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FULL LENGTH ARTICLE

The impact of one session of exhaustive activity on bloods' electrolytes of city Malekan's selected wrestlers

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ABSTRACT
The purpose of the present research was investigation of the impact one session of aerobic exhaustive activity on some of electrolytes in blood of city Malekan's selected wrestlers. For this purpose, 10 wrestlers from among Malekan'swrestlers with a mean age of19.65 ± 22.34 weight83.44 ± 70.33 height 187.11 ± 171.71 ,and body mass index 25.42 ± 2.87 voluntarily chosen and after filling out a consent form and Occupational Health attended in the present study and conducted one session of exhaustive activity to the extent of fatigue on a treadmill. Before and after the activity, immediately after the Bruce protocol exercise that most wrestlers in step 5 , and 3 of them in step 6 reached to the extent of exhaustive fatigue, had been collected 5 cc blood from subjects' brachial vein to measure calcium , phosphorus , sodium potassium , and magnesium were collected and taken to the laboratory immediately. For data analysis dependent t-test was performed on the significance level. P <0.05
The results showed that a single session of exhaustive activity has a significant impact on calcium, phosphorus,sodium, potassium, magnesium values.
Keywords: selected wrestlers, exhaustive activity, Bruce

INTRODUCTION

Water and electrolyte disorders meanthe increase or decrease of acids and electrolytes of the interstitial fluid and blood. Examples of electrolyte disordersare hypernatremia, hyponatrmia, hyperkalemia or hypokalemia, acidosis and alkalosis, respectively. Often facing with acids and bases disorders, the body tries to compensate the problem, for example at the time of climbing to the heights of the mountains we have hyperventilation due to reduced oxygen concentration in air which causes decrease in blood carbon dioxide and respiratory alkalosis. In this situation, the body tries to maintain blood's pH with the increase of renal excretion of bicarbonate and creating acidosis metabolic, so we have compensated respiratory alkalosis and acidosis metabolic.
Electrolytes: measuring the four elements consist of sodium, potassium chloride and bicarbonate (HCO3),the body fluid level ,electrolyte concentrations and acid-base balance are all interrelated ,and any increase or decrease in each of these four elements is effective on PH Balance.
The amount of excreted water through sweating heavily depends on the physical activity and exercise and ambient temperature. The humidity also affects the sweat and regulation of body temperature. To keep the amount of water and electrolytes, particularly in athletes who have endurance activities, 3 to 5 % glucose solution during the race is recommended. Reduction of 3 % of body weight through dehydration encounters the athlete with serious risk and if it reaches 5 to 10%, reduction in the effects of water shortages, especially cramps and muscle soreness occurs. Due to dehydration caused by exercise in hot weather, plasma volume decreases. This reduction makes the red blood cell volume diminished and dried up, so the oxygen supply ability is reduced and the athlete becomes tired. Further dehydration of 5% decreases stroke volume and ultimately cardiac output and lowers the athlete's performance (1).
Excessive sweating in hot weather during sever physical activities lower the amount mineral solute and body electrolytes specially Clair, sodium and potassium, so athletes must drink enough water with a few salt, 2 to 3 grams per liter. Excretion of sodium also affects potassium loss from the body, so much activity in top condition persists, the more sodium and more potassium excreted from the intracellular space to be transported out of the cell.Severe potassium excretion will follow disorders in the kidneys and the heart

action followed by impaired in muscle contractions, muscle weakness, fatigue and imbalance of acid–bases.

Whatever can provide dehydrated even before an endurance activity with the necessary water use,skill efficiency and athletic performance will be increase. Measurement of electrolytes such as sodium (Na^+), potassium (K^+), Ca (Ca^{++}), magnesium (Mg^{++}), zinc (Zn), chlorine (Cl^-), and the concentration of insulin and oxidant and antioxidants in samples of serum and spinal cerebrospinal fluid (CSF), can lead to better diagnosis and more appropriate treatment of epilepsyin individuals with epilepsy (2).

In some patient populations, including the elderly, where metabolic abnormalities (e.g., hyponatremia, or hypoglycemia) is typical, between 15 and 30 % of acute seizures has metabolic causes. In a study of 375 adults with epilepsy, 10 % of metabolic disorders have been reported as the main cause of seizures. On the other hand changes in blood electrolytes may spread to the brain and cause metabolic encephalopathy and as a result follow EEG abnormalities. EEG is widely used to assess metabolic and electrolyte disorders. Several reports indicate that the levels of some trace elements have vital role in identifying the cause of the seizure.

The concentration of sodium (Na^+) and its role in epilepsy

Sodium is considered to bean important element in the physiology of the cell membrane and seizurestimulation and since the sodium has an important role in cell membrane depolarization and thus re-depolarization, so changes in serum sodium levels can predispose to the occurrence of seizures.

