COMPARISON OF EFFECTING ONE SESSION OF SOCCER MATCH ON BLOOD CELLS

Ali Bemani Ranjbar and Mohammad Hassan Solhjoo
Department of Exercise Physiology, Jahrom Branch, Islamic Azad University, Jahrom, Iran
*Author for Correspondence

ABSTRACT
Carbohydrates cause blood sugar changes, time and distance to physical activity and improve the performance of athletes. The present study investigated the effects of carbohydrate supplementation on cell (HGB, MCV, RBC, WBC, MCHC, HCT) in elite soccer players after a formal competition. For this purpose, 32 members of the youth football team Rafsanjan copper industry as samples were chosen and matched equally in both groups, consuming carbohydrates (with an average height of 30/9 ± 1/177 cm, weight 73/7 ± 6/4 kg age 78 / ± 8/16 years), and control group (mean height of 70/8 ± 7/176 cm, weight 72/7 ± 5/68 kg, age 87 / ± 1/17 years). Carbohydrate and control group in an official football match for 90 minutes in 45 minutes with a 15 minute break between the two half of the game participated. Carbohydrate supplement group received 0/8 Kg solution of body weight of 150 cc for each half of the game and at regular intervals during the game. Blood samples of 10 ml of the right brachial vein in three stages, before, immediately after and 24 hours were used to measure these indicators. After analyzed using repeated measures at the level of significance was concluded.

Keywords: Carbohydrate, Glucose, Physical Activity, Blood Cells

INTRODUCTION
Reaching high levels in the soccer game is an aspirational goals of players who must consider an interaction of a set of physical, physiological, and psychological skills together to become a top professional football player (Hurley et al., 1984). Physical and physiological requirements of elite soccer players and high level of soccer are very large and diverse. Such players are forced to have high physical and physiological capacities and abilities to provide the context to be active during 90 minutes of soccer game or in the conditions of being exposed to extra time i.e. 120 minutes. Most successful teams have novice tactics or ideas in the games and this is one of the main reasons for their success. But without skilled players, success will not be achieved. So one of the main reasons for the development of football game of all time is the development of techniques and physical and physiological conditions according to the standard level (Rowiaya et al., 1995).

One factor that is quite important is the Oxygen carrying capacity by the blood. In addition, the number of red blood cells, hemoglobin and hematocrit are essential factors to increase or decrease the capacity to transport oxygen to the tissues and excretion of carbon dioxide (Arazi et al., 2011). Body fluids are divided into several sections that one part of them is flown in blood vessels. Physiologically and in terms of sport, blood is more important, as oxygen, carbon dioxide and other materials needed in tissues and their products are shipped through this way. Generally, blood is formed of plasma, red blood cells, white blood cells and platelets. Hemoglobin and red blood cells are the basic elements of water. Blood factors and most importantly, red blood cells and hemoglobin has the task of transporting nutrients and oxygen for active tissue and carrying waste materials and carbon dioxide from the tissues for disposal from the lungs. On the other hand, it has been proven that to enhance aerobic capacity and physical endurance, sports activities depend on several factors. The findings of Fild and Colleagues (1991) reported the increased number of white blood cells twice after two exhaustive exercise session with the ergo meter (Fild et al., 1991). In another study, by reviewing the effects of two intense rowing training session for 6 minutes during the day, Nilsen and Colleagues (1996) observed a threefold increase in the number of white blood cells of elite rowers than the resting conditions (Nilsen, 1996). A positive result about using the amino acid glutamine that is the major fuel of white cells is obtained. In addition to taking vitamins,
carbohydrates and some drugs have also been proposed to improve the functioning of the immune system (Gleeson, 2000; Nieman and Pedersen, 2000). Carbohydrate intake during long-term exercise delays fatigue (Fild et al., 1991). After prolonged and intense exercises, some features appear in the immune system that are associated with increased inflammation and cellular immune destruction. Increased plasma cortisol decreases catecholamine’s (adrenaline and noradrenaline), growth hormone and Adrenocorticotropic and also reduces exercise-induced immune suppression. So the concentration of lymphocytes comes down and the innate immunity, Lymphocyte cell proliferation, cell and discharge surfaces (immune globulins) are stopped. Nutritional supplements can be used as protection principle against increasing the risk of infection during the recovery period after heavy exercise (Nieman and Pedersen, 2000).

