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**URINARY EXCRETIONS OF HEAVY MOLECULAR WEIGHT PROTEINS AFTER A
SOCCER MATCH AMONG AMATEUR MALE FOOTBALL PLAYERS**

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ABSTRACT

Proteinuria is a renal impairment and denotes the presence of proteins in urine. Nevertheless, the sport proteinuria, which occurs following physical activities and is mostly common among intense ones, is a reversible and moderate process and does not accompany with symptoms. Ten volunteer amateur young football players of Esteghlal Shiraz FC with averages of age of 18±0.5 year old, height of 174±3.44 cm, weight of 63.12±3.51 and VO_{2max} of 48.3±3.1 (ml/ (kg.min)) participated in a 90 min soccer game. Blood samples were taken, before, immediately then and 45 min after the match, and urinary globulin and total protein concentrations were determined by electrophoresis method. The concentrations of total protein and urinary protein significantly increased, immediately then the competition (P≤0.05). Although these concentrations were still significantly higher than their relaxation levels, but they had relieved abated back to the relaxation amounts. The post-soccer match proteinuria could not limit the athlete. Indeed, post-exercise proteinuria is a temporary and reversible process and differs from pathologic proteinuria.

Keywords: Proteinuria, Total Protein, Globulin, Soccer Match

INTRODUCTION

The several researches that are accomplished about sport physiology and its subcategories open new widows of erudition toward unknown pale of this science. Proteinuria or urinary protein excretion is a phenomenon, which is one of the under study topics of those annual researches, and the scholars essay to clarify heretofore unclear issues of that. Proteinuria is a renal impairment and denotes the presence of proteins in urine. Nevertheless, the sport proteinuria, which occurs following physical activities and is mostly common among intense ones, is a reversible and moderate process and does not accompany with symptoms. The Post-exercise urinary proteins excretions are well-known phenomena. Heavy proteins would not pass through glomerular membrane and exist negligibly in urine, though their urinary levels would heighten at glomerular wastage, which is called glomerular proteinuria [3, 7, 8].

The collection of plasma proteins is named total protein. The appearance of total protein in urine indicates glomerular dysfunction [1]. Urine formation begins with filtration of large amounts of liquid from glomerular capillaries into Bowman's capsule. Like most capillaries, the glomerular capillaries are relatively impermeable, in a manner that the liquid

filtration (named glomerular filtration) is actually protein free [13].

The glomerular filtration is nearly plasma protein minus, and the filtration has only 0.03% protein [8]. In order to determine whether molecules expose the filtration, the glomerular refinement wall selectively operates, based on the size and the electricity load [8]. Albumin, globulins and fibrinogen are the most substantial total proteins that fibrinogen and albumin are the largest and smallest ones among them, respectively. The urinary total protein is a biochemical test for measurement of whole amounts of proteins in urine [21]. There are three kinds of globulins, which are famed as α , β and γ -globulins and have several important roles. Some of them are insoluble in water, though they are soluble in dilute saline solutions [9, 14, 20].

Agha Ali Nejad (1994) stated the difference in excretions of urinary total protein was significant between two groups of athletic and non-athletic male students, following an activity with 75 percentage of maximal aerobic power [1]. Shahidi (1994) declared the average of urinary total protein excretions would increase after activities with the range of 75-90 percentage of maximal aerobic power, among athletic male students [2]. Boileau *et al.*, (1980) reported proteinuria

among 30% of their subjects, in a study on 383 marathon runners after 42.195 kilometers running [6]. De Meersman *et al.*, (1982) surveyed nine Judo players and their subjects' urine samples were investigated 1, 2, 4, 9 and 24 hrs after the activity. Proteinuria of the samples increased following trauma occurrence [10].

Gilli *et al.*, (1984) surveyed 132 endurance runners in aspect of urinary anomalies. Their urinary microscopic examinations indicated 95% of the subjects have at least one kind of urinary anomaly. Proteinuria (solely or in company with microscopic hematuria) is observed, in some samples. The whole anomalies would disappear, after 24 to 36 hrs [11]. Proteinuria is an unstable stage with half-life of about 1 hr, and maximal excretion of protein would occur between first 20 to 30 min of after the activity [3, 4, 12, 16, 17, 18].

The aim of the present research was determination of the effects of a soccer game on urinary excretions of heavy molecular weight proteins, among amateur male football players.

SUBJECTS AND METHODS

Subjects

The subjects of the research consisted of 10 young male competitive football players of Esteghlal Shiraz FC with averages of age of 18 ± 0.5 year old, height of 174 ± 3.44 cm,

weight of 63.12 ± 3.51 and $VO_2\text{max}$ of 48.3 ± 3.1 (ml/ (kg.min)). They had the precedence of recent 3 years playing at premier leagues of Shiraz city and Fars province of Iran. In accordance with the club and explaining the goals of the research, the ten line-up football players of the club were purposefully chosen, before a 90 min friendly match. The subjects were arranged to play the whole 90 min of the match.

Data Collecting Method

After selection of the subjects, the complete information about the method and steps of the research was given to them. Then, they filled the informed consent form, and their healthiness was approved, after medical examinations. They were asked to avoid consumption of foods rich in protein and fat, and caffeine. In addition, they were avoided to do any physical activity, from 48 hr before the match beginning. They were demanded to discharge their bladders, in the morning of match day. Thereafter, they rested sitting in an appropriate place, and went to the game field, 2 hrs before the competition beginning. The subjects drank enough water for samples collecting of before and after the game, in the morning of match day. Urine samples were gathered, before, immediately then and two hrs after the competition [15]. At both turn of samples collecting, the samples were

preserved in specific containers and at temperature of 4°C, delivered to the lab, utmost in span of 30 min. The gathered samples were analyzed by the method of urine electrophoresis, and levels of total protein and globulin were determined, for each sample.

