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Anthropometric and Hematological Profile of Some Selected Ethiopian Premier League Male Soccer Players in the Final Competitive Season

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Abstract

The purpose of the study to determine anthropometric and hematological profile of some selected Ethiopian premier league male soccer players according to playing position. Descriptive cross-sectional study was employed on purposely selected twenty eighty premier league soccer players from (14) Sidama Coffee and from (14) Hawassa Town soccer club from all positions (GK, DF, MD, SK). Anthropometric, speed, agility and seventeen hematological parameters (WBC, RBC, Lymph, HGB, HCT, MCV, MCH, MCHC, PLT, RDW-CV, RDW-SD, PLT, MPV, PDW, PCT, P-LCC, and P-LCR) were measured. The obtained quantitative data was analyzed by one way analysis of variance (ANOVA) ($p<0.05$) with the help of SPSS version 20.00 software. The study found mean scores of anthropometric, performance and hematological parameter among soccer players. Further a statistically significant change was observed is only WBC, RBC and MCH hematological variables were observed when compared among the different playing positions (goalkeepers, defenders, midfielders and attackers). It was concluded that no significant difference in anthropometric and hematological variables except (WBC, RBC and MCH) soccer players between playing position, although the values of the measured hematological parameters fell within the reference range ($P>0.05$). It could be considered that regular monitoring of the anthropometric and hematological parameters is fundamental for the identification of a health status and related optimal performances by sport medicine specialist, nutritionist, trainers and selection of adequate training intensity by trainers. From a practical point of view, the clinician has to take into account not only age, but also training status of individuals when evaluating their blood tests.

Key words: Ethiopian premier league, Hawassa Town, Hematological profile, , Sidama Coffee

INTRODUCTION

Soccer is a multiple sport that requires high intensity, intermittent activity, to be undertaken over an extended period of time. In addition to intensive daily training session players are involved additional commitment such as national cup and other matches. In most research studies, soccer players are classified into four groups: forwards or attackers, midfielders, defenders, and goalkeepers. Players of different positions have a very different workload during a game: midfielders run the longest distances (up to 11–11.5 km) compared to forwards or defenders whereas goalkeepers run around 4 km (10). Previous studies have reported that each specific playing position may have unique physical and physiological requirements (29). Morphological characteristics, tactical, physical and technical skills successfully discriminate soccer players by competitive level and position (15). Besides fitness and the technical skills of the footballers, anthropometric indicators and body composition play an important role in successful performance (24). Anthropometry is the study of the measurement of the human body in terms of the dimensions of bone, muscle, and adipose (fat) tissue. Anthropometric and physical fitness characteristics provide important information about normality of body size, health condition, and body shape (5).

Hematological parameters may also play a crucial role in predicting optimal physical performance. But, unfortunately, very little attention has been given to the assessment and monitoring of hematological parameters in professional soccer players. It is possible that the stability of the players' hematologic status that associates with good health may be considered as key determinants of athletic performance. The competitive demand of soccer game may impose strain various physiological systems including the musculoskeletal, nervous and immune and metabolic, which may be reflected in

changes in biochemical and hematological parameters (3). Soccer is an endurance-based sport during which athletes require large amounts of oxygen within the different systems of the body in order for them to function (20). Endurance training, like in soccer, may bring about a decrease in erythrocyte, hemoglobin, hematocrit, iron and ferritin concentration, and may lead to changes in the health status of athletes (2). The measurement of hematological and biochemical data provides many answers about how training is being interpreted by the various systems. In addition endurance-trained athlete's also hematological parameters such as hematocrit, hemoglobin concentration, and red blood cell count are reduced, mainly due to exercise-induced plasma volume expansion, which sets in within a few days of exercise training. Hematological parameters and biochemical characteristics which can be crucial for predicting optimal physical performance have been scarcely examined in elite soccer players, who are involved in very demanding competitive seasons. Knowing the biochemical and hematological parameters of the athletes; assist the coaches and sports scientists in identifying energy needs and preparing training programs in this direction (25). The reference values in hematological laboratory reports have been calculated on sedentary people and may not be useful for sports people. Athletes are by definition, healthy and "normal" subjects, but they often show – owing to physical exercise, training, psychophysical stress, and peculiar environmental conditions – some biochemical, hormonal, and hematological values that are out of range. This particular behavior of laboratory values must be properly interpreted to avoid incorrect treatment, expensive examinations, and possible cessation of training and competition (6). However the effect of different level of physical fitness variable on the levels of many routinely measured variables seems to be not clear. It is also unclear whether age and playing position of players affect the hematological profile of elite Soccer players. Since there is limited studies have been done comparing different playing position(22). Hematological parameters are influenced by several factors within the apparently healthy population. These factors include training, age, sex, ethnicity, nutrition, and altitude. Any one or all of these factors can have a positive or negative influence on hematological variable (26). As a result, in Ethiopian, professional soccer club players are practiced in various towns important towns are located in low and moderate altitude zones. Some of these Towns include: Yirgalem (1776m) in and Hawassa (1708m), Arba Minch (1285), Wolaita Sodo (1600m) Addis Ababa (2,355), Bahir Dar (1800m) above sea level.

