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Research Article

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The Effect of Iron Deficiency and Supplementation on Players Performance: In Case of Lemo and Ambericho Super League Football Clubs

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Abstract

This study was aimed to examine the effect of iron deficiency and supplementation on player's performance: in case of lemo and Ambericho super league football clubs. Experimental study design was employed. Sampling size determination and sampling technique was used purposive sampling technique method and sampling size was determined by classifying player's age level. The instrument of data collection was anthropometric (age, height, weight and BMI) measured by meter and kilogram, cardiovascular endurance test measured by 12-minute run test and Astrand tridmile test resting heart rate measured by counting heart beat after interval training. The analyses were carried out by using paired sample T test to analyze player's hematological change and performance change before and after supplementations by using. The result show that there is significant change was scored on hematological and performance efficiency after supplementation of Iron and 12-week training. Based on the result football players in addition to daily food menu they should have supplement iron with managed training intensity.

Keywords: Iron, Performance, Soccer player, Hemoglobin

Introduction

Good performance in soccer consists of many factors, including excellence in games skills, cognitive abilities to make correct decisions within the game, moderate to high aerobic and anaerobic power. Endurance performance at reduced exercise intensities, however, is more closely related to tissue iron concentrations because of the strong association between the ability to maintain prolonged sub maximal exercise and the activity of iron-dependent oxidative enzymes [1]. Having to this idea football player mostly used cardiovascular endurance or high aerobic capacity during extensive training and loses minerals via sweeting so they need iron supplementations to maintain performance. Several studies have examined the effect of iron supplementation on iron stores and on parameters characterizing changes in aerobic capacity or physical fitness [1-4]. As far as individuals with iron deficiency anemia are concerned, there is no question as to the benefit of iron-containing medications, because even mild anemia decreases the capacity for performance of physical exercise substantially and mainly cardiovascular endurance of football players decrease dramatically [5,6]. Some investigators also identified objective signs of improved fitness such as increased VO2max longer endurance time to exhaustion and decreased blood lactate levels and subjective parameters, for example increased training motivation [7-11]. However, it is possible that some of the athletes were slightly anemic at study entry and that the positive effects noted in these studies were evaluated the baseline iron and randomly and equally categorized in to high and moderate intensity groups before iron supplement and endurance trainings.

The physiological roles of minerals are importance to the athlete's muscle contraction, normal heart rhythm, nerve impulse conduction, oxygen transport, oxidative phosphorylation, enzyme activation, immune functions, antioxidant activity, bone health, and acid-base balance of the blood [12]. In elite athlete's daily iron losses are often increased and especially daily iron losses of football players increased due to extensive training and competitions, but this is usually compensated by enhanced absorption of dietary iron [13]. The concentration of myoglobin in skeletal muscle is drastically reduced (40-60%) following iron deficiency, thus limiting the rate of oxygen. Therefore, iron deficiency may have detrimental effects, especially on endurance performance which is susceptible to, and negatively affected by disturbances in skeletal muscle's iron concentrations [5].

Thus, we hypothesized that iron supplement and daily training could have positive effects on iron deficiency and increasing hemoglobin concentration which is the protein in red blood cells that carries oxygen to the working tissues. Therefore, the purpose of this study was to examine the effect of iron deficiency and supplementation on player's performance.

Material & Methods

Study Design: The researcher used experimental research de-

sign to examine the effect of iron deficiency and supplementation on player's performance.

Study Population: The study population includes football players which are found in Hadiya-lemo and Ambericho football clubs. The number of study population found in each football clubs 30, then which is equal to (n=60)

Sampling Size and Sampling Techniques

Purposive sampling: Ten (10) players selected purposively from total population (n=60). The selection based on age category of the football players and the range of age min 22- max 26.

Data Collection Instrument

The data collection instrument was used to collect from player's performance efficiency of cardiovascular endurance measured by using a strand Treadmill Test and cooper test measured by 12-minute run test of Vo2 max of football players. The objective of this test is to monitor the development of the athlete's general endurance (VO2max). Iron status was measured by taking blood from the players and tested by laboratory of hematological test. Resting heart rate measured by counting pulse rate of sample players. The instrument used to measure the BMI meter and weight mashen.

Experimental Design Procedures

Before starting the test Participant cheeked risk factors associated with injury and were not engaged in other regular training program. Other exclusion criteria included medication usage and smoking.

