectin concentrations in the male rat. Peptides, 32(5), 1008-1012.
11. Garekani, E. T., Mohebbi, H., Kraemer, R. R., & Fathi, R. (2011). Exercise training intensity/volume affects plasma and tissue adiponectin concentrations in the male rat. Peptides, 32(5), 1008-1012.
12. Devries, M. C., Samjoo, I. A., Hamadeh, M. J., & Tarnopolsky, M. A. (2008). Effect of endurance exercise on hepatic lipid content, enzymes, and adiposity in men and women. Obesity, 16(10), 2281-2288.
13. Lim, J. E., Kou, J., Song, M., Pattanayak, A., Jin, J., Lalonde, R., & Fukuchi, K. I. (2011). MyD88 deficiency ameliorates β-amyloidosis in an animal model of Alzheimer's disease. The American journal of pathology, 179(3), 1095-1103.
14. Brien, S. E., Ronksley, P. E., Turner, B. J., Mukamal, K. J., & Ghali, W. A. (2011). Effect of alcohol consumption on biological markers associated with risk of coronary heart disease: systematic review and meta-analysis of interventional studies. Bmj, 342.
15. Ronksley, P. E., Brien, S. E., Turner, B. J., Mukamal, K. J., & Ghali, W. A. (2011). Association of alcohol consumption with selected cardiovascular disease outcomes: a systematic review and meta-analysis. Bmj, 342, d671.
16. National Institute for Alcohol Abuse and Alcoholism: Drinking Levels Defined. http://www.niaaa.nih.gov/alcohol-health/overview-alcohol-consumption-moderate-binge-drinkingRetrieved. Jan 10–2014
17. Greenfield, T. K., Ye, Y., Bond, J., Kerr, W. C., Nayak, M. B., Kaskutas, L. A., ... & Kranzler, H. R. (2014). Risks of alcohol use disorders related to drinking patterns in the

US general population. Journal of studies on alcohol and drugs, 75(2), 319-327.

18. American College of Sports Medicine and their Exercise Is Medicine. Being Active When You Have Chronic Liver Disease. https://www.exerciseismedicine.org/assets/page_documents/EIM_Rx%20for%20Health_Chronic%20Liver%20Disease.pdf
19. Vanhees, L., Lefevre, J., Philippaerts, R., Martens, M., Huygens, W., Troosters, T., & Beunen, G. (2005). How to assess physical activity? How to assess physical fitness?. European Journal of Preventive Cardiology, 12(2), 102-114.
20. Cordero, A., Masiá, M. D., & Galve, E. (2014). Physical exercise and health. Revista Española de Cardiología (English Edition), 67(9), 748-753.
21. Alberti, K. G. M. M., Zimmet, P., & Shaw, J. (2007). International Diabetes Federation: a consensus on Type 2 diabetes prevention. Diabetic Medicine, 24(5), 451-463.
22. Pandey, A., Chawla, S., & Guchhait, P. (2015). Type-2 diabetes: Current understanding and future perspectives. IUBMB life, 67(7), 506-513.
23. Wilhelm-Leen, E. R., Hall, Y. N., Deboer, I. H., & Chertow, G. M. (2010). Vitamin D deficiency and frailty in older Americans. Journal of internal medicine, 268(2), 171-180.
24. Kirwan, R., McCullough, D., Butler, T., Perez de Heredia, F., Davies, I. G., & Stewart, C. (2020). Sarcopenia during COVID-19 lockdown restrictions: long-term health effects of short-term muscle loss. GeroScience, 42(6), 1547-1578.
25. Bertolotti, M., Lonardo, A., Mussi, C., Baldelli, E., Pellegrini, E., Ballestri, S., ... & Loria, P. (2014). Nonalcoholic fatty liver disease and aging: epidemiology to management. World journal of gastroenterology: WJG, 20(39), 14185.
26. Lombardi, R., Onali, S., Thorburn, D., Davidson, B. R., Gurusamy, K. S., & Tsochatzis, E. (2017). Pharmacological interventions for non-alcohol related fatty liver disease (NAFLD). Cochrane Database of Systematic Reviews, (3).
27. Lonardo, A., Arab, J. P., & Arrese, M. (2021). Perspectives on precision medicine approaches to NAFLD diagnosis and management. Advances in Therapy, 38(5), 2130-2158.
28. Argo, C. K., Henry, Z. H., & Caldwell, S. H. (2017). Nonalcoholic fatty liver disease. Schiff's Diseases of the Liver, 867-908.
29. van der Windt, D. J., Sud, V., Zhang, H., Tsung, A., & Huang, H. (2018). The effects of physical exercise on fatty liver disease. Gene expression, 18(2), 89.
30. Aamann, L., Dam, G., Rinnov, A. R., Vilstrup, H., & Gluud, L. L. (2018). Physical exercise for people with cirrhosis. Cochrane Database of Systematic Reviews, (12).
31. Purkins, L., Love, E. R., Eve, M. D., Wooldridge, C. L., Cowan, C., Smart, T. S., ... & Rapeport, W. G. (2004). The influence of diet upon liver function tests and serum lipids in healthy male volunteers resident in a Phase I unit. British journal of clinical pharmacology, 57(2), 199-208.
32. Giboney, P. T. (2005). Mildly elevated liver transaminase levels in the asymptomatic patient. American family physician, 71(6), 1105-1110.
33. Pavletic, A. J., Pao, M., & Wright, M. E. (2015). Exercise-induced elevation of liver enzymes in a healthy female research volunteer. Psychosomatics, 56(5), 604.
34. Kim, J., Lee, J., Kim, S., Ryu, H. Y., Cha, K. S., & Sung, D. J. (2016). Exercise-induced rhabdomyolysis mechanisms and prevention: A literature review. Journal of sport and health science, 5(3), 324-333.