Hematological profile of athlete especially Ethiopian Premier League soccer players are no system of reference values for players or a lack of data in this field. There are few studies on hematological values in football players and modern reference values for biochemical and hematological parameters are available (9, 17)

Objectives

The aim of the present study was to determine anthropometric and hematological profile of some selected Ethiopian premier league male soccer players and to compare the values of seventeen hematological parameters between playing position.

MATERIAL AND METHODS

Subjects

Twenty eight male soccer players purposely selected from Southern part of Ethiopian premier league male soccer club players (Hawassa Town and Sidama coffee) to participate in this study. The selection criteria included: (1) they have been members of the club and best players (from all position, GK, DF, MD, SK) (2) all players participated in at least 75% training sessions per week. (3). the participants were instructed to abstain from vitamin and mineral supplementation, ergogenic aid or any medications in general. Subjects were also advised not to make any drastic changes in their diet during the study period. The physicians of the outpatient hospitals evaluated the physical performance of all participants, and sport injury rates and incidence were recorded. The soccer players were instructed not to change their normal eating habits and to refrain from drinking beverages containing caffeine or alcohol and from consuming food 24 h before testing.

The study was undertaken in compliance with the Arba Minch University Medical School and approved by Arba Minch University Ethical Committee (No, RCP/1234/09 and date 2/23/2018). The soccer players gave written informed consent after having been explained the procedures, benefits and possible risks of participation in the study. We followed the club soccer players during a competitive final season, over a three-month period (March, April and May). During the study, the

soccer players were engaged in their designed training programme that consisted of 7–8 training sessions per week and a weekly match. There was no training program before a day of hematological measurement day.

Inclusive and Exclusive Criteria

The study subject recruited apparently well healthy footballers deemed fit and best to carry out the coach`s scheduled training exercises. That they are no recent history of febrile illness, muscle lesions, lower limb trauma, and metabolic diseases. Unwell and injured footballers of the team were excluded.

Procedures

Anthropometric Measures

The anthropometric data included age, body mass, standing height, body mass index measurements. Speed and agility test also measured to assess the current performance of players. Each subject was measured in accordance with the standard methods proposed by the international society for the advancement of kinanthropometry (11). Height and body mass were measured using calibrated digital stadiometer and weighing machine, body mass was measured to the nearest 0.1 kilogram and height was measured to the nearest of 0.001 meter. Body mass index is calculated using body mass index formula, i.e. weight (kg) divided by height (m^2).

Blood Collection and Analysis

Blood samples were collected in to plain evacuated tubes from a forearm vain after an overnight before the taking the meal at morning 6:00-6:30 Pm, 20º C -25º C and at least 24 hour from the last training session. All blood samples were collected by using sterile plastic heparin vacutainer tubes (Greiner Bioone, Kremsmünster, Austria), Plasma and serum were separated by centrifugation and multiple aliquots of each sample were stored at –80 °C until analysis. K-EDTA and immediately mixed with EDTA solution to prevent clotting for hematology. EDTA blood samples were sent for immediate analysis of leukocytes (WBC) red blood cell concentration (RBC), Hemoglobin (HB), platelets (PLT), Hematocrit (Htc), mean corpuscular volume (MCV), mean corpuscular Hemoglobin (MCH), mean corpuscular Hemoglobin concentration (MCHC), lymphocytes, RDW-CV, RDW-SD, PLT, MPV, PDW, PCT, P-LCC, P-LCR on automatic analyzer (Dimension Xp and Plus Analyzer, Siemens, Munich, Germany).