Gleason (2007), Moore (2002) and Colleagues observed an increase in white blood cells after two intense endurance exercises at 75% maximal consumed oxygen (Gleeson, 2007; Moore et al., 1993). Niman (2003) observed a significant reduction in the number of red blood cells in adolescent boys and girls in sports under the maximum level and the changes observed in both genders are linked to the practice factor (Niman., 2003). Also Malm (2004), Huey-june and colleagues (2004) observed a significant increase in the amount of white blood cells and platelets in the blood after a 24-hour marathon race. But no significant change observed in the other variables (Malm, 2004; Huey et al., 2004).

In another study, Karakoc and colleagues (2005) observed significant decrease in hemoglobin, mean corpuscular volume and a significant increase in platelet and white blood cells after 90 minutes of football practice. But no significant change was observed in the amount of red blood cells (Karakoc et al., 2005; Ghanbariniyaki et al., 2007). The nature of compound exercises is such that in the short time, it includes dual responses related to any type of endurance activities (continued physical function and frequent involvement of the cardiovascular system in the respiratory physiological process activity) and resistance (short muscular activity, mainly with moderate to severe load with the rest intervals between these activities and skeletal muscles, particularly large). Overlapping and contradictory of these responses may vary significantly from the blood variables and shows clinical efficacy in performing host athletes of these exercises. However, despite numerous studies that have been conducted or are underway, the effectiveness of these factors as indicators affecting the quality and quantity of training and the likely performance of athletes is not clear and there are many contradictions. Also exploring on the effect of changes process of blood tissue in routine physical activity in elite expert athletes will provide desirable achievements for effective design of trainings with combinational nature. The present study is conducted aiming to review the effect of carbohydrate supplementation on mean cell volume of red blood cells, white blood cells, red blood cells, hemoglobin, hematocrit, mean hemoglobin concentration in elite male soccer players after an official match.

**Statistical Community**

The statistical population included 32 male soccer players of young soccer team. The research sample includes 15 youths football team player that will compete in the state league and purposefully included in a group and formed the current study sample.

**The Measurement Method of Research Variables**

**Blood Cells (Research Variables)**

Measurement of blood cells was measured using a Coulter T890.

**Amount of Hemoglobin**

Measurement of hemoglobin has been done by using Lysing solution and isotonic solution through laboratory kit made in Sweden.

**MATERIALS AND METHODS**

**Method**

A written consent letter was taken by the subjects to participate in the current study. The subjects in each group had not a history of drug use and disease and at least six months before participating in this study did not take any particular medication. Before the start of the match, information on age, height and
weight were recorded from the subjects. To study biochemical variables, blood samples in 3 stages, i.e., before the start of the race, immediately after the match and 24 hours after the race was done in sitting position. 10 ml of blood was taken from each subject's right arm vein. The race was performed in a time of 90 minutes at 4 pm.

**Statistical**

For statistical analysis, statistical analysis of repeated measurements (Repeat measurement) was used. In addition, analysis of the data was performed using SPSS software version 20 and the calculation of significant level $P<0.05$ was done.

**RESULTS AND DISCUSSION**

**Findings**

**Table 1-1: ANOVA (repeated measures), compared to the impact of physical activity on the amount of white blood cells before, immediately after and 24 hours after a football match**

<table>
<thead>
<tr>
<th>Statistical index</th>
<th>Total squares</th>
<th>Degree of freedom</th>
<th>Mean squares</th>
<th>F</th>
<th>Significance level (Sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The impact of one session soccer match on white blood cells</td>
<td>60.931</td>
<td>1.000</td>
<td>60.931</td>
<td>13.609</td>
<td>0.005</td>
</tr>
</tbody>
</table>

According to results of Table (1-1), P value to the amount of white blood cells equals $(P=0.005)$, that in this case study, we confirmed the hypothesis and the null hypothesis is rejected which indicates that physical activity increases levels of white blood cells immediately after the racing and decreases after 24 hours of racing.

**Table 1-2: ANOVA (repeated measures), compared to the impact of physical activity on red blood cells before, immediately after and 24 hours after a football match**

<table>
<thead>
<tr>
<th>Statistical index</th>
<th>Total squares</th>
<th>Degree of freedom</th>
<th>Mean squares</th>
<th>F</th>
<th>Significance level (Sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The impact of one session soccer match on red blood cells</td>
<td>0.292</td>
<td>1.641</td>
<td>0.178</td>
<td>8.449</td>
<td>0.005</td>
</tr>
</tbody>
</table>

According to results of Table (1-2), P value to the amount of red blood cells equals $(P=0.005)$, that in this case study, we confirmed the hypothesis and the null hypothesis is rejected which indicates that physical activity decreases levels of red blood cells.

