

ASSESSMENT OF URINARY POTASSIUM CONCENTRATION AMONG SAUDI YOUNG SOCCER PLAYERS

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Abstract:

Purpose: to assess urinary potassium concentration level among young professional Saudi soccer players. **Method:** a cross sectional study design, conducted during the official Saudi Soccer League. A total of 43 players from Riyadh, Saudi Arabia participated in this study. Age, weight, height, body fat % and three spot urinary samples were collected during one day of training. These three spots were collected during one of normal training day. Samples were analyzed and calculated of three spot urine, subsequently mean of potassium was used to report the concentration in that day. A descriptive data analysis were used. **Result:** the current study found that soccer players had an optimal urinary potassium concentration (64.3 ± 23.7) mEq/L. **Conclusion:** more measurements regarding electrolytes in the urine of soccer players are needed, especially for days to ensure more assessment in the hot weather. In addition, Saudi soccer players and medical teams in the clubs should consider electrolytes concentrations during the season and during training and competition days.

Keywords: potassium, hydration, electrolytes

تقييم تركيز البوتاسيوم في البول لدى لاعبي كرة القدم السعوديين الشباب

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ملخص باللغة العربية:

الهدف: تقييم مستوى تركيز البوتاسيوم في البول بين لاعبي كرة القدم السعوديين المحترفين الشباب. المنهجية: تصميم دراسة مقطعية أجريت خلال الدوري السعودي لكرة القدم الرسمي. شارك في هذه الدراسة ثلاث واربعون لاعباً من مدينة الرياض بالمملكة العربية السعودية. تم جمع بيانات العمر والوزن والطول ونسبة الشحوم في الجسم وعينة البوتاسيوم البولي خلال يوم واحد من التدريب. تم جمع هذه العينات الثلاث، وبعد ذلك تم تحليل عينات البول بشكل منفرد ، وبعد ذلك تم حساب متوسط تركيز البوتاسيوم في البول من العينات الثلاثة. تم استخدام تحليل البيانات الوصفية

النتيجة: وجدت الدراسة أن لاعبي كرة القدم لديهم تركيز بوتاسيوم مثالي في البول 23.7 ± 64.3 (مل مكافئ لتر) الخلاصة: هناك حاجة إلى مزيد من القياسات المتعلقة بنسب الاملاح في عينات بول لاعبي كرة القدم، خاصة لعدة أيام لضمان مزيد من التقييم في الطقس الحار. لاعبي كرة القدم السعوديين والطاقم الطبي بالاندية الرياضية يجب عليهم الاهتمام بمستويات الاملاح والمعادن خلال الموسم الرياضي وايضاً الاهتمام بالتغذية الصحية خلال أيام التدريبات والمنافسات.

الكلمات المفتاحية: بوتاسيوم، ترطيب، الاملاح

Introduction:

Potassium is an electrolyte and essential nutrient for human body in all cellular functions (i.e., potassium affects mortality, cognitive, and cardiovascular)(Appel, 2013; Cisternas et al., 2015). High or low level of potassium depends on daily dietary intake or/and supplements(Te Dorsthorst et al., 2019). Urinary potassium concentration account to 77% of dietary intake of potassium(Holbrook et al., 1984). Moreover, potassium concentration in urine may affected by dietary, fluid intake and sweat loss during the day(Armstrong et al., 1985). Imbalance electrolytes affect by fluid loss as sweat during exercise in warm and/or high relative humidity(Pelto, 2017). In addition, sweat rate among individuals during exercise vary depends on mainly intensity of exercise and the weather(Patterson et al., 2000; Yustika et al., 2019).

Excessive sweat loss may lead to imbalance in electrolytes and decrease total body fluid that increase body temperature and caused muscle cramps(Stofan et al., 2005). Therefore, potassium has classified as a fundamental electrolyte to regulate total body water and involves in muscle contraction during exercise(Terwoord et al., 2018). Moreover, optimal and frequencies of muscle contract rely on the adequate potassium stored in the body(Periard et al., 2021). On the other hand, loss of urinary potassium can lead to condition of hypokalemia and may put athletes at danger of performance fatigue or muscle cramping(Pelto, 2017). The current study aimed to assess urinary potassium concentration level among young professional Saudi soccer player. To our knowledge, this is study is the first study that assesses urinary potassium concentration among young professional Saudi soccer player. In addition, it is unique and the sole one in the kingdom of Saudi Arabia.

Method:

The study designed as a cross-sectional, which was conducted in Riyadh, Saudi Arabia. Ethical committee at King Saud university was approved to conducted the study (4/67/352673), and the study procedure, purpose and protocol were explained to all participant prior to starting the study. Participants were agreed to involve in the study and signed the consent after they informed of the aim of the study.

Participants:

A total of 43 of Saudi professional soccer players were participated in this study during official season Saudi league 2015/2016 (mean±: age 20.16 ± 0.85 years, body weight 66.21 ± 5.3 kg, height 175 ± 4.3 cm, body fat % 6.72 ± 2.12). The weekly schedule for these players was playing one official match and train five day during the season. Players were always attended the club two hours before training sessions and completed five hours in the club for training. These players are playing locally, national and international games with their team and Saudi national teams.

thropometry measurements:

Body weight was measured by a digital scale to nearest 0.1 kg (Seca 813, Germany), and height was measured to the nearest 0.01 cm by (Seca 213, Germany). Body fat percentage was performed using skinfold thickness method from four sites: suprailiac, abdominal, thigh and triceps. Holtain skinfold caliper used to measure the skinfold (Holtain Ltd., Crymch, UK). Estimated percentage of body fat was obtained after calculated the sum from four measurements of skinfolds using the following equation (Jackson & Pollock, 1985): body fat percentage = $(0.29288 \times \text{sum of skinfolds}) - (0.0005 \times \text{square of the sum of skinfolds}) + (0.15845 \times \text{age}) - 5.76377$ (Jackson & Pollock, 1985).

