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Peer Review Report for "The Effects of Consuming 6 Weeks of Beetroot Juice (*Beta vulgaris* L.) on Hematological Parameters in Female Soccer Players "

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The effect of 6 weeks beetroot Juice (Beta vulgaris L.) consumption on the hematological parameters in the female soccer players

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Abstract:

Background: The purpose of this study was to investigate the effect of 6 weeks beetroot juice (Beta vulgaris L.) consumption on the hematological parameters in the female soccer players. Methods: Twenty female soccer players were selected randomly and assigned into two groups: experimental (beetroot juice, n = 10) and control (placebo, n = 10). Subjects did their soccer trainings for six weeks (3 session per week for 90 min) with consumption of 200 ml juice 2 hour before they started their trainings. Blood samples were collected and investigated (Hb, Hct, RBC, Iron, MCV, Ferritin and TIBC) in the pre and posttest. Paired sample t-test was used for comparision within groups and independent sample t-test used for comparison between groups ($P < 0.05$). Findings: results showed that the experimental group had significant increase in the (Hb, Hct, RBC, Iron, Ferritin) levels ($P<0.05$). MCV levels had no significant difference ($t= -1.10$, $P=0.29$) and there was a significant decrease in the TIBC ($t=4.99$, $P=0.001$). In the control group, except (Hct, Iron, Ferritin and TIBC) ($P<0.05$), there were no significant difference between pre and post treatment (Hb, RBC, MCV) ($P>0.05$). Also there was significant difference in (Hb, Hct, RBC, Iron, Ferritin and TIBC) between experimental and control subjects ($P<0.05$), except mean corpuscular volume ($t=1.11$, $P=0.28$).Conclusion: Since beetroot juice consumption have significant effects on the levels of some hematological parameters in the female soccer players. So, we can use it for preventing and improving anemia among them.

Key words: Anemia, Female Adolescent, Beetroot juice, Soccer

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1. Introduction

Soccer is one of the most popular sports in the world that performed by men and women with different levels of expertise. During a 90-min-game, soccer players at top levels covered 10–12 km with cardiorespiratory endurance as one of the fundamental components of physical fitness(1). Aerobic (cardiorespiratory) fitness represents an integrated function with contributions from lung, heart, blood and active muscles. More recently, it is believed that hematological parameters may also play a crucial role in predicting optimal physical performance in the soccer. Hematological parameters are influenced by several factors within the apparently healthy population. These factors include training, age, sex, ethnicity, nutrition, and altitude(2). Anemia is a common disorder among adolescent women regardless levels of physical activity. Anemia, defined as a decreased concentration of blood hemoglobin, is one of the most common nutritional deficiency diseases observed globally and affects more than a quarter of the world's population**.** It has a variety of converging contributing factors including nutritional, genetic and infectious disease factors(3). Although many causes of anemia have been identified, it is agreed that iron deficiency is an important cause. Iron is an important element that makes up the heme molecules of hemoglobin within red blood cells, allowing for oxygen transportation and utilization(4). During anemia, defined as a deficiency of red blood cells, a decrease of hemoglobin impairs oxygen delivery to the tissues, predisposing to performance decrements despite a compensatory increase of cardiac output(5). Yet, elite athletes specially female soccer players during intensive training have a higher risk of iron depletion because of several possible mechanisms (i.e. intravascular/foot-strike hemolysis(4, 6), ischemia to the viscera(7) or frequent nonsteroidal anti-inflammatory drug use(8) which may promote gastric lesions(7), loss of iron through urine caused by renal ischemia(6), menstrual cycle and etc. Several studies suggest that there is measurable impairment of aerobic performance when iron stores are low or depleted and early detection of depleted iron stores seems to be successful intervention in aim to prevent iron deficiency and anemia(9). Adolescent female soccer players who encounter with anemia have a diminished athletic performance. Nutritional supplementations and organic materials are the best ways for eliminating iron depletion and anemia among female soccer players. Among vegetables, beetroot (Beta vulgaris L.) is a main source of iron, nitrate, sodium, potassium, betalain(10). The pigment that gives beetroot its rich, red and purple color is called betalain. Some of the benefits of beetroot juice are lowering blood pressure by dilating the blood vessels and relaxing smooth muscles, treating anemia by increasing the blood count and improving blood circulation and oxygen carrying capacity of erythrocytes (red blood cells), preventing birth defects by folate and folic acid, preventing hypertension and stroke, cleansing intestine, reducing kidney stone, improving rheumatoid arthritis, gout sand improving menstrual problems(11). Beetroot juice is particularly beneficial as an anemia remedy for children and teenagers, according to H.K. Bakhru author of "food that heal". Easton Patrick[2] said that consuming beetroot juice or beet as cooked vegetable in salad is highly beneficial in treating anemia. Nirman Walker[3]claimed that beetroot build red corpuscles by betalain and add tones to