**Table 1-3: ANOVA (repeated measures), compared to the impact of physical activity on average volume of red cells before, immediately after and 24 hours after a football match**

<table>
<thead>
<tr>
<th>Statistical index</th>
<th>Total squares</th>
<th>Degree of freedom</th>
<th>Mean squares</th>
<th>F</th>
<th>Significance level (Sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The impact of one session soccer match on average volume of red blood cells</td>
<td>20.385</td>
<td>1</td>
<td>20.385</td>
<td>18.089</td>
<td>0.002</td>
</tr>
</tbody>
</table>

According to results of Table (1-3), P value to the amount of white blood cells equals $(P=0.005)$, that in this case study, we confirmed the hypothesis and the null hypothesis is rejected which indicates that physical activity increases levels of red blood cells immediately after the race and after 24 hours of racing decreases than immediately after the race.
Research Article

Table 1-4: ANOVA (repeated measures), compared to the impact of physical activity on the mean hemoglobin concentration before, immediately after and 24 hours after a football match

<table>
<thead>
<tr>
<th>Statistical index</th>
<th>Total squares</th>
<th>Degree of freedom</th>
<th>Mean squares</th>
<th>F</th>
<th>Significance level (Sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The impact of one session soccer match on average concentration of hemoglobin</td>
<td>7.933</td>
<td>1</td>
<td>7.933</td>
<td>27.523</td>
<td>0.001</td>
</tr>
</tbody>
</table>

According to results of Table (1-4), P value to the amount of white blood cells equals (P=0.005), that in this case study, we confirmed the hypothesis and the null hypothesis is rejected which indicates that physical activity increases levels decreases the average concentration of hemoglobin in the blood immediately after the race and 24 hours after the racing.

Table 1-5: ANOVA (repeated measures), compared to the impact of physical activity on blood hematocrit levels before, immediately after and 24 hours after a football match

<table>
<thead>
<tr>
<th>Statistical index</th>
<th>Total squares</th>
<th>Degree of freedom</th>
<th>Mean squares</th>
<th>F</th>
<th>Significance level (Sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The impact of one session soccer match on the amount of blood hematocrit</td>
<td>7.933</td>
<td>1</td>
<td>7.933</td>
<td>27.523</td>
<td>0.001</td>
</tr>
</tbody>
</table>

According to results of Table (1-5), P value to the amount of blood hematocrit equals (P=0.005), that in this case study, we confirmed the hypothesis and the null hypothesis is rejected which indicates that physical activity reduces the hematocrit levels in the blood after 24 hours of racing and 24 hours after the racing.

Table 1-6: ANOVA (repeated measures), compared to the impact of physical activity on blood hemoglobin levels before, immediately after and 24 hours after a football match

<table>
<thead>
<tr>
<th>Statistical index</th>
<th>Total squares</th>
<th>Degree of freedom</th>
<th>Mean squares</th>
<th>F</th>
<th>Significance level (Sig)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The impact of one session soccer match on the amount of hemoglobin</td>
<td>7.933</td>
<td>1</td>
<td>7.933</td>
<td>27.523</td>
<td>0.001</td>
</tr>
</tbody>
</table>

According to results of Table (1-6), P value to the amount of hemoglobin equals (P=0.005), that in this case, we confirmed the hypothesis and the null hypothesis is rejected which indicates that physical activity reduces the hemoglobin levels in the blood immediately after the race and 24 hours after the race.

Discussion

This study showed that an official soccer match increases the amount of white blood cells immediately after the race, while it reduces the amount of red blood cells within 24 hours after the race. Findings of Naiman and colleagues (2005) and Fild and colleagues (1991) suggests an increase in the number of white blood cells after 30 minutes of walking on a treadmill at 60% of peak aerobic power. Gleason et al., (2007) in their review observed increased white blood cell after prolonged activities (90 min) and 55 to 75% of peak aerobic power. Ghanbari Niaki and colleagues (2007) after a circular resistance exercise, Havil and colleagues (2004) after a session of an increasingly aerobic exercise in young athletes and adults and Nemet and colleagues (2004) after a training athlete session reported increased white blood cells and platelets that are consistent with the results of the present findings. Furthermore, in the research...
done by Ansley and colleagues (2007) after 3 consecutive sessions of alternative intense exercises in an endurance form, no significant change was observed in the number of white blood cells. Simonson (2001) also did not observe a significant change in the number of white blood cells after a session of resistance exercise. Rebeleo and colleagues (1998) reviewed the effects of soccer trainings on the athlete’s immune system. They examined total number of leukocytes and their subpopulations before, after 6 weeks, 6 months and 11 months. Their results indicated that the total number of leukocytes showed no significant changes in an instance that is inconsistent with the current research.