Research shows that hyponatremia or decrease of serum sodium concentration less than 136mEqvalan per liter is the cause of 70 % of seizures in children under 6 months. And hypernatremia or increased plasma concentrations of serum sodium greater than 145 mEq per liter can cause seizures.The risk of seizures inHyponatremia is greater than hypernatremia mode. Hypernatremia can cause generalizedtonic-clonic seizures. A study published in 1995 by Kiviranta and Airaksinen represents a significant reduction in serum sodium at a rate of 132.9mmol per liter in children with seizures.

Concentration of calcium (Ca^{++}) and its role in epilepsy

Hypocalcemia, mainly in the CNS causes neuronal excitability or seizures. Hypocalcemia is plasma calcium levels' reduction less than 8.5 mg / dL or the decrease of ionized calcium concentration to less than 0 / 4 mg per deciliter or more. Acute hypocalcemia causes neuromuscular irritability and in the CNS is the usual protests acute hypocalcemia, seizures and altered mental status. In the seizure resulted in hypocalcemia, the seizure may observed without muscular movements. Other studies have shown that a low calcium level in the cerebrospinal fluid has an effect on seizure,partial seizure andsimple Complex partial seizures (3).

Considering the amount of electrolytes excreted through sweat (sodium, potassium, magnesium ...) which is not in the amount that result indischarging electrolytes in the body even in prolonged heavy exercise,so usuallythere is no need to add electrolyte to consumed solution during exercise but adding trace amounts of sodium (salt) can be beneficial.

Excessive sweating in hot weather during intense physical activity leads to decrease of-some minerals and electrolytes from the body, especially chlorine, sodium and potassium.

So, in this field athletes should drink enough water with little salt for 2 to 3 grams per liter (pereachliter of waste water , the equivalent of half a gram or one gram of salt to be excreted from the body). The more activity in top condition persists, the more sodiumexcreted and more potassium transferred and excreted from the cell interior to the outside of the cell. Severe excretion of potassiumleads to disorders in the kidneys and the heart, followed by impaired muscle contractions, muscle weakness, fatigue and acid imbalance(4).

However, since the athletes are susceptible to muscle cramps induced from exercise, researchers assume that fluid and electrolyte disturbances are the cause of this phenomenon.so, sever exercise save fluids and most of electrolytes except potassium (5). In addition to the severity of exercise and the type of body activity, time of exercise also can play an assistance role in the excretion of electrolytes and even its role can be more important than its intensity.

During exercise the change in the body's tone can be due tonisbalancing between receiving and disposing of sodium and potassium water and renal which are dependent to renalor adrenal mechanisms (6). Long-term excretion is risky for electrolyte balance and may lead to mild Hayponatrmy.Extracellular potassium increases observed in athletes and novice ones after sever exercise activities (7).also extracellular potassium increases with the intensity of exercise activities.

In a study was shown that after anaerobic exercise, extracellularmagnesium increased, whereas another study found that magnesium decreased. In the performed studies have shown that physical activity can increase the absorption of calcium (8).

In a study was performed on men reported that after a week of resistance training, there was a significant decrease in urinary calcium excretion (9).

Vadeh and colleagues during studies on untrained men during a running session of moderate intensity for 45 minutes did not observed a significant difference in calcium excretion between days of training and day of entraining (10).

Although wrestling is done in gym and mild weather, the nature of high intensity of exercise accompanied with athletes' large body size can lead to heavy sweating anddehydration. But unlike some other disciplines such as football, in wrestling, there are more opportunities to drink fluids because of easier access and more game pauses. but since one of the main causes of muscle fatigue is lactic acid accumulation in muscles and weakened muscle response to nerve signals, homeostasis and the release of sodium, potassium calcium and chlorine ions to the cycle of action potential and contraction of production may be disrupted and eventually leads to weakened muscles and performance degradation (11). Since limited researchhas been done regarding the effect of exercise competition on the body's electrolyte balance. Hence, this study has investigated the effect of one session ofexhaustive activity on young wrestlers' blood electrolytes.

Statistical Methods

The research methodwas quasi -experimental and 10subjects from Malekan wrestlers with a mean age of 19.65 ± 22.34, height 187.11 ± 171.71, weight83.44 ± 70.33 and BMI 25.42 ± 2.87 , which were selected on a voluntary basis after filling the Occupational Health consent form participated in the study.Researchtest was implemented using several regular preliminary and final designsand a research protocol group and required data was gathered. The study was conducted in two stages. First, immediately before the exercise protocols were taken the subjects' blood samples before the test. After that, the subjects stayed for 20 minutes with no activity And after that the participants did one session of exhaustive activityto the extent of fatigue on a treadmill, immediately after theBruce protocol exercise that most wrestlers in step 5, and 3 of them in step 6 reached to the extent of fatigue, had been collected 5 cc blood from subjects' brachial vein to measure calcium , phosphorus , sodium potassium , and magnesium were collected and taken to the laboratory immediately.