Exercise Schedule

The exercise schedule involved a 90 min soccer competition (consisting two times of 45 min and 15 min half-time rest).

Statistical Approach

At first, the statistical test of Kolmogorov-Smirnov was implemented to determine the usage of whether parametric or non-parametric tests and naturalness of the data distribution was approved to apply parametric ones. Therefore, the statistical method of variance analysis with repeated measurements was implemented, to investigate changes of urinary globulin and total protein, before, immediately then and two hrs after the match. In order to determine origins of differences, T-paired test with Bonferroni modification was used.

RESULTS

Table 1 shows the statistical results concerned to variations of under study variables, from before to immediately then and to two hrs after the match. Immediately then the competition, total protein and globulin increased, significantly.

Urinary globulin and total protein had great significant increases following the match, which decreased 45 min after the game. Nevertheless, they still had significant increments than those of before the competition. The study of Boileau et al (1980) reported proteinuria among 30% of its subjects [6]. De Meersman et al (1982) observed increment of proteinuria level after trauma occurrence [10].

Gilli *et al.*, (1984) stated that the urinary alomy surveyed 132 endurance runners in aspect of urinary anomalies. Their urinary microscopic examinations indicated 95% of the subjects have at least one kind of urinary anomaly. Proteinuria (solely or in company with microscopic hematuria) is observed, in some samples. The whole anomalies would disappear, after 24 to 36 hrs [11].

Table 1: Variations of Under Study Variables, From Before to Immediately Then and to two hrs After the Match

Variable	Before the match (mg/min)	Immediately then the match (mg/min)	Two hrs after the match (mg/min)	Significance
Total protein	11.426	97.3	26.828	0.000 *At immediately then and 45 min after the match
Globulin	4.881	28.457	10.143	0.000 *At immediately then and 45 min after the match

*NOTE: Significant at the Level of $P \leq 0.05$

DISCUSSION

According to the results of the present study, a soccer competition would cause remarkable increases in excretions of urinary globulin and total protein, after the match. The understandings of Boileau *et al.*, (1980), De Meersman *et al.*, (1982) and Gilli *et al.*, (1984) were in approval with those of the present study [6, 10, 11]. Boileau *et al.* (1980) reported the heightening of proteinuria among 30% of the runners of their research [6]. De Meersman *et al.*, (1982) observed the rising of proteinuria following trauma occurrence [10]. Gilli *et al.*, (1984) mentioned the post-exercise urinary anomalies are common and these problems are in relation with hemodynamic disorders, which exactly happen because of glomerular mechanisms though mainly have tubular origins [11].

The glomerular excretions of protein molecules have inverse relations to molecular weights and their diffusivity coefficients, and are directly proportional to their plasma concentrations [1]. Aside of molecular size, three other factors influence the transmission of the proteins from the glomerulus, which consist of hemodynamic characteristics, diffusive processes and molecular charge [1]. The hemodynamic characteristics affect the amount of glomerular refinement and the transmission of macromolecules through

glomerular capillary walls by changes of volume. Indeed, formation of an extraordinary filtration is controlled by inactive repulsive forces, like the existing imbalances between the glomerular pressure, colloid osmotic pressure of plasma and that of Bowman's capsule [1].

It should be noticed that the refinement is not an exclusive parameter in the transmission, and an equal proportion of the diffusion and refinement has been calculated in renal excretion of hemoglobin, among dogs [16]. The recent issue means the diffusion is the prominent mechanism of the glomerular transmission. Molecular charge is considered as an important characteristic in the transmission of macromolecules, besides sizes and shapes of protein molecules and the glomerular refinement level [1].

The electrostatic characteristics of glomerular capillary walls would remarkably restrict the passage of polyanions of the circulation than neutral macromolecules with similar sizes. Reversely, the passage of polycations would increase, in comparison to neutral macromolecules with similar sizes and structures. The existing glycoproteins of the carboxylic groups have been suggested as the responsible elements of that particular restriction of polyanions and the transmission facilitation of polycations, which have been

placed in the endothelial layer, epithelial cells and a part of the structure of glomerular basic membrane [1].

The glomerular injury, which causes proteinuria, has a close association with losing optional features of the charge of those related capillaries. In addition, the results of the present study showed that excretions of urinary proteins came back toward the relaxation levels, after the initial rising. Nevertheless, the amounts of proteinuria at 45 min after the match were significantly larger than those of before the game, yet. It seems, those amounts would return to the relaxation levels, over longer time (for example 1 hr or longer, which depends to intensity of activity). In researches of Poortmans and Vancalck (1978) and Kohanpour *et al.*, (2009), proteinuria of 45 min after the activity had less increment than that of immediately then the activity [4, 15]. The recent issue is in agreement with the previous finds that have denoted the proteinuria as an unstable stage with half-life of about 1 hr, and have represented the occurrence of maximal albumin excretion at the 20 to 30 min after the activity [5, 12, 17, 18, 19].

CONCLUSION

The results of the present study indicated that the urinary excretions of heavy molecular weight proteins following a soccer

competition would increase, significantly and remarkably. Thereafter, those amounts would come down to the relaxation levels. The after soccer match proteinuria is not injurious and is different from pathologic conditions.

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