Urine sample collection:

Three spot urine samples were collected in one day of normal training from soccer players. Samples were collected in the morning after waking up, pre-training (mid-day) and at night after completed training at least three hours. Each sample was collected by player from urine midstream all samples collection. Samples were gathered and analyzed separately in the lab. Then concentrations were calculated as three samples and mean used in the study to detected potassium level of soccer players in one day of training session.

All urine samples were collected in a specific sterile tube with approximate amount of 30 ml. Urine samples were assigned and liable to each player according to their code in the study. Collection samples gathered from players in the same day of the measurement and transferred to a biochemistry lab at college of sport sciences and physical activity in King Saud University.

Urine potassium analysis:

Urinary potassium was analysed by using intergraded multisensor technology (IMT) (Siemens Dimension Xpand Plus, Germany). A diagnostic test used to analyse the concentration of urinary potassium using Siemens reagent (Siemens QuikLYTE® Integrated Multisensor). Small volume of urine approximately 1 ml used to run the test.this instrument was calibrated every day by quality control test.

Statistical analysis:

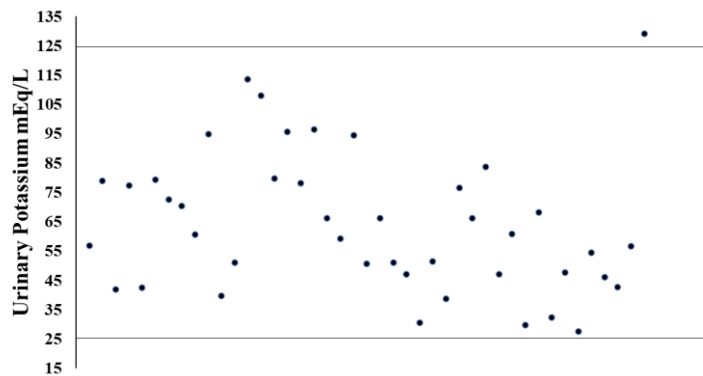
A descriptive data analysis used to report in this study and present as mean and standard deviation. All data analysis was carried out using IBM's SPSS version 27 (version 27 SPSS, Inc. Chicago, Illinois).

Results:

Total of 43 Saudi soccer players, age was between 19 and 22 years old. A summary of the players' characteristic (e.g., age, weight, height and body fat %) is presented in Table 1

Table (1). Characteristics of Saudi soccer players Mean $\pm$ SD, minimum (Min) and maximum (Max).

Variable	Mean $\pm$ SD	Min/Max
Age (years)	20.2 $\pm$ 0.8	(19 – 22)
Body weight (kg)	66 $\pm$ 5.3	(55.1 – 73.7)
Height (m)	1.75 $\pm$ 0.03	(1.63 – 1.82)
Body Fat (%)	6.67 $\pm$ 1.66	(3.90 – 13.70)
Urinary potassium (mEq/L)	64.3 $\pm$ 23.7	(28 – 129)

**Figure (1).** shows the mean of urinary potassium of Saudi soccer players in one day of training. Continued line indicates lower and higher reference range.

Discussion:

The purpose of the study was to assess urinary potassium of Saudi soccer players during one training day. To our knowledge there is no study investigate urinary electrolytes among Saudi athletes. In addition, using multiple urine sample during the day has is more strength to assess potassium concentration in the urine. This method agreed with recent study(Kieneker et al., 2014). It has been known that 24-hour urine collections are standardized as gold method to assess dietary potassium concentration. In meanwhile, spots urine collections can be present potassium concentration as we collected sample during the day.

In general, urinary potassium range between 25 and 125 mEq/L. The current study found that potassium concentration among Saudi soccer players were in the optimal range. however, even collection of samples during the day from three urine samples revealed that, the average of potassium concentration was 64.3 mEq/L which mainly in normal range. Our result were more higher then recent study which found the mean of 24-hour urinary potassium excretion was 59.6 mEq/L (Iwahori et al., 2016). In the study of Francescato et al, found that there was significant difference of urinary potassium between pre and post training sessions in soccer (Francescato et al., 2019), in addition, soccer players attended the training session with an optimal urinary potassium approximate value of 57 mEq/L(Francescato et al., 2019).

Studies revealed that urinary potassium affected by exercise and exposure to heat and lead to imbalance electrolytes combined with lost fluid for athletes(Nasour et al., 2009). Moreover, physical activity found to affect the urinary potassium due to decrease in sodium concentration and increase

potassium in the urine that might be relied on hormonal regulation(Chlíbková et al., 2014).

In general, soccer players in the current study showed an optimal level of potassium compare to normal people and other soccer players. However, measurements of urinary potassium are important to assess different electrolytes intake from dietary intake. Different aspects can affect urinary potassium such as physical activity, diet, fluid intake and sweat loss especially in the hot weather. For soccer players, urinary electrolytes in specific potassium relay on status of hydration and dietary intake. Soccer players and their medical team should consider the concentrations of electrolytes during the season. Moreover, optimal dietary intake is important during training and competition in all time to maintain and balance hydration status especially in the warm conditions.

Conclusion:

The current study provided a great result of urinary potassium that revealed Saudi soccer players had an optimal potassium concentration during training day. More measurements regarding electrolytes in the urine of soccer players are needed, especially for days to ensure more assessment in the hot weather. In addition, large sample size may reflect urinary potassium combines with dietary intake record.

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