Step 1: Giving all necessary information about exercise protocol performing performance efficiency of cardiovascular endurance to test Vo2 max of football players. A strand Treadmill test used treadmill mashed which is found in gymnasium. From the total running time an estimate of the athlete's VO2max can be calculated as follows: VO2max = (Timex1.444) + 14.99

Step 2: Measuring football players Vo2 Max by using a strand Treadmill and cooper test of Vo2 max of football players before iron supplementation and recording data carefully. Resting heart rate measured by using counting pulse rate.

Step 3: Checkup iron status from sample football players. Iron status was carefully checked by laboratory technicians to test hematology by taking blood from sample football players. Wachemo University specialized hospital certified laboratory technicians conducted all the laboratory test procedures including collection and handling of materials carry out in accordance with standard protocols. The researcher and laboratory technician checked the expired date of all the reagents and keep them from contamination when using and store in favorable temperature.

Step 4: Iron was Supplied 3mg of iron with folic acid in tablet form three days per week for 12 weeks of the study period.

Step 5: After they supplied iron with folic acid measured cardiovascular endurance Vo2 Max by using A strand Treadmill.

Step 6: Comparing the result before and after iron supplement of sample football players of Vo2 Max performance and effect of iron supplement on player's performance by comparing the result with hypothesis of this study.

Methods of Data Analysis

Descriptive statistics mean and standard deviation and paired sample t test was employed to analyze the data gathered before and after from hematological changes and performance efficacy by using SPSS statistical software version 20. with A p-value < 0.05.

Ethical Issues

The study was conducted under the auspices of Wachemo University rules, policies and code of conduct governing research activities and ethical issues and also obtained approval from the Institutional Research Ethics Review Committee (IRERC) of Wachemo University College of Natural and computational Science, stationed at Main campus.

Result and Discussion

Table 1 showed that significance mean age of Hadiya Lemo super league football players from 10 respondents were 24.9 ± 1.78. Mean value height of the football players were 1.67 ± 0.061 and the mean difference weight of football players were 69.1 ± 2.51. Ambericho super league football players have sample size 5 players from this age mean value of the player were 25.1 ± 2.47, mean value of height of the player were 1.69 ± 0.06 and mean difference of weight of the football players were 64.2 ± 5.17.

Table 1: Characteristic of Football Players (Mean ±SD)

Hadiya Lemo super league football players			
	N	**Percent**	**Mean ± SD**
Age of the players(years)	26	100.0%	24.9±1.78
Height of the players(m)	26	100.0%	1.67±0.061
Weight of the players(kg)	26	100.0%	69.1±2.51
Ambericho super league football players			
	N	**Percent**	**Mean ± SD**
Age of the players(years)	26	100.0%	25.1±2.47
Height of the players(m)	26	100.0%	1.69±0.06
Weight of the players(kg)	26	100.0%	64.2±5.17

Table 2 explain that Age of sample football players 22.1 ± 0.73, average height of sample players was 1.78 ± 0.04, average weight (kg) of sample football players were 59.6 ± 5.7 and average BMI (Kg/m2) were 18.64 ± 1.25.

Table 2: Characteristics of the Players Before and After Supplement (Mean ± SD)

	Before Supplement	After Supplement
Age (years)	22.1 ± 0.73	22.1 ± 0.73
Height (m)	1.78 ± 0.04	1.78 ±0.04
Weight (Kg)	59.6 ± 5.7	60.4 ± 6.39
BMI (Kg/m^2)	18.64 ± 1.25	18.71 ± 1.33

Sample football players were after supplement the characteristics of the sample football players were as follows the average age (year) of sample players were 22.1 ± 0.73, average height of sample players was 1.78 ± 0.04, average weight (kg) of sample football players were 60.4 ± 6.39 and average BMI (Kg/m2) were 18.71 ± 1.33. The results show that there is iron supplement effect on weight and BMI of sample football players. Player's weight gives 0.8 kg difference from the weight they have before iron supplement. BMI of sample football players gives 0.07 differences after they supplement iron.

The result in Table 3 explain the mean RBC difference of sample players before supplement was 4.28 ± 0.132. The mean RBC difference of sample players after supplement was 5.26 ±0.132 therefore sample players gives RBC mean difference were 0.98 ml/cm3 iron supplementation and endurance training. Hb of sample football players has 14.38g/dl before supplement and 17.73g/dl has after supplement iron.