For data analysis dependent t-test was performed on the significance level.$P<0.05$.

All statistical operations were performed using SPSS 18 softwareResultsTable

1: Characteristics of subjects based on age, height, weight and body mass factors

19.65±22.34	Age
83.44±70.33	Weight
171.71±187.11	Height
2.87±25.42	BMI
18.26±4.78	Body fat percentage
32.12±1069	Maximal aerobic

Table 2 : The amount of blood electrolytes before and after physical activity inwrestlers

after activity	Before activity	
140.27	135.21	Sodiumconcentrations (Na^+)
8.76	7.69	calcium concentration) Ca^{++}(
4.78	3.92	)K^+(Potassium
5.45	4.26	phosphorus
3.70	2.35	magnesium

Table 3 : Mean and standard deviation of the time of reaching to trainingexhaustionin training intensity

Average (min)	independent variable	dependent variable
55.12±17	75-70intensity	Time of exhaustion
9.13±3	intensity95-90	

Table4 : Changes in levels of electrolytes of blood before and after physical activity in wrestlers

P	T	SD	mean	number	
0.000	3.45	11.2	138.24	10	concentrations of sodium (Na+)
0.002	2.49	4.12	8.13	10	concentration of (Ca++)
0.031	-3.21	2.37	4.34	10	Potassium (K^+)
0.004	2.35	3.21	5.08	10	phosphorus
0.000	2.89	2.46	3.21	10	magnesium

Based on the one session of intense training, changes in sodium, calcium, phosphorus and magnesium were significant, but there was no significant increase in the potassium concentration.

: Discussion

In the present study, calcium, magnesium, sodium and phosphorus showed significant changes. While,potassium increasedin significantly. Urine and serum electrolytes' changes were consistent except for phosphorus and potassium. Moreover the blood concentration also decreased.

Exercise naturally decreases sodium excretion and it appears to be largely due to the effect of aldosterone production during exercise (12).

The results of this study agree with the findings of researchers such as Rucker et.al.(1989),Nagashyma .al. (1999), Kubickaet.al. and Jemsi et.al (13).

But it is not in harmony with the results of Ruveiraet.al. (2007) and Strand and Saltyn (14, 15).

In our study, one session of aerobic activity cause the meaningful increase of potassium concentrationin serumthat it was probably due partly to the loss of plasma fluid and to some extent release and the returnofpotassiumfrom therelated intracellular spaceand this process happens at first in muscles, liver and red blood cells. The results of this study, in this case are consistent with the findings of researchers such as Mashikuet.al.Reducing electrolytes, which are reported in the present study, seems reasonable,because, perhaps with the loss of electrolytes through sweating and also body need to electrolytes to perform vital functions, tubular reabsorption mechanisms of electrolytes, particularly sodiumis activated through the nerves and endocrine. This happening in the wrestling competition which isan anaerobic activitywith high intensity and duration is a natural event. Ions radient of sodium could be affected by the impact of sodium excretion through sweating that this impact reduces with maintain of salt in the level of the sweat glands. Reduction in urinary sodium and calcium is also due to the vital need of these electrolytes in muscle contraction. However, calcium and sodium entry into the muscle cell leading to a non- significant reduction of serum electrolytes. Another factor that has an effect on the plasma concentrations is phosphate's concentration in plasma.

Reported that after a short-term intense exercise which plasma magnesium increased, the increase is probably due to increased blood viscosity. Another factor that may affect the magnesium concentration probably is lactic acid or hydrogen ions. But there is not enough evidence in this regard. Studies showed that one factor can be magnesium changes into the cells and the organs of the body such as the liver or the blood. One of the factors of fatigue is also magnesium ion entry into muscle cells.This may be one reason why magnesium is non-significantly reduced. It is shown that the duration and intensity of activityare effective in the electrolytes' changes (16).Due to the decrease of blood's concentration, non-significant changes in blood levels seem real. Although, this may be due to fluid intake during exercise (17). Since wrestling is a physicaland interactive sport activity and requires a lot of running and lots of challenges, probably, the other cause of decrease in red blood cells can bedue to destroying red blood cells during exercise. This phenomenon frequently reportedin marathon runners (5).Perhaps Physical condition and fitness of participants are the other reasons for the decline in blood concentration.Asreported, plasma volume decreasesduring and after exercise, but due to compatibility in the effect of exercise since the plasma volumeincreases more, this cause pseudo-decrease.However, the results of the present study revealed that official wrestling race as an activity of high intensity and intermediate duration causes absorption of electrolytesbased on the activation mechanism related to absorption.Moreover, this study proved that providing athletes with fluid will cause maintain of body fluid and decrease in athletes' performance. In addition, it was shown; the fluid intake will increase the plasma volume and will decrease concentration in the bloodand consequently will reduce the hemoglobin.

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