[2] 2011

[3] 2010

blood so that it increases hemoglobin levels in the blood. The cost is low when compared with other iron rich vegetables and it can be stored easily(12). Thus, the purpose of this study was to determine the effect of 6 weeks beetroot juice (Beta vulgaris L.) consumption on the hematological parameters in the female soccer players.

2. Methods:

The study was conducted at Razi University, Kermanshah, Iran. The research design used for this study was a semi-experimental design. The study protocol received ethical approval from the faculty of sport sciences ethics committee at Razi University.

2.1. Subjects:

Written permission and oral consent was obtained from the subjects after explaining the purpose of the study. None had any known food allergies, thalassemia (minor, major), blood cancer, unknown blood diseases, previous history of renal, gastrointestinal or cardiovascular complications or any other contraindication to the study procedures. Subjects were wanted not to use supplementations, coffee, energetic beverages(13) and drugs that affected on the blood profile such as (anticoagulant drugs like heparin, antiplatelet drugs like aspirin, thrombolytic drugs like streptokinase, drugs for treating anemia like (Iron, folic acid) and drugs for treating bleeding like thrombin). Subjects had the same diet and they used the food that provided by central canteen of Razi University.

The sample size selected for this study consisted of 20 adolescent female soccer players (23.13±0.77) years old, BMI: (23.05±1.01) kg/m^2 playing in the Razi university soccer team. Subjects were devided into two groups (experimental and control: n=10) randomly. In the first session, in the fasting mode, blood samples were collected. Beetroot Juice and placebo) water, carmoisine food color and stevia) (200 ml) were given to subjects 2 hour before they started their trainings (14).

2.5 Description of the tool

2.5.1. **Background variables:** Background variables were used in the questionaire to collect the data from the female soccer players consisted of age, type of family, family income per month, number of children in the family, type of food, meals per day, does their meal contain more vegetables, do they have anemia before, if yes, are they taking any treatment and menstrual cycle.

2.2. Anthropometric measurements

Anthropometric measurements including height, weight and BMI were obtained before the test. Height was measured using semiautomatic height measurement equipment (HD; STDK, Tokyo, Japan), weight and body composition were measured by using a bioelectrical impedance analysis body composition analyzer (Inbody220; Biospace, Seoul, Korea) (Table 1).

2.3. Exercise training method

The training programs were held three times per week for 90 min and participants after general and special warm-up(dribbling, shooting,…) did their preparing programs before soccer competitions between universities.

2.4. Blood collection and analysis method

Before and after treatment, blood (10 ml) collected from the antecubital vein with a 22-gauge needle and placed in the test tubes which contain anticoagulant substance and taken to the laboratory to measure the hematological Parameters (Hb, Hct, RBC, Iron, MCV, Ferritin and TIBC). Test tube was utilized to do complete blood count by UDI hemolysis machine. The blood separation was performed by centrifugation at 3000 rpm for 15 min. The levels of (Hb, Hct, RBC, Iron, MCV, Ferritin and TIBC) in pretest and posttest were compared.

2.5. Statistical analysis

Data generated were analysed using statistical package for social sciences (SPSS version 22). Comparisons within groups in the pretest and posttest we used paired sample t-test. And for comparison between experimental and control groups we used independent t-test. Statistical significance (p) was set at 0.05.

3. Results:

Table 1: Anthropometric measurements (weight, Height, BMI) (Mean ± SD).

Variable	Experimental group	Control group
Weight(kg)	58.56±4.88	61.18±2.48
Height(cm)	161.05±5.10	162.60±1.89
BMI (kg/m^2)	22.57±1.54	23.13±0.58

With regard to type of family, (83.3%) in experimental group and (80%) in control group were from nuclear family. Regarding family monthly income, experimental group (36.67%) and in control group (46.67%) had income of 2 million tomans. Regarding type of food, experimental group (90%) and control group (90%) were nonvegetarian. With regard to history of anemia, girls in the experimental group (100%) and control group (100%) had no history of anemia. In relation to menstrual cycle, all of subjects in the experimental and control groups had regular menstrual cycle.

