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Research Article

Biochemical Assessments of Some Liver Function Parameters in Football Players and Sedentary at Rest

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ABSTRACT

Studies have revealed that athletes exhibit resting values of certain parameters that differ from those of the general population. This study aimed to assess the liver function status in football players and sedentary at rest. With a purposeful sampling technique, 20 male football players and 20 sedentary were recruited for this observational study following inclusion and exclusion criteria. The Ahmadu Bello University review board approved all procedures under the Declaration of Helsinki. Blood samples were taken at rest, to measure the liver function profiles. The independent t-test was used to compare the values. The level of significance was set at P< 0.05. Our result showed a significant decrease (p<0.05) in serum ALT activity (27.70 ± 2.1 IU/L vs 38.85 ± 3.0 IU/L) with a significant increase (p<0.05) in serum total bilirubin (11.35 ± 2.6 mmol/L vs 4.80 ± 1.6 mmol/L), and serum albumin (48.75 ±1.0 g/L vs 44.35 ± 0.7 g/L respectively) among the football players compared to sedentary. Notably, the AST activity and ALP value among the football players exceeded the normal limit but was not statistically significant (p> 0.05). These results suggested that regular football training increased liver function at rest. This observation has implications for sports medicine.

Keywords: Football Players; Sedentary; Liver Function; Serum

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INTRODUCTION

Physical exercise induces significant changes in hepatic hemodynamics due to the increased demand from the skin and active muscle tissue. The liver plays a crucial role in energy-requiring processes such as ureagenesis, futile cycling of substrates, gluconeogenesis, protein synthesis, and ketogenesis (Müller, 1995). Research has shown that athletes often exhibit resting values for certain parameters that differ from those of the general population (Crespo *et al*., 1995; Hartmann & Mester, 2000). However, these effects appear to vary based on the intensity, duration, and frequency of exercise, as well as the physical and physiological condition of the individuals (Koç & Tamer, 2008). To achieve beneficial physiological changes through regular exercise, the intensity and frequency of exercise must be carefully regulated (Turgay *et al*., 2002). Soccer, a team sport played outdoors, requires a high level of preparation to sustain 90 minutes of competitive play (Popovic *et al*., 2012; 2013 & 2014). Adequate monitoring of functional status is essential to ensure effective recovery and continued success in professional athletics (Meeusen *et al*., 2013). However, there is a notable lack of data specifically comparing resting liver function markers between football players and sedentary individuals. Understanding these differences is essential for assessing the impact of regular football training on liver function. Therefore, this study aims to compare liver function status at rest between football players and sedentary individuals to fill this research gap and provide insights into the effects of football training on liver health.

MATERIALS AND METHODS

Subjects

Using a purposeful sampling technique, a sample of 20 adult male football players and 20 age-matched sedentary individuals were recruited for this study. All football players were members of soccer clubs and had been training for at least four years, with sessions occurring at least four days per week, each lasting 1 to 1.5 hours. The sedentary individuals had not engaged in regular sports activities. Inclusion criteria for participants required that they had no history of diseases, were not using steroids or other banned substances, were non-smokers, and had no history of liver disorders. The study was approved by the university's institutional review board (ABUTH/HREC/TRG/36) and was conducted in accordance with the Declaration of Helsinki. Participants were required to visit the research laboratory to complete and sign a medical questionnaire and informed consent form, following the guidelines set by the American College of Sports Medicine (1991). Participants were fully briefed on the experimental procedures, risks, and protocol, and were informed that they could withdraw from the study at any time.

Blood Sampling

Venous blood samples were collected into plain tubes from a forearm vein with minimal stasis after approximately 10 min of rest in a sitting position between 8 and 9 am, after an overnight fast and at least 24 hours from the last workout. The blood sample was left to coagulate for 30 min at room temperature and was centrifuged at 1500 x g for 10 min in order to separate the serum for the liver function biochemical analysis. The serum was stored at -20 °C before analyses.

Assays

Serum samples were analyzed for albumin and total protein using the method described by Doumas *et al.* (1971). Aspartate aminotransferase (AST) levels were measured following the procedure outlined by Schumann *et al*. (2002a). Alanine aminotransferase (ALT) was assessed according to the method of Schumann *et al*. (2002b), and alkaline phosphatase (ALP) levels were determined using the technique specified by German Society for Clinical Chemistry (1972). Total and conjugated bilirubin were measured as described by Schumann *et al*. (2002b). These analyses were performed with a Selectra XL Vital Scientific laboratory analyzer. All tests were conducted in the Department of Chemical Pathology at Ahmadu Bello University Teaching Hospital, Zaria, Nigeria.

Data Analysis

The data are presented as mean ± standard error of the mean ($\bar{X}$ ± SEM). Statistical analyses were performed using SPSS software (version 20.0). An independent samples t-test was employed to compare values between the two groups. Statistical significance was set at a p-value of less than 0.05.

RESULTS

Physical characteristics of the study population (n=40)

The mean physical characteristics of the study population were presented in Table 1. There was no significant difference (p> 0.05) in age and body weight between the football players and the sedentary group. However, height of the football players was significantly higher (p< 0.05) compared to sedentary. Notably, the body mass index among the football players, reduced significantly (p< 0.05) compared to the sedentary.