Statistical Analysis

Anthropometric, speed, agility and hematological parameters were analyzed using the one way analysis of variance (ANOVA) *with the help of SPSS version 20.00 software.* To examine changes in the mean values for each specific position of players P values ≤ 0.05 were considered statistically significant.

RESULTS

Table 1. Anthropometric, speed and agility characteristics of the Subjects.

	GK		DF		MD		SK		Total	
	N	M	N	M	N	M	N	M	N	M
Age	2	20.50±.707	9	23.555±3.844	11	22.545±3.045	6	24.333±5.785	28	23.107±3.881
Height	2	183.25±4.596	9	176.277±4.309	11	173.418±4.522	6	178.161±3.828	28	176.056±4.923
Body mass	2	71.0±1.414	9	68.300±6.064	11	67.363±4.791	6	74.650±8.609	28	69.485±6.449
Body Mass Index	2	21.15±.636	9	21.672±1.783	11	22.408±1.513	6	23.483±2.172	28	22.312±1.795
30 meter speed	2	4.37±.028	9	4.346±.094	11	4.338±.186	6	4.325±.242	28	4.340±.161
Illinois's agility test	2	16.39±.190	9	16.326±.489	11	16.260±.419	6	15.911±.535	28	16.214±.469

N = number of players, M=mean value, GK = goal keeper, DF= Defender, MD = mid field, SK = Striker players

The players had as characteristic: age, body mass, height, Body mass index, 30 meter and Illinois's agility parameters of 28 football players sampled were shown in table 1.

Table 2. Hematological Parameter of Elite Professional Soccer Players as a Function of Playing Position

	GK		DF		MD		SK		Total	
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
WBC (10^9/L)	2	4.9±.565	9	5.45±1.494	11	6.79±1.386	6	4.82±1.570	28	5.80±1.598
Lymph(10^9/L)	2	2.2±.282	9	2.09±.635	11	2.35±.555	6	2.07±.436	28	2.19±.538
HGB (g/dL)	2	15.25±.212	9	14.99±.711	11	15.63±.490	6	15.22±.611	28	15.30±.622
RBC(10^12/L)	2	5.22±.466	9	5.43±.300	11	5.45±.246	6	5.04±.186	28	5.34±.304
HCT (%)	2	45.75±.495	9	46.55±1.856	11	48.12±2.337	6	46.02±.934	28	46.99±2.030
MCV(FL)	2	87.95±6.85	9	85.95±4.809	11	88.25±2.012	6	91.39±3.228	28	88.16±3.995
MCH(Pg)	2	29.3±2.262	9	27.67±1.686	11	28.67±1.046	6	30.22±1.142	28	28.72±1.604
MCHC(g/dL)	2	33.35±.070	9	32.2±1.166	11	32.52±1.264	6	33.10±1.293	28	32.60±1.207
PLT(10^9/L)	2	296.5±62.933	9	220.67±50.371	11	197.36±55.813	6	215.33±41.903	28	215.79±54.829
PDW	2	15.65±.495	9	15.81±.306	11	15.99±.413	6	15.9±.275	28	15.89±.353
RDW-CV (%)	2	13.8±.141	9	13.98±.489	11	14.14±.358	6	13.72±.685	28	13.97±.485
RDW-SD(fL)	2	44.5±.989	9	46.61±2.419	11	48.44±2.584	6	47.51±3.110	28	47.37±2.704
MPV(fL)	2	8.85±1.484	9	9.53±1.162	11	10.263+1.690	6	10.45+.697	28	9.968+1.368
PCT(mL/L)	2	2.19±.417	9	2.25±.336	11	2.00+.502	6	2.17+.409	28	2.129+.420
P-LCC(10^9/L)	2	65.5±34.648	9	77.33±15.676	11	72.2727+19.100	6	84.66+17.648	28	76.071+18.471
P-LCR (%)	2	26.1±13.435	9	33.71±10.041	11	38.2636+12.388	6	40.866+4.381	28	36.489+10.633

HGB= Hemoglobin, RBC= Number of red Blood Cells, HCT= Hematocrit, MCV =Mean corpuscle volume (Average Size of red blood cells), MCH = Mean corpuscle hemoglobin (Average no of hemoglobin in each red blood cells), MCHC= Mean corpuscle hemoglobin concentration (Average amount of hemoglobin in the red blood cells compared to average size of red blood cells), PLT= Platelet (Cell helping for blood clot), PDW = Platelet distribution width (Uniformity of platelets in size), RDW-CV = Red cell distribution width-coefficient of variation, RDW-SD = Red cell distribution width-standard deviation, MPV = mean platelet volume, PCT = procalcitnin (conditions associated with mildly elevated serum procalcitonin), P-LCC = Platelet large cell count, P-LCR = Platelet large cell ratio.