3.1. Changes in hematological parameters

Changes in hematological parameters (Hb, Hct, RBC, Iron, MCV, Feriitin and TIBC) before and after treatment in the experimental and control groups are shown in Table2.

Table2: (Hb, Hct, RBC, Iron, MCV, Ferritin and TIBC values before and after beetroot juice consumption in the experimental and control groups (mean± SD).

	Hb(g/dl)		Hct (%)		RBC(*10^6/µl)		Iron(µg/dl)	
	BR	**PL**	**BR**	**PL**	**BR**	**PL**	**BR**	**PL**
pre	12.77±0.44	12.87±0.41	39.06±1.70	41.37±1.18	4.31±0.16	4.46±0.32	79.50±11.64	87.70±15.46
post	14.21±0.24	12.86±0.47	42.22±0.69	40.55±0.82	5.11±0.20	4.43±0.34	86.10±11.69	86±15.49
t	-10.85	0.31	-7.59	3.11	-11.80	1.08	-21.60	6.53
p-value	P<0.05 P=0	P>0.05 P=0.75	P<0.05 P=0	P<0.05 P=0.01	P<0.05 P=0	P>0.05 P=0.30	P<0.05 P=0	P<0.05 P=0
	MCV (fL)		**Ferritin(ng/ml)**		**TIBC(µg/dl)**			
	BR	**PL**	**BR**	**PL**	**BR**	**PL**		
pre	91.92±1.43	90.57±3.28	36.20±2.28	36.58±1.66	365.90±28.42	347.50±29.61		
post	92.25±1.71	90.56±3.30	37.09±2.21	36.24±1.67	351.10±31.96	340.60±28.11		
t	-1.10	0.22	-5.28	12.75	4.99	12.17		
p-value	P>0.05 P=0.29	P>0.05 P=0.82	P<0.05 P=0.001	P<0.05 P=0.000	P<0.05 P=0.001	P<0.05 P=0.000		

Abbreviations: Hb= hemoglobin, Hct= hematocrite, RBC= red blood cell, MCV= mean corpuscular volume, TIBC= total Iron binding capacity, BR=beetroot, PL=placebo

Table 2 shows the result of laboratory investigations for (Hb), (Hct), (RBC), Iron and (MCV) from blood samples of the subjects before and after 6 weeks of beetroot juice consumption along soccer trainings. In the experimental group overall pretest mean score of haemoglobin was 12.77 with SD of 0.44 and the overall posttest mean score of Hb was 14.21 with SD of 0.24. Indeed, after the administration of 6 weeks of beetroot juice consumption, there was a significant