The results of this study indicate that physical activity can reduce the amount of red blood cells. Reduced amount of red blood cells before and after the race is not significant, but the amount of reduction before the race and immediately after the race is significant to 24 hours after the race. Lehmann and colleagues (1996) and Boyajied (2000) observed significant decrease in red cell parameters in adolescent boys and girls in sports under the maximum level and changes in the practice of both sexes relates to the exercise factor that is consistent with the current results. Moore et al., (1993) stated in his report that there is no difference in hemoglobin concentration, hematocrit and red blood cells in trained and untrained people. Also Karakoc and colleagues (2005) reported that there is no difference between the number of trained and untrained Erythrocytes which is inconsistent with the current research results.

But the results of some studies also indicate increased Hematologic factor following physical activities. According to Zbigiew (1990), reports physical exercises that increase the strength and maximum consumed oxygen leads to a series of changes, including the erythrocyte device of peripheral blood and create the impression that elite athletes have high levels of hemoglobin and more erythrocytes in peripheral blood than untrained people. The results of this study indicate that physical activity increases the average amount of red blood cells immediately after the race and 24 hours after the race. But 24 hours after race after the race, this ratio is reduced than immediately after the race. These changes re significant immediately after the race than before the race, but not significant 24 hours after the race than before the race. Regarding the exercise changes in red blood cells and blood factors, Zbigiew (1990) has been mentioned that the morphologic transformation of Erythrocytes on the relationship with MCV factor following the short-term physical activity with body fatigue is remained unchanged. Also Moore et al., (1993) and Huey-June and colleagues (2004) reported no significant changes in the concentration of subjects’ blood factors after exercise which is inconsistent with the findings of the present study. This phenomenon can be attributed to the compatibility of blood in this group.

NazarAli and colleagues (2013) reviewed the effects of a period of intense endurance activity on hemorheologic factors on the three-partite national team athletes and concluded that a dual competition period (three-phase) causes a significant increase in the average volume of red blood cells immediately after the race, which is consistent with the current research results. The results of this study indicate that physical activity decreases average concentration of blood hemoglobin immediately after the race and increases 24 hours after the race. These changes immediately after the race than before the race are significant and 24 hours after the race is not significant.

Moore et al., (1993) and Huey-June and colleagues (2004) reported no significant changes in the concentration of subjects’ blood factors after exercise. Also, Zbigiew (1990) has been mentioned the morphologic transformation of Erythrocytes on the relationship with MCV factor following the short-term physical activity with body fatigue is remained unchanged. Also, Gray and colleagues (1993) showed in a study that and intense intermittent exercise significantly increases the mean hemoglobin concentration immediately and one hour after it, which is not consistent with the research results on immediately after the match. The average concentration of hemoglobin in the 24 hours after the race is consistent with. This issue can be attributed to compatibility phenomenon and blood matches in these groups.

Arazi and colleagues (2010) conducted a study on the effects of one session of endurance and resistance parallel exercises on hematological changes of male athletes, which no significant differences was observed in the MCHC value that is inconsistent with the current research results. Natale and colleagues (2003) and Huey-June and colleagues (2004) reported that changes in hematocrit and hemoglobin levels
immediately after a 24-hour ultra-marathon race is not significant. Also Martinez (1992) examined the impact of a session of the gauge machinist and observed a significant increase in hemoglobin and hematocrit of the subjects. Gaeni (2002) after a maximal exercise and Nazar Ali and colleagues (2013) after a period of prolonged intense activity reported a significant increase in hemoglobin and hematocrit. Also, Marjani and colleagues (2010) examined the effect of a short period of intense activity sessions on some of the blood factors among elite karate athletes. By studying he survey results, it has been indicated that Hemoglobin and hematocrit at the end of three minutes short of intense activity has significantly increased which has been inconsistent with the current research results.

