RENAL FUNCTION TEST PARAMETERS IN MALE FOOTBALL PLAYERS
Musa¹, I., Mabrouk², M.A., and Tanko³, Y.

¹Department of Human Physiology, Kogi state university, Anyigba, Nigeria
²Department of Human Physiology, Bayero University, Kano, Nigeria
³Department of Human Physiology, Ahmadu Bello University, Zaria, Nigeria
Corresponding author: (+234) 07031570218, ibrophs@yahoo.com

ABSTRACT
Physical exercise decreases renal hemodynamics due to high demand of the skin and active muscle tissue. The aim of this study was to investigate the dynamics of renal function in male football players and to compare the values to that of the non-athletes of similar age. Employing purposeful sampling technique, 20 male football players and 20 non-athletes were recruited for this cross sectional study following inclusion and exclusion criteria. The university institutional review board (ABUTH/HREC/TRG/36) gave approval for all procedures in accordance with the Declaration of Helsinki. Blood samples were taken at rest, to measured serum creatinine and urea concentrations and to estimate glomerular filtration rate (eGFR). The independent students-t-test was used to compare values between the two groups. The level of significance was set at P< 0.05. Our result showed that there was no significant differences (p>0.05) in the serum creatinine (70.05±2.3 µmol/l vs 65.45±4.1 µmol/l), urea (2.90±0.1 mmol/l vs 2.77±0.1 mmol/l) and eGFR ((123.71±5.06 ml/min/1.73m2 vs 114.54±8.88 ml/min/1.73m2) between the male football players and non athletes. The absence of significance changes in these parameters suggests that, high intensity and frequency of footballing, not enough to evoke clinical changes in renal function. This observation has implications for sports physiology.

Keywords: renal function, non athlete, performance status, football players
INTRODUCTION

Physical exercise induces profound changes in the renal hemodynamics due to the high demand of the skin and active muscle tissue. This aversive stimulus is capable of altering physiological homeostasis whose intensity might have detrimental effects [24]. In addition, intense training and the growing number of competitions are attributes of contemporary professional sport [9, 14, 15]. However, Frequent and regular exercise stress has been shown to provide various health benefits [8]. Indeed, soccer is a team sport that is played in an outdoor field and requires a high standard of preparation through the development of physical performance skills, as well as tactical and technical expertise in order to complete 90 minutes of competitive play [20, 21, 22]. Adequate monitoring of the functional status is necessary to ensure the quality of recovery and hence further successful participation in professional athletic activities [16]. Monitoring of recovery is usually complicated because of the absence of simple and valuable indicators. Athletes are usually monitored by using biochemical and hematological indices for evaluating possible performance status [6]. Therefore, scientists all over the world are looking for a standard formula that can improve the performance of elite players and discover talents as efficiently as possible [20]. The wide choice of metabolic markers in sports medicine was recently systematized by Banfi and colleagues [2]. Serum creatinine level has become the most commonly used measure of kidney function in the last four decades. In addition, serum Urea, and equations to estimate the glomerular filtration rate (eGFR) were also used to assess kidney function. Assessment of renal function is an obligatory part of the evaluation of an athlete’s general health. Despite the absence of specialized normative ranges for sportsmen, relationships between creatinine levels and morphological properties have been described [2, 3, 4, 7, 13, 17]. There is lack of data regarding the dynamics of renal function in male football players. We hypothesized that, a long competitive season involving frequent matches and intense training could influence renal function, as a consequence of applying repeated physical loads. The aim of this study was to investigate the dynamics of renal function in male football players and to compare the values to that of the non-athletes (control group) of similar age range.

MATERIAL AND METHOD

Subjects
This cross-sectional design study was performed on a sample of twenty adult male football players and twenty non-athletes of similar age, using the purposeful sampling technique. The sample size was based on previous research examining biochemical assessments of oxidative stress, erythrocyte membrane fluidity and antioxidant status in professional soccer players and sedentary controls [5]. All participants were members of soccer clubs and had been training for the past four years or longer, at least 4 days per week, with training sessions lasting 1–1.5 hour. The twenty non-athletes males had not been playing any sports regularly. All subjects who had no history of diseases, not using steroids or other banned substances, non-smokers, and history of no renal disorders, were included to participate in this study. The university institutional review board
(ABUTH/HREC/TRG/36) gave approval for all procedures in accordance with the Declaration of Helsinki. Subjects were required to report to our research laboratory to read and sign a medical questionnaire and an informed consent in accordance with the American College of Sports Medicine [ACSM, 1991] guidelines. Subjects were fully informed about the experimental procedures, risks and protocol, knowing that they can withdraw voluntarily at any given time of the experiment.

**Blood Sampling**
Venous blood samples were collected into plain evacuated 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 chemistry. The serum was stored at -20 °C before analyses.

**Determination of Urea**
Serum urea was measured according to the method described by [27]. Urea reacts with hot acidic Diacetylmonoxime in the presence of Thiosemicarbazide and produces a rose-purple coloured complex, which is determined colorimetrically. The %CV for this assay was 23.4% at 2.90 mmol/l and 26% at 2.77mmol/l for the football players and non-athletic respectively.