improvement in the Hb levels of subjects (P<0.05), Whereas in the control group overall pretest mean score of Hb was 12.87 with SD of 0.41 and the overall posttest mean score Hb was 12.86 with SD of 0.47. It showed that, there was no significant improvement in the Hb levels (P>0.05). In the experimental group overall pretest mean score of Hct was 39.06 with SD of 1.70 and the overall posttest mean score of Hct was 42.22 with SD of 0.69. It showed that after the administration of beetroot juice, there was a high significant improvement in the Hct levels (P<0.05), Whereas in the control group overall pretest mean score of Hct was 41.37 with SD of 1.18 and the overall posttest mean score Hct was 40.55 with SD of 0.82. It showed that, there was significant difference in the Hct levels (P<0.05). In the experimental group overall pretest mean score of RBC was 4.31 with SD of 0.16 and the overall posttest mean score of RBC was 5.11 with SD of 0.20 .It proved that after the administration of beetroot juice, there was a significant improvement in the RBC levels of subjects (p<0.05), Whereas in the control group overall pretest mean score of RBC was 4.46 with SD of 0.32 and the overall posttest mean score RBC was 4.43 with SD of 0.34. It showed that, there was no significant improvement in the RBC levels (P>0.05). The overall pretest mean score of iron in the experimental subjects was 79.50 with SD of 11.64 and the overall posttest mean score of Iron was 86.10 with SD of 11.69 .It showed that In the experimental group, there was a significant improvement in the iron levels (P<0.05), Whereas in the control group overall pretest mean score of Iron was 87.70 with SD of 15.46 and the overall posttest mean score Iron was 86 with SD of 15.49 .It showed that, there was significant difference in the iron levels (P<0.05). The overall pretest mean score of MCV was 91.92 with SD of 1.43 and the overall posttest mean score of MCV was 92.25 with SD of 1.71. It showed that after the administration 6 weeks of beetroot juice consumption, there was no significant improvement in the MCV levels of subjects (P>0.05) and in the control group overall pretest mean score of MCV was 90.57 with SD of 3.28 and the overall posttest mean score MCV was 90.56 with SD of 3.30. It showed that, there was no significant improvement in the MCV levels (P>0.05). The overall pretest mean score of ferritin was 36.20 with SD of 2.28 and the overall posttest mean score of ferritin was 37.09with SD of 2.21. It showed that after the administration 6 weeks of beetroot juice consumption, there was significant improvement in the ferritin levels (P<0.05) and in the control group overall pretest mean score of ferritin was 36.58 with SD of 1.66 and the overall posttest mean score ferritin was 36.24 with SD of 1.67. It showed that, there was significant decrease in the ferritin levels (P<0.05). In the experimental group, the overall pretest mean score of TIBC was 365.90 with SD of 28.42 and the overall posttest mean score of TIBC was 351.10 with SD of 31.96. It showed that, there was a significant decrease in the TIBC (P<0.05) and in the control group overall pretest mean score of TIBC was 347.50with SD of 29.61 and the overall posttest mean score TIBC was 340.60 with SD of 28.11. Indeed, there was significant decrease in the TIBC levels of adolescent female soccer players(P<0.05).

3.2. Changes in the hematological parameters (Hb, Hct, RBC, Iron, MCV, Ferritin and TIBC) between experimental and control groups are shown in Table3:

Table 3 shows us the comparisons of mean and standard deviation were made for experimental and control subjects using the student t-test. Results show us there were significant difference in (Hb, Hct, RBC, Iron, Ferritin and TIBC) between experimental and control subjects(P<0.05), but

there was no significant difference in (MCV) between experimental and control subjects, too(t=1.11, P>0.05).

Table: 3. Comparison of hematological parameters scores (mean difference) between the experimental and control group.

	Hb(g/dl)	Hct (%)	RBC(*10^6/µl)	Iron(µg/dl)	MCV (fL)	Ferritin(ng/ml)	TIBC(µg/dl)
Experimental	1.44±0.41	3.16±1.31	0.80±0.21	6.60±0.96	0.33±0.96	0.89±0.53	-14.80±9.36
Control	-0.01±0.09	-0.81±0.82	-0.02±0.08	-1.70±0.82	-0.003±0.04	-0.34±0.084	-6.90±1.79
t	10.63	8.08	11.38	20.67	1.11	7.21	-2.62
p-value	0.000	0.000	0.000	0.000	0.28	0.000	0.017

Abbreviations: Hb=hemoglobin, Hct=hematocrite, RBC=red blood cell, MCV= mean corpuscular volume, TIBC= total Iron binding capacity

4. Discussion:

In our study, hemoglobin levels was significantly increased in the experimental group (P<0.05), indicating a positive effect of beetroot juice on the levels of (Hb). This finding is consistent with the studies conducted by Priya(12), Nora M(15) and patel (16), whereas the control group showed no significant change in (Hb) levels(P>0.05). In this study, the experimental group had a significant increase (Hct) levels in compared with the pretreatment and control group. It showed us after the administration of beetroot juice, there was a high improvement in the (Hct) levels (P<0.05), Whereas in the control group, there was significant difference in the (Hct) levels of adolescent female soccer players(P<0.05).There was slightly decrease in (Hct) levels in the control group that was related to the fact that athletes often have decreased levels of Hct that called sport anemia(5). The levels of (RBC) was significantly increased in the experimental group in relation to pretest levels and in compared to control group. It proved that after the administration of beetroot juice, there was a significant improvement in the (RBC) levels (p<0.05), Whereas in the control group, there was no significant improvement in the RBC levels (P>0.05). In the experimental group, there was a significant improvement in the iron levels of subjects (P<0.05); so this increase in iron may be related to improvement of iron store as a result of beetroot juice intake and this result supports previous studies reporting that beetroot is an excellent source of iron(10), Whereas in the control group, the levels of iron was decreased after 6 weeks of soccer trainings. In the other words, there was a significant difference in the iron levels of subjects (P<0.05) that we can related it to their menstrual cycles(4) and soccer trainings that they had(17). Also, MCV levels showed up mild increase in the 5 subjects of experimental group in compared to the control group; This may be related to the fact that 6 weeks of beetroot juice consumption was not sufficient to have a convincing results regarding MCV levels and was consistent with the study conducted by Nora M.(15). Indeed, results of the study unfolded that in the experimental group, there was no significant improvement in the MCV levels of subjects (P>0.05) and in the control group, there was no significant improvement in the MCV