Clement (1782), Fredrichson and Puhl (1983) reported a decrease in hemoglobin and hematocrit levels after aerobic exercises. Also, Miller (1988) observed a decrease in hemoglobin concentration and hematocrit after an intense exercise. Amir (2002) reported a significant decrease in hemoglobin and hematocrit after a session of intense aerobic activity. Also Ghanbar and colleagues (2006), after three days of continuous running in one mile, observed a significant decrease in the levels of hematocrit and hemoglobin which is consistent with the current research results. In this study, changes in blood cells of young footballers including HCT and HB and MCHC, MCV, WBC and RBC in response to an official football race meeting was investigated. The findings showed that the volume of blood plasma of subjects before exercise, immediately after and 24 hours after a football official race meeting has changed significantly. This finding suggests the lack of plasma dilution or concentration phenomenon and relative stability of its size. During the exercise, the subjects were allowed to drink enough water optionally. On the other hand, the exercises they did had relatively low intensity. Therefore, adequate hydration and low intensity exercises justifies no change in plasma volume.

Often the results of research carried out by the changes in white blood cells in various physical activities specifies that increasing white blood cells is more and stable in intense and longer activities. Nevertheless, lack of changes in the number of white blood cells at 24 h after a football match in this study and the same ones may be resulted from lack of stimulation of the immune factors, the hypothalamus-pituitary-adrenal and lack of sufficient duration and intensity of these changes, suggesting that the safety performance of these exercises in terms of safety.

This finding is consistent with the research done by Ansley and colleagues (2007) and Simonson (2001), but not consistent with the researches done by Naiman and colleagues (2005), Gleason (2007), Ghanbari and colleagues (2005), Havil and colleagues (2003) and Nemeth and colleagues (2004). Based on these findings, the number of red blood cells immediately after exercise is decreased and the values of hematocrit and hemoglobin have also decreased. In this regard, the Shephard (1982) has reported that acute effects of intense physical exercise increased by 5 to 10 percent in the number of red blood cells, hematocrit and hemoglobin. Also, the red blood cells in a heavy training session are encountered with more damage compared to the resting time. Because their frequently encountered with the blood vessel walls was higher. In the conditions that rupture of the membranes of red blood cells is intense, the value of hemoglobin and other proteins in the urine also increase. In addition, the state of acidosis in some heavy physical activity is the cause of the rapid breakdown and vulnerability of red blood cells. Although the absolute number of red blood cells in the blood does not change, the number of red blood cells in active tissues increases during physical activity. This phenomenon is created due to increased blood flow in active tissues that is accompanied by immediately after training with the increase in the number of red blood cells and also a slight increase in hemoglobin and hematocrit, which is not consistent with the current research. According to other findings of research, despite the lack of change of RBC, HCT, HB immediately after exercise, with over 24 hours of the end of practice, despite the lack of change of RBC, HCT, HB immediately after exercise, with over 24 hours of the end of practice, these factors have been reduced which are consistent with the findings of Miller and colleagues (1988), Clement and colleagues (1982), Fredrichson and colleagues (1983), Amirsasan and colleagues (2002) and Ghanbari and colleagues (2006), the onset of this phenomenon can be attributed to factors such as intensity, duration, combinational nature of the of exercise and adequate rest between exercises, which effectively reduced important factors of gas exchange and transport of oxygen to active muscles. From a physiological point
Research Article

of view, if there is no change in plasma volume, this issue reduces oxygen available for active muscles, and causes the muscles use their anaerobic energy stores more. Immediate use of energy resources, in turn, leads to glycogen depletion, pH reduction and accumulation of lactate in the blood totally leads to fatigue and undermining athletic performance. Zbigiew (1990) maintains that some researchers associated with the sport changes in red blood cells and anemia factors stated that the morphological transformation of the erythrocyte on the relationship with factors MCV, MCHC and subsequent short physical activity associated with body fatigue are unchanged. Also Moore and colleagues (1993) and Huey-June and colleagues (2004) reported no significant changes in the subjects’ concentration of blood after exercise, which is not consistent with the findings of current research suggesting significant differences on measures of MCHC, MCV immediately and 24 hours after an exercise session. This phenomenon can be attributed to compatibility and blood matches in these groups.

REFERENCES


© Copyright 2014 | Centre for Info Bio Technology (CIBTech)
Research Article


Malm C (2004). Exercise Immunology, the Current State of Man and Mouse. Sports Medicine 34(9) 555-556.