The players from all position had seventeen hematological variable were tested and clearly indicate their current profile of hematological variable in the above table 2.

Table 3. Univariate differences between GK, DF, MD, SK Soccer players

		Sum of Squares	df	Mean Square	F	Sig.
WBC (10^9/L)	Between Groups	19.290	3	6.430	3.104	**.045**
	Within Groups	49.720	24	2.072		
	Total	69.010	27			
Lymph(10^9/L)	Between Groups	.480	3	.160	.523	.671
	Within Groups	7.349	24	.306		
	Total	7.830	27			
HGB (g/dL)	Between Groups	2.095	3	.698	2.003	.140
	Within Groups	8.364	24	.349		
	Total	10.459	27			
RBC(10^12/L)	Between Groups	.780	3	.260	3.627	**.027**
	Within Groups	1.721	24	.072		
	Total	2.501	27			
HCT (%)	Between Groups	24.458	3	8.153	2.253	.108
	Within Groups	86.832	24	3.618		
	Total	111.290	27			
MCV(FL)	Between Groups	106.244	3	35.415	2.618	.074
	Within Groups	324.683	24	13.528		
	Total	430.927	27			
MCH(pg.)	Between Groups	24.133	3	8.044	4.259	**.015**
	Within Groups	45.334	24	1.889		
	Total	69.467	27			
MCHC(g/dL)	Between Groups	4.139	3	1.380	.939	.437
	Within Groups	35.241	24	1.468		
	Total	39.380	27			
PLT(10^9/L)	Between Groups	16978.335	3	5659.445	2.116	.125
	Within Groups	64188.379	24	2674.516		
	Total	81166.714	27			
PDW	Between Groups	.284	3	.095	.736	.541
	Within Groups	3.083	24	.128		

	Total	3.367	27			
RDW_C (%)	Between Groups	.781	3	.260	1.122	.360
	Within Groups	5.571	24	.232		
	Total	6.352	27			
RDW_SD(	Between Groups	34.508	3	11.503	1.693	.195
	Within Groups	163.024	24	6.793		
	Total	197.532	27			
MPV(FL)	Between Groups	6.556	3	2.185	1.191	.334
	Within Groups	44.025	24	1.834		
	Total	50.581	27			
PCT(mL/L	Between Groups	.324	3	.108	.583	.632
	Within Groups	4.446	24	.185		
	Total	4.770	27			
P_LCC(10^9/L)	Between Groups	839.842	3	279.947	.803	.505
	Within Groups	8372.015	24	348.834		
	Total	9211.857	27			
P_LCR (%)	Between Groups	434.939	3	144.980	1.329	.288
	Within Groups	2617.788	24	109.074		
	Total	3052.727	27			

*Significant at .05 level of Confidence, GK = goal keeper, DF= Defender, MD = mid field, SK = Striker players, WBC=Number of white blood cells, Lymph= Lymphocytes, HGB= Hemoglobin, RBC= Number of red Blood Cells, HCT= Hematocrit, MCV =Mean corpuscle volume (Average Size of red blood cells), MCH = Mean corpuscle hemoglobin (Average no of hemoglobin in each red blood cells), MCHC= Mean corpuscle hemoglobin concentration (Average amount of hemoglobin in the red blood cells compared to average size of red blood cells), PLT= Platelet (Cell helping for blood clot), PDW = Platelet distribution width (Uniformity of platelets in size), RDW-CV = Red cell distribution width-coefficient of variation, RDW-SD = Red cell distribution width-standard deviation, MPV = mean platelet volume, PCT = procalcitnin (conditions associated with mildly elevated serum procalcitonin), P-LCC = Platelet large cell count, P-LCR = Platelet large cell ratio

In table 2 and 3 are observed variables of seventeen hematological parameters of WBC, RBC, Lymph, HGB, HCT, MCV, MCH, MCHC, PLT, RDW-CV, RDW-SD, PLT, MPV, PDW, PCT, P-LCC, P-LCR. The results in present study show us statistically significant difference in only white blood cell (WBC) red blood cells (RBC) and Mean Corpuscle Hemoglobin (MCH) or Average no of HG in each RBC hematological variables between different playing positions of soccer players. However, Striker players show slightly higher mean values of MCV (Mean Corpuscle Volume or Average Size of RCBs) parameters in relation to the other positions of players. In addition to this Strikers shown less mean value in Red blood cell (RBC) parameters when compared to other playing position. Higher mean value of Hematocrit (HCT) variable also shown midfield players than the rest of other positional players, although not significantly different.