Table 3: Mean Value of Hematological Test of Players Before and After Iron Supplementation

Treatments	RBC	Hb
Before supplement	4.28 ± 0.132	14.38 ± 0.209
After supplement	5.26 ±0.132	17.73 ± 0.377
Mean diff.	-0.9840*	-3.350*
Sig.	0.000	0.000
Means ± in the same column in each parameter with different *superscripts are significantly different ($p<0.05$) RBC = red blood cell and HB = hemoglobin.		

Endurance athletes with normal hemoglobin status who attempt to increase their red blood cells (RBC) and hemoglobin levels may benefit from iron supplementation [10]. Iron absorption is the main mechanism through which iron balance is maintained. Iron plays a critical role in oxygen transport as it is necessary for the formation of Hb, the oxygen transport protein that is critical for aerobic capacity.

Table 4 explains that resting heart rate of sample football has mean deference 3.7 beat/minute after supplement iron. Cooper test of players have mean deference of 580 meters after supplement iron. A strand Treadmill test of players have mean difference 5.72 mls/kg/min after supplement and 35.65 mls/kg/min.

Table 4: Mean Effects of Physiological and Performance Efficiency Test

Treatments	RHR	Cooper	Astrand Treadmill
Before supplement	60.90±3.54	2740±134.99	29.93±3.173
After supplement	57.20±3.29	3320±257.33	35.65±5.145
Mean diff.	3.70*	-580.00*	2.70*
Sig.	0.021	0.000	0.000
Mean ± SD in the same columns in each parameter with different * superscripts are significantly different ($p<0.05$), RHR (beat/min) = resting heart rate in beat per minute.			

Figure 1 show that sample football players have RHR before supplementations 60.9 beat/minute and after supplementation 57.2 beat/minute.

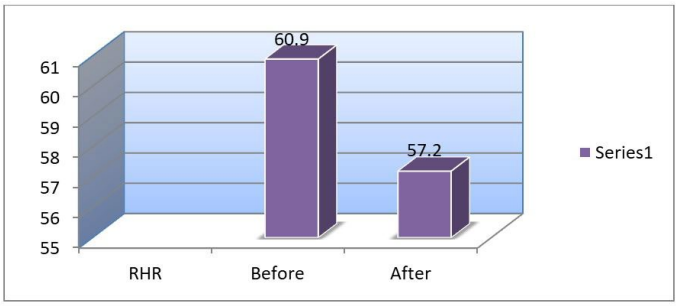

Figure 1: RHR of Players Before and After Supplementation

Figure 2 show that sample football players have cooper before supplementations 2,740 meters and after supplementation 3,320 meter. This result show that sample football players have change after supplementing the iron because it enhances hemoglobin to carry out more oxygen this enables to get more energy and increase endurances.

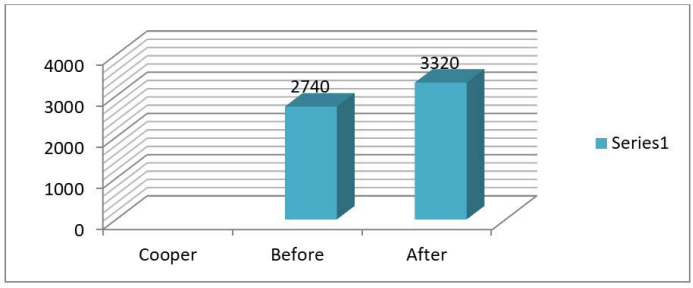

Figure 2: Cooper Test Before and After Supplementation

Figure 3 shows that sample football players have Astrand Treadmill before supplementations 29.93 mls/kg/min and after supplementation 35.65 mls/kg/min. This result show that sample football players have change after supplementing the iron because it enhances hemoglobin and players have Vo2 max.

H0: There is no difference on the effect of iron deficiency and supplementation on player's performance.

Ho hypothesis set goal that there is no difference on the effect of iron deficiency and supplementation on player's performance. This fact is rejected according to the result of this study there is iron deficiency on Hadiya lemo and Ambericho sample players and effect of iron supplementation on player's hematology and physiology.

HI: There is difference on effect of iron deficiency and supplementation on player's performance

According to the result alternative hypothesis is accepted. The result shows that there is effect of iron deficiency on player's performance and effect of iron supplementation on player's hematology and physiology.

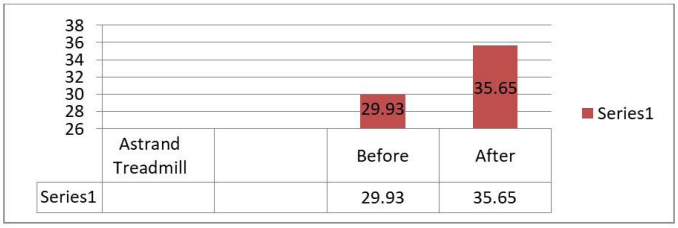

Figure 3: Astrand Treadmill Test Before and After Supplementations.