levels (P>0.05), too. In the experimental group, there was a significant improvement in the ferritin levels of subjects (P<0.05); so this increase in ferritin may be related to improvement of iron store as a result of beetroot juice intake, Whereas in the control group, levels of ferritin was decreased. In the other words, there was a mild decrease in the ferritin levels of subjects (P<0.05) that we can related it to their menstrual cycles(4) and soccer training that they had(17). In the experimental group, there was a significant decrease in the TIBC levels (P<0.05); so this decrease in TIBC may be related to improvement of iron store as a result of beetroot juice intake, whereas in the control group, the levels of TIBC was decreased (P<0.05).

5. Conclusion:

Anemia in association with iron deficiency has serious implications(18). Iron depletion is the earliest stage of iron deficiency. Iron-deficiency anemia is the most advanced stage of iron deficiency. It is characterized by decreased or absent iron stores, low serum iron concentration and low blood hemoglobin concentration. Hemoglobin determination is one of the most convenient screening methods in anemia(15). Beetroot is a source of substances and minerals. In this study, we recorded obvious increase in (Hb, Hct, RBC, Iron and Ferritin) levels after taking 200 ml beetroot juice for 6 weeks, that was consistent with the study conducted by Indhumathi and Kannikaparameswari stated that B. vulgaris recorded significant increase in packed cell volume (PCV), hemoglobin concentration, Red Blood Cell counts (RBCs)(19). Thus, it can be stated that consumption of beetroot juice may be beneficial for maintenance of good health and enhance athletic performance and have some therapeutic properties for eliminating anemia in the female soccer players. So, it is suggested that beetroot juice be put within the dietary protocols for adolescent female soccer players. A glass of red Beetroot juice a day will not only provide the body with the required nutrient but may also protect and prevent anemia.

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Refrences:

1. OSTOJIC SM. Elite and nonelite soccer players: preseasonal physical and physiological characteristics. Research in Sports Medicine. 2004;12(2):143-50.
2. Ostojic S, Ahmetovic Z. Indicators of iron status in elite soccer players during the sports season. International journal of laboratory hematology. 2009;31(4):447-52.
3. Addis Alene K, Mohamed Dohe A. Prevalence of anemia and associated factors among pregnant women in an urban area of eastern Ethiopia. Anemia. 2014;2014.
4. Rowland T. Iron deficiency in athletes: an update. American Journal of Lifestyle Medicine. 2012;6(4):319-27.
5. Mairbäurl H. Red blood cells in sports: effects of exercise and training on oxygen supply by red blood cells. Frontiers in physiology. 2013;4:332.

