

Biochemical Parameters in Professional Male Footballers Before and After Training

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ABSTRACT The goal of this study is exploring serum alterations related to acute coronary sendrom, muscle deterioration, hypoglysemia and the other variables in the serum of the fifteen footballers. Fifteen professional male footballers (mean (SD) age: 24 (4.4) years) were gathered from a 3rd league team. Blood samples were collected from them before and after exercise. Blood samples were analyzed by standard methods and the results were corrected in the biochemistry laboratory. The average pre- and post-exercise biochemical values of 15 footballers are found below. The glucose in the serum is 62.3 ± 3.9 (before) and 69.5 ± 7.8 (after) ($P < 0.05$) for pre- and post-exercise, respectively. The urea in the serum is 36 ± 9.5 (before) and 34.4 ± 9.2 (after) ($p > 0.05$). The creatine in the serum is 0.9 ± 0.1 (before) and 0.8 ± 0.9 (after) ($p > 0.05$). The CK in the serum is 309.9 ± 200.9 (before) and 253 ± 149.7 (after) ($p > 0.05$). The CK-MB in the serum is 17.9 ± 6.3 (before) and 14.5 ± 5.4 (after)($p > 0.05$). The total bilirubin in the serum is 0.8 ± 0.4 (before) and 0.8 ± 0.5 (after) ($p > 0.05$). The albumin in the serum is 4.1 ± 0.3 (before) and 4.1 ± 0.2 (after) ($p > 0.05$). The BUN (blood urea nitrogen) in the serum is 16.7 ± 4.4 (before) and 16.3 ± 4.5 (after) ($p > 0.05$) (Table 1). Although broad variety of biochemical perturbations is present during acute physical stress, many parameters remain within regular limits.

INTRODUCTION

The researchers have performed this study for stating serum alterations that are associated with acute coronary sendrom, muscle breakdown, hypoglysemia and many other variables in the serum of these players. This study is made for designating biochemical alterations of the sportsmen on behalf of exercise. In particular, to attempt to clarify series of issues related to ultra-endurance sport, specifically the incidence of hyponatraemia, the time course of changes in indicators of skeletal muscle harm, and possible tissue damage (Fallon et al. 1999).

“Footballers run the risk of incurring mild head injury from a variety of sources, including the intentional use of the head to play the ball, known as heading” (Bamac et al. 2011). “Some studies have reported that no neurochemical proof or neuropsychological disorder for brain damage caused by heading in soccer” (Zetterberg et al. 2007; Bamac et al. 2011).

MATERIAL AND METHODS

Fifteen male footballers (mean (SD) age, 24 (4.4) years) were gathered from a third league team. Blood samples were collected from them

before and after the exercise. Blood samples were analyzed by standard methods, and results were corrected in biochemistry laboratory. In the present study 5 mL of blood was obtained from each player of a soccer team. All players were informed about the study procedure and purpose, and informed consent was obtained from each player. The running exercise programs of soccer players were set as follows (Duman et al. 2013):

- Warm-up running for 20 minutes
- A 7.5-minute running in which the pulse was kept at 150-160 per minute
- A cool-down period with 2.5 minutes of jogging (Duman et al. 2013).

This set of exercises was repeated three times. Then, the exercise period was completed with a 10-minute running period during which the pulse was maintained at 150-160 per minute again. The blood samples were collected in tubes without preservatives. The samples were allowed to form clots for 30 minutes and then centrifuged at 2500 g for 10 minutes to separate the serum. The serum samples were tested immediately (Duman et al. 2013).

Statistical Analysis

The non-parametric Mann-Whitney U test was used to test differences between pre-exercise and

post-exercise data. Means (SD) are given as descriptive statistics. SPSS (version 15.0) was used for statistical analyses (SPSS Inc., Chicago, Illinois, USA) (p value <0.05 was considered statistically significant) (Banac et al. 2011).

RESULTS

The average pre- and post-exercise biochemical values of 15 footballers are found below. The glucose in the serum is 62.3 ± 3.9 (before) and 69.5 ± 7.8 (after) ($P < 0.05$). The urea in the serum is 36 ± 9.5 (before) and 34.4 ± 9.2 (after) ($p > 0.05$). The creatine in the serum is 0.9 ± 0.1 (before) and 0.8 ± 0.9 (after) ($p > 0.05$). The CK in the serum is 309.9 ± 200.9 (before) and 253 ± 149.7 (after) ($p > 0.05$). The CK-MB in the serum is 17.9 ± 6.3 (before) and 14.5 ± 5.4 (after) ($p > 0.05$). The total bilirubin in the serum is 0.8 ± 0.4 (before) and 0.8 ± 0.5 (after) ($p > 0.05$). The albumin in the serum is 4.1 ± 0.3 (before) and 4.1 ± 0.2 (after) ($p > 0.05$). The BUN (blood urea nitrogen) in the serum is 16.7 ± 4.4 (before) and 16.3 ± 4.5 (after) ($p > 0.05$) (Table 1).