Discussion

The result show that RBC of sample players before supplement was 4.28 ± 0.132. The means RBC difference of sample players after supplement was 5.26 ±0.132 therefore sample players gives RBC mean difference show increase by 0.98mm3 iron supplementation and endurance training. Hb of sample football players has 14.38g/dl before supplement and 17.7g/dl has after supplement iron.3.35g/dl.

Endurance athletes with normal hemoglobin status who attempt to increase their red blood cells (RBC) and hemoglobin levels may benefit from iron supplementation [14]. Iron absorption is the main mechanism through which iron balance is maintained. Iron plays a critical role in oxygen transport as it is necessary for the formation of Hb, the oxygen transport protein that is critical for aerobic capacity.

The result show that Astrand Treadmill test before supplementations 29.93 mls/kg/min and after supplementation 35.65 mls/kg/min. Mean difference show that 5.72 mls/kg/min after supplementation. This result supported by that Exercise and/or physical activity is characterized by a substantial increase in oxygen needs [1]. Iron is an essential factor for the formation of Hb, the protein responsible for oxygen transport from the respiratory organs to the peripheral tissues [1]. Increases in central O2 delivery (cardiac output) and peripheral O2 uptake (arteriovenous oxygen difference) contribute to training induced improvements in cardiorespiratory fitness.

The improvement of iron status due to iron supplementation has been accompanied by an improvement in endurance capacity [7]. However, in Astrand treadmill test improvements have been observed in sample football players. RBC and Hb level have change on endurance group of Hadiyas lemo and Ambericho soccer players. Iron supplementation to soccer players with high intensity endurance exercise is necessary to RCB and Hb concentration increment. High intensity group highly improved physiological RHR, Hb and endurance performance efficiencies endurance group of both Ambericho and Hadiya lemo soccer players. Iron is essential for endurance exercise for the formation of hemoglobin and oxygen carrying capacity. Acute strenuous physical activity may alter several indices of iron status. A significant reduction in serum iron levels of 12.2 μmol/L was reported after a triathlon completion [2]. The authors proposed that heavy sweating or a prelate iron deficiency may explain the observed severe reduction of serum iron. However, sweat iron concentration does not correlate with the increased whole body sweat rates [15]. A slight increase in exercise although within

the normal range, has also been recorded after incremental running to exhaustion, but not after 45 min of submaximal exercise or after 3 consecutive days of aerobic training in highly trained endurance cyclists [16]. This idea supported by finding of table 4.1.4 explain that RHR before supplementations 60.9 beat/minute and after supplementation 57.2 beat/minute. Cooper before supplementations 2,740 meters and after supplementation 3,320 meter. Astrand Treadmill before supplementations 29.93 mls/kg/min and after supplementation 35.65 mls/kg/min resting heart rate of sample football has mean deference 3.7 beat/minute after supplement iron, Cooper test of players have mean deference of 580 meters after supplement iron and Astrand Treadmill test of players have mean difference 5.72 mls/kg/min after supplement.

This result show that enhance and bring change on significant reduction in serum iron Lack of adequate amounts of iron for the formation of Hb due to iron deficiency, can strongly affect physical work capacity, by reducing oxygen conveyance to the exercising muscles. The result show that sample football players measuring data has change RHR, Hb after supplementing iron and it show increase. Astrand treadmill test and Cooper 12-minute test increase than they test before iron supplement. Therefore, Hadiya hosanna and Ambericho football players has extensive training and competition this can strongly affect physical work capacity, by reducing oxygen conveyance to the exercising muscles. The result showed that change on hematology and physiology after them supplementing iron [17-20].

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Ethical Requirement

The study was conducted under the auspices of Wachemo University rules, policies and code of conduct governing research activities and ethical issues and also obtained approval from the Institutional Research Ethics Review Committee (IRERC) of Haramaya University College of Public Health and Medical Science. Written informed consent to participate in this study was provided by the participants' legal guardian/next of kin.

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Authors contribution's

Fkreyesus Daniel (PhD) contributed in analysis and interpretation of data. Dagle Shamoros (PhD) contributed in conception and a critical revision of the article. All authors read and approved the final manuscript.

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