Table 1: Physical characteristics of the study population (n=40)

Characteristics	Football Players (20)	Sedentary (20)
AGE (Years)	20.60±0.5 ns	20.00±0.4
HEIGHT (meters)	1.76±0.0*	1.70±0.0
WEIGHT (kg)	60.25±1.3 ^{ns}	58.60±1.0
B M I (kg/m^2)	19.34±0.2*	20.19±0.3

BMI = body mass index
* = Statistically significant (p<0.05) male football players vs. sedentary
ns = Not statistically significant (p>0.05)

Biochemical Assessment of Liver Function Tests

The mean liver function tests between the two groups at rest were presented in Table 2. The football players, serum albumin (48.75±1.0) was significantly higher (p< 0.05) when compared to the sedentary, serum albumin (44.35±0.7). A significant decrease (p< 0.05) in the serum ALT activity (27.70±2.1vs 38.85±3.0) was observed among the football players compared to the sedentary group at rest. However, the serum AST activity, ALP and total protein concentrations exhibited no significant difference (p> 0.05) (Table 2 and Figure 4.5) when compared between the football players and sedentary groups at rest. However, serum AST activity, ALP and total protein concentrations showed increased trend among the football players (26.85±2.10; 93.60±11.90 and 82.80±1.44) as compared to the sedentary group (21.20±3.0; 90.90±8.82 and 80.15±1.4) at rest respectively. Notably, The AST activity and ALP value among the football players exceeded the normal limit. Moreover, serum TBIL concentrations exhibited a significant increase (p< 0.05) among the football players (11.35±2.6) compared to the sedentary group (4.80±1.6) at rest.

Table 2: The mean resting liver function tests between adult male football players and sedentary

Parameters	Football players	Sedentary group	p-value*	Normal range
AST (IU/L)	26.85±2.10	21.20±3.0	0.135	5-22
ALT (IU/L)	27.70±2.1	38.85±3.0	0.005	16-40
ALP (IU/L)	93.60±11.90	90.90±8.82	0.856	21-92
Albumin (g/dL)	48.75±1.0	44.35±0.7	0.001	30-50
Total protein (g/dL)	82.80±1.44	80.15±1.4	0.205	60-82
Total bilirubin (mmol/L)	11.35±2.6	4.80±1.6	0.046	4-17

DISCUSSION

The present study aimed to compare the biochemical markers of liver function between football players and sedentary individuals at rest. Aminotransferases, specifically alanine aminotransferase (ALT) and aspartate aminotransferase (AST), are key indicators of hepatocyte injury, as they measure the concentration of intracellular hepatic enzymes that have leaked into the bloodstream. ALT is particularly significant as it is more specific to liver damage than AST. In this study, we observed a significant decrease (p < 0.05) in resting serum ALT levels among football players (27.70 ± 2.1 IU/L) compared to sedentary individuals (38.85 ± 3.0 IU/L). This finding is at variance with the findings of previous studies by Pettersson (2008) and Ermili *et al.,* (2012), which reported increased ALT levels following strenuous exercise. The reduced ALT levels observed in this study may be attributed to the intensity and duration of football training, as well as the subsequent reperfusion of the liver, which may suggest improved hepatocyte integrity at rest. Pettersson *et al.,* (2008) reported that strenuous exercise significantly increased AST and ALT levels for at least seven days post-exercise. Similar findings were reported by Dickerman *et al.,* (1999). Altogether, our result showed that reduction in ALT levels suggests that regular football training may enhance liver function and hepatocyte integrity at rest.

Regarding other liver function markers, this study found a significant increase in resting serum total bilirubin (TBIL) levels among football players (11.35 ± 2.6 mmol/L) compared to sedentary individuals (4.80 ± 1.6 mmol/L). Our result does not agree with the findings of Menevse (2011). The discrepancy may be due to differences in training methods. Menevse reported an insignificant decrease in TBIL levels among athletes compared to sedentary individuals. The elevated TBIL levels in this study could be linked to increased heme oxygenase-1 (HO-1) activity (Loprinzi and Abott 2014), the enzyme responsible for converting biliverdin to bilirubin. In addition to increase in HO-1 activity, other potential mechanisms may also be related to physical activity-induced intravascular hemolysis (Burtis and Tietz 199) following training adaptation. Some forms of exercise may not sufficiently activate the HO-1 system or induce haemolysis, potentially explaining the differences observed between this study and the previous research. Despite previous studies linking low bilirubin levels with increased risks for cardiovascular disease (Djousse *et al*., 2001), metabolic syndrome (Giral *et al*., 2010), type 2 diabetes (Han *et al*., 2010), stroke severity (Xu *et al*., 2013), certain cancers (Zucker *et al*., 2004), autoimmune diseases (Yang *et al*., 2012), and psychiatric disorders (Radhakrishnan *et al*., 2011), our findings suggest that football training may positively affect biliary tract integrity. Additionally, ALP levels among football players were elevated but did not reach statistical significance, possibly due to factors such as bone growth or liver cell damage (Hartmann & Mester, 2000).

Finally, in this study, we observed a statistically significant increase (p<0.05) in resting serum albumin levels among football players (48.75 ± 1.0 g/L) compared to sedentary individuals (44.35 ± 0.7 g/L). This result aligns with the finding of Crespo *et al.,* (1995), who reported higher pre-albumin levels in athletes. The increased serum albumin levels could enhance the water-binding capacity of the blood due to plasma hypervolemia associated with training, potentially indicating an increase in the anabolic functioning of hepatic cells at rest.

CONCLUSION

In conclusion, the study suggests that regular football training may improve liver function at rest, as indicated by the reduced ALT levels, elevated bilirubin, and increased albumin levels, thereby potentially promoting overall liver health and hepatocyte integrity.

Conflict of Interests
The authors have no conflict of interests to disclose in this study.

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