6. Clénin G, Cordes M, Huber A, Schumacher YO, Noack P, Scales J, et al. Iron deficiency in sports–definition, influence on performance and therapy. Swiss Med Wkly. 2015;145:w14196.
7. Reinke S, Taylor WR, Duda GN, von Haehling S, Reinke P, Volk H-D, et al. Absolute and functional iron deficiency in professional athletes during training and recovery. International journal of cardiology. 2012;156(2):186-91.
8. Burden RJ, Pollock N, Whyte GP, Richards T, Moore B, Busbridge M, et al. Impact of intravenous iron on aerobic capacity and iron metabolism in elite athletes. Med Sci Sports Exerc. 2014;47(7):1399-407.
9. Banfi G, Dolci A, Freschi M, Verdini C. Immature reticulocyte fraction (IRF) monitored in elite athletes during a whole season. Clin Lab Haematol. 2005;27:213-4.
10. Kale R, Sawate A, Kshirsagar R, Patil B, Mane R. Studies on evaluation of physical and chemical composition of beetroot (Beta vulgaris L.). IJCS. 2018;6(2):2977-9.
11. Clifford T, Howatson G, West DJ, Stevenson EJ. The potential benefits of red beetroot supplementation in health and disease. Nutrients. 2015;7(4):2801-22.
12. Priya NG, Malarvizhi M, Jothi A. Beet root juice on haemoglobin among adolescent girls. IOSR-JNHS. 2013;2(1):9-13.
13. Khanna G, Manna I. Supplementary effect of carbohydrate-electrolyte drink on sports performance, lactate removal & cardiovascular response of athletes. Indian Journal of Medical Research. 2005;121(5):665.
14. Hoon MW, Jones AM, Johnson NA, Blackwell JR, Broad EM, Lundy B, et al. The effect of variable doses of inorganic nitrate-rich beetroot juice on simulated 2000-m rowing performance in trained athletes. International journal of sports physiology and performance. 2014;9(4):615-20.
15. Al-aboud NM. Effect of red beetroot (Beta vulgaris L.) intake on the levels of some hematological tests in a group of female volunteers. ISABB Journal of Food and Agricultural Sciences. 2018;8(2):10-7.
16. Patel R, Luke F. A Study to Assess the Effectiveness of Beetroot Juice with Jaggery on Anemia among Adolescent Girls in the Selected Urban Area at Rajkot. International Journal of Nursing Education and Research. 2017;5(2):140-2.
17. Jamurtas AZ, Douroudos II, Deli CK, Draganidis D, Chatzinikolaou A, Mohr M, et al. Iron status markers are only transiently affected by a football game. Journal of sports sciences. 2015;33(20):2088-99.
18. Beard JL, Connor JR. Iron status and neural functioning. Annual review of nutrition. 2003;23(1):41-58.
19. Indhumathi T, Kannikaparameswari K. Hematopoietic study of the methanolic root extract of Beta vulgaris on albino rats-an in vivo study. Int J Pharm Biol Sci. 2012;3(4):1005-15.

تاثیر مصرف 6هفته نوشیدنی آب چغندرقرمز بر شاخص های خونی در دختران فوتبالیست

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چکیده:

زمینه: هدف این پژوهش، بررسی تاثیر مصرف 6 هفته نوشیدنی آب چغندر قرمز بر شاخص های خونی در دختران تمرین کرده فوتبالیست بود. **روش ها:** 20 بازیکنان دختر فوتبالیست با میانگین سنی (13/23±77/0) به طور تصادفی انتخاب و به دوگروه تجربی و کنترل تقسیم شدند. آزمودنی ها تمرینات فوتبال را به مدت 6 هفته(هفته ای سه جلسه 90 دقیقه ای) همزمان با مصرف 200 میلی لیتر آب چغندر قرمز دو ساعت پیش از اجرای تمرین، انجام دادند. نمونه های خونی جمع آوری شده و در حالت پیش آزمون و پس آزمون مورد بررسی قرارگرفت. از آزمون تی همبسته برای مقایسه درون گروهی و از آزمون تی مستقل برای مقایسه بین گروهی استفاده شد. **یافته ها:** براساس آزمون تی همبسته، نتایج نشان داد که در گروه تجربی افزایش معناداری در سطوح(هموگلوبین، هماتوکریت، گلبول قرمز، آهن و فریتین) وجود دارد (P< 05/0). در سطوح میانگین حجم گلول قرمز تفاوت معناداری وجود ندارد(P= 29/0) و کاهش معناداری در مجموع ظرفیت اتصال به آهن وجود دارد(p= 001/0). نتایج آزمون تی مستقل نشان داد که بین دوگروه تجربی و کنترل به جز در متغیر میانگین حجم گلبول های قرمز خون تفاوت معناداری در سطوح (هموگلوبین، هماتوکریت، گلبول قرمز، آهن و فریتین و مجموع ظرفیت اتصال به آهن) وجود دارد(P< 05/0). **نتیجه گیری:** از آن جا که 6 هفته مصرف نوشیدنی آب چغندر قرمز منجر به بهبود سطوح شاخص های خونی می شود، می توان از آن در جهت بهبود و درمان کم خونی در میان دختران فوتبالیست به کار برد.

کلمات کلیدی: کم خونی، نوجوانان دختر، آب چغندر قرمز، فوتبال

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