**Determination of Creatinine**
Serum creatinine was measured according to the methods described by [25]. Creatinine reacts with alkaline picrate reagent to form an orange-red colour which is measured in a spectrophotometer. The %CV for this assay was 15.1% at 70.05µmol/l and 28.4% at 65.45µmol/l for the football players and non-athletic respectively.

**Determination of Glomerular Filtration Rate (Gfr)**
Estimated glomerular filtration rate (eGFR) was obtained using the Modification of Diet in Renal Disease (MDRD) equation [10]. The %CV for this assay was 18.3% at 123.71 ml/min/1.73 m² and 34.7% at 114.54 ml/min/1.73 m² for the football players and untrained respectively. eGFR, ml/min/1.73 m² = 186 x (Serum CRE(mg/dl) – 1.154 x age (yrs.) for male.

**STATISTICAL ANALYSIS**
The data generated were expressed as mean ± standard error of mean (X±SEM). For statistical analysis, SPSS software (version 20.0) was used; the independent students-t-test was used to compare values between the two groups. A comparison was considered statistically significant if the P value was < 0.05.

**RESULTS**

**Physical characteristics of the study population (n=40)**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Football players (20)</th>
<th>Non-athletes (20)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGE (Years)</strong></td>
<td>28 ± 0.6 ± 0.5</td>
<td>26.93 ± 0.4</td>
</tr>
<tr>
<td><strong>HEIGHT (meters)</strong></td>
<td>1.76 ± 0.0</td>
<td>1.70 ± 0.0</td>
</tr>
<tr>
<td><strong>WEIGHT (Kg)</strong></td>
<td>69.25 ± 4.3</td>
<td>55.65 ± 4.2</td>
</tr>
<tr>
<td><strong>BMI (Kg/m²)</strong></td>
<td>19.31 ± 0.2</td>
<td>20.19 ± 0.3</td>
</tr>
</tbody>
</table>
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 athletic group and the non-athletic group. However, height of the athletic group was significantly higher (p< 0.05) compared to the non-athletic group. Notably, the body mass index among the athletic group, reduced significantly (p< 0.05) compared to the non-athletic group.

Assessments of Renal Function Markers

The mean (SEM) serum urea and creatinine concentrations between male football players and non-athletic groups obtained at rest were presented in Table 2, Figure 1 and figure 2 respectively. A non significant increase (p>0.05) in the serum urea, creatinine and mean eGFR concentrations was observed among the male football players compared to the non-athletes. The results from the present study contradict the findings of Banfi and Del Fabbro, [3], and Nunes and Macedo, [18]. However, increase serum creatinine had been linked to the higher muscle mass found in athletes, as total muscle mass is the most important determinant of the Creatine pool size and creatinine production [19]. Similarly, the present study also demonstrated a non significant increase (p>0.05) in the serum urea among the male football players compared to the non athletes. This present study does not agree with the findings of [26], [23], [18] and the findings of [12]. However, increase in serum urea had been linked to the continual stress of training [26] or due to increased muscle proteolysis during recovery following very exhausting, long lasting exertion, like after single
soccer match [1]. In contrast, [12] reported that regular physical activity reduced urea levels and serum creatinine which could consequently improves renal disorders. [11] investigated biochemical changes in responses to low-volume pre-competition swimming training for elite swimmers and showed that the level of urea was significantly increased for both male and female swimmers; He stated that high level of blood urea reveals that protein catabolism becomes the dominant biochemical process in the body of the swimmer, which may have a negative impact on the body energy storage and disorder the process of glomerular filtration rate. The reason for this present study not observing significant difference in the serum creatine and urea could be associated with the training program or activity type as well as environmental conditions and human race. This present findings could also explain that, muscle metabolisms at rest show no significant differences between the football players and the non athlete even though, during exercise, muscle uptake of urea and creatinine is increased. A non significant increase (p<0.05) in eGFR was also observed among the male football players compared to the non athletes. However, the clinical relevance of this finding remains unclear primarily because of a very narrow variation which fits the normative range. Estimation of glomerular filtration rate depends on the equation used [2, 3, 4, 7, 13, 17]. We opted to use the MDRD equation because is not sensitive to body mass or body mass index, which have an impact on the result of eGFR [3, 7, 13, 17]. Confirmation of the detected trends in the parameters of renal function probably requires a longer period of observation. Nevertheless, our results failed to confirm any significant differences in the dynamics of renal function between male football players and the non-athletes of similar age range at rest. This observation has implications for sports physicians or others involved in biochemical assessment of healthy athletes in regular training, diagnostic and applied exercise physiology. Particular attention should be paid in the monitoring of these parameters as indicators of renal function requirement during prolonged exercise.

CONCLUSION
The present study demonstrated no significant difference in the dynamics of renal function between male football players and the non-athletes of similar age range at rest. The absence of significance changes in these parameters could suggests that, the high intensity and frequency of footballing, was too low to evoke clinical changes of renal function. However, further research is necessary to elucidate regularities in changes of renal function among team sport representatives with control group.

CONFLICT OF INTERESTS
The authors have no conflict of interests to disclose in this study.

ACKNOWLEDGMENTS
The authors would like to thank the study participants that took part in this study for their patients and cooperation with dedication. The present study was self-sponsored.
REFERENCES