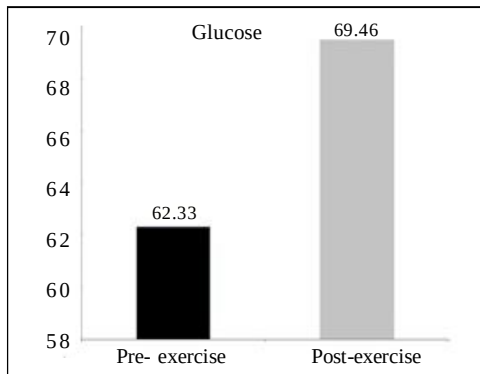


Fig. 1. Pre- and post-exercise glucose

There are some studies that support these results. Ferreira et al. (2016) had 20 athletes to run 5 and 21 km. After this test, they found that the glucose levels of the two groups increased significantly after the run. They did not clarify the glucose increase clearly. Because in their study the athletes were stressed in view of adrenaline increasing, which is responsible for glycolysis. The researchers also found significant glucose increase in this study.

Forty-four obese women performed endurance (22 women) or endurance-strength (22 women) exercise in a study (Skrypnika et al. 2016). They found that either of serum bilirubin (direct and indirect) levels is not affected from both endurance and endurance-strength training (Skrypnika et al. 2016). The researchers also found the same results for total bilirubin.

DISCUSSION

There are many studies that indicate the serum levels alter with sports (Mussack et al. 2003; Shewchenko et al. 2005; Colak et al. 2010; Duman et al. 2010; Kanko et al. 2012). Mashiko et al. (2004) reported that ALT and AST levels in serum of the sportsmen had significantly increased after the training program applied in 20 days camping period ($p < 0.05$). Stuart et al. (2004) stated that the acute exercises performed on treadmill caused an increase in serum glucose level. Goodman et al. (1996) tested 20 male runners in 21 kilometers marathon in their study. They found that the runners' serum levels of myoglobin had significantly increased just after the run, but CK serum levels had increased 24 hours after the run ($p < 0.001$). Ergun et al. (2006) stated that a twelve-week training program had increased the urea levels of the three groups, which were composed of

Table 1: The biochemical values before and after exercise (Mean $\pm$ SD)

Biochemical parameters	Pre- exercise	Post- exercise	P
Glucose (mg/dl)	62.3 $\pm$ 3.9	69.5 $\pm$ 7.8	<0.05*
Urea (mg/dl)	36 $\pm$ 9.5	34.4 $\pm$ 9.2	>0.05
Creatine (mg/dl)	0.9 $\pm$ 0.1	0.8 $\pm$ 0.1	>0.05
Creatin kinase(CK)	309.9 $\pm$ 200.9	253 $\pm$ 149.7	>0.05
CK-MB	17.9 $\pm$ 6.3	14.5 $\pm$ 5.4	>0.05
Bilirubin (mg/dl)	0.8 $\pm$ 0.4	0.8 $\pm$ 0.5	>0.05
Albumin (g/dl)	4.1 $\pm$ 0.3	4.1 $\pm$ 0.2	>0.05
BUN (mg/dl)	16.7 $\pm$ 4.4	16.3 $\pm$ 4.5	>0.05

Values shown are mean $\pm$ standard deviation (mean $\pm$ SD), *Significant differences between Pre- Exercise and Post-Exercise ($p < 0.05$).

10 people and which were applied three different endurance aerobic training.

Cakmakci and Pulur (2008) investigated the biochemical effects of the fifteen taekwondo sportswomen who had been trained 4 weeks before the European Championship with very intense training program. The mean of the sportswomen's ages were 22.26 ± 3.29 years. They found that AST, ALT and glucose levels of the sportswomen's serums increased significantly. However, they stated that urea levels of those were not significantly different from that of pre-exercise serum levels. Therefore, in these studies it has been reported that some of the biochemical parameters vary with the exercise.

"A wide variety of biochemical perturbations occur during soccer playing but a number of variables remain within normal limits despite severe physical stress" (Corrado et al. 2006; Duman et al. 2013). "The mechanism of exercise-related sudden death in young competitive athletes includes a number of triggers, such as acute myocardial ischemia, sympathetic stimulation, and abrupt hemodynamic changes, leading to life-threatening ventricular arrhythmias" (Corrado et al. 2006; Duman et al. 2013). "During exercise, physical and metabolic changes occur, which lead to an increased risk of acute coronary complications and life-threatening myocardial ischemia" (Corrado et al. 2006; Duman et al. 2013).

Arakawa et al. (2016) performed a study about changing biochemical serum parameters on 18 nonprofessional sportsmen who completed a 2-day ultra-marathon that includes 130 km running and climbing. The serum parameters were explored before the exercise, first day of the exercise, just after the exercise, one day, three days and five or six days after the exercises. They stated that just after the exercise the BUN, CK, creatine, total bilirubin levels had been increased significantly and albumin levels had been decreased significantly. They also pointed that the muscle injury and the excessive fluid loss because of the hard conditions of the ultra-marathon was the reason of biochemical alterations. However, in this study the researchers did not find any significant change in these parameters. The researchers think that the exercise conditions are not as hard as in the study by Arakawa et al. (2016).

The glucose, Albumin, Billuribin, Bun, Ck, Ckmb, Glucose and creatine that are free in the

circulation are debated to be reliable markers showing off visceral harm (Gold et al. 2003; Duman et al. 2007). For example, increased levels of NGF should be interpreted with caution since its effect seems to depend on the respective receptors and could be neuro-protective or detrimental in nature (Gold et al. 2003; Bamac et al. 2011).

The biochemical parameters should be inquired not solely in pathological diseases but also in individuals practicing vigorous sport activities.

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