35. Bäcker, H. C., Busko, M., Krause, F. G., Exadaktylos, A. K., Klukowska-Roetzler, J., & Deml, M. C. (2020). Exertional rhabdomyolysis and causes of elevation of creatine kinase. The Physician and sportsmedicine, 48(2), 179-185.
36. Argo, C. K., Stine, J. G., Henry, Z. H., Lackner, C., Patrie, J. T., Weltman, A. L., & Caldwell, S. H. (2018). Physical deconditioning is the common denominator in both obese and overweight subjects with nonalcoholic steatohepatitis. Alimentary pharmacology & therapeutics, 48(3), 290-299.
37. Stine, J. G., Soriano, C., Schreibman, I., Rivas, G., Hummer, B., Yoo, E., ... & Sciamanna, C. (2021). Breaking down barriers to physical activity in patients with nonalcoholic fatty liver disease. Digestive Diseases and Sciences, 66, 3604-3611.
38. Schneider, C. V., Zandvakili, I., Thaiss, C. A., & Schneider, K. M. (2021). Physical activity is associated with reduced risk of liver disease in the prospective UK Biobank cohort. JHEP Reports, 3(3), 100263.
39. Schneider, C. V., Zandvakili, I., Thaiss, C. A., & Schneider, K. M. (2021). Physical activity is associated with reduced risk of liver disease in the prospective UK Biobank cohort. JHEP Reports, 3(3), 100263.
40. Thorp, A., & Stine, J. G. (2020). Exercise as medicine: the impact of exercise training on nonalcoholic fatty liver disease. Current hepatology reports, 19, 402-411.
41. Simon, T. G., Roelstraete, B., Khalili, H., Hagström, H., & Ludvigsson, J. F. (2021). Mortality in biopsy-confirmed nonalcoholic fatty liver disease: results from a nationwide cohort. Gut, 70(7), 1375-1382.
42. O'Gorman, P., Naimimohasses, S., Monaghan, A., Kennedy, M., Melo, A. M., Ní Fhloinn, D., ... & Norris, S. (2020). Improvement in histological endpoints of MAFLD following a 12-week aerobic exercise intervention. Alimentary Pharmacology & Therapeutics, 52(8), 1387-1398.
43. Khan, A., Khan, S., Khan, S., Bhatti, S., & Khan, S. (2019). Impact of low-intensity exercise on liver enzymes and antioxidants systems of the body. International Journal of Medical Research & Health Sciences, 8(7), 148-155.
44. Tartibian, B., Malandish, A., Afsargharehbagh, R., Eslami, R., & Sheikhlou, Z. (2018). Assessment of hepatic and lipid profiles following 12 weeks of aerobic exercise in overweight postmenopausal women. International Journal of Basic Science in Medicine, 3(4), 159-167.
45. Gonzalez-Ruiz, K., Ramirez-Velez, R., Correa-Bautista, J. E., Peterson, M. D., & Garcia-Hermoso, A. (2017). The effects of exercise on abdominal fat and liver enzymes in pediatric obesity: a systematic review and meta-analysis. Childhood Obesity, 13(4), 272-282.
46. Smart, N. A., King, N., McFarlane, J. R., Graham, P. L., & Dieberg, G. (2018). Effect of exercise training on liver function in adults who are overweight or exhibit fatty liver disease: a systematic review and meta-analysis. British journal of sports medicine, 52(13), 834-843.