DISCUSSION

The purpose of this study was to determine Anthropometric and Hematological profile of some selected Ethiopian premier league male soccer players and to compare the value of hematological variables in related to different playing position. Sport and exercise scientists engaged in soccer research are interested in a multitude of factors that determine the performance of a player as well as the related underlying phenomena that explain how each factor influences that performance. The knowledge of the correct morphological and hematological parameters is an important indicator of health status, body condition. These studies revealed that specific anthropometric characters could play a momentous role in contributing to achievement in soccer sports and it offers certain type of natural advantages. The age of the football players in the study covers a wide range (23.107±3.881) of mean age in both Hawassa Town and in Sidama Coffee soccer players. Jasimina PL et al., (13) showed on the mean age of players was similar to Turkey (24.1 years) and South America (24.2 years), the mean age (26.4 years) of soccer players in four high level European Leagues (English, Italian, German and Spanish League). Height could be useful and which an important parameter in the selection process of the players (22, 27). Body composition is an important aspect of fitness for soccer players. An excess body fat acts as dead mass in activities when body mass is lifted repeatedly against gravity in running and jumping

during play (16). In competitive sports, as soccer, players with a lower body fat percentage have better performance because low body fat is a direct measure of the intensity of training (14). In our study, Hawassa Town and Sidama coffee club players showed healthy, normal BMI with a mean of 22.312±1.795 and statically no significant different in different playing position in accordance with the BMI classification made by the World Health Organization (30). Speed and explosive power were considered prerequisites for the success of youth soccer players. Elite players perform approximately 30 –40 sprints of various lengths during a match and more than 700 turns (18). However, mean value of 30m speed in according to 30m dash standard made by Davis, B (8) all positional players were shown on average level standard although not significantly different. Agility-is an important physical fitness component necessary for successful performance in soccer game (4).The average mean value of Illinois's agility of both club (Hawassa Town and Sidama Coffee) players were found to be on average level to compare with the standard made by McKenzie, B (7).But the mean value of Illinois's agility result showed strikers had better performance than other positional difference.

Hematological tests are used widely to access health and fitness of the intensively training athlete. Hematological means is fundamental to identifying good health, and it may be critically important in predicting optimum physical performance. The results in present study show us statistically significant difference in only white blood cell (WBC) red blood cells (RBC) and Mean Corpuscle Hemoglobin (Average no of HG in each RBC) (MCH) between different playing position, although all the values of the measured hematological parameters fell within the reference range. A study done by Thiago S et al (28) regarding hematological parameters during the period of competition relative to playing position no significant differences in RBC, HCT, and HB were observed. Several studies have reported that the decrease in hemoglobin and hematocrit is a sign of physical exertion and heavy participation (19). A low hematocrit indicate anemia, blood loss, bone marrow failure, leukemia, nutritional deficiency, over – hydration or rheumatoid arthritis. The normal hematocrit range for adult male is 40 – 54 percent (12). In addition to this, indicators of white blood cells, red blood cells, hemoglobin and hematocrit are the variables that are directly related to the volume and intensity of training (23). Abnormally high levels of white blood cells may indicate infections, tissue damage, and inflammatory diseases (21). In related to physical excretion mid fielders show slightly higher mean value than other playing position. Thus, physical exercise/training plays a fundamental role in the immune system, health, and physical performance of athletes (1)

In the present study we observed that hemoglobin, hematocrit and MCHC diminished in the Goal keeper players in relation to other position of soccer players. In this study soccer players had significantly lower Mean Corpuscle Hemoglobin (MCH) level in Defensive players than other playing position. Concerning the effect of high intensity physical activity, Schumacher YO et al. (26) found a slightly lower HGB, HCT, MCH, MCHC profile in soccer player after high intensity training. This finding suggests that the players were subjected to an appropriate level of training intensity and duration while developing the technical, tactical, and physical skills to improve their performance. In addition, it is likely that the players' diet and extra supplementation of nutrients helped to improve some hematological value.

CONCLUSION

The present study was to determine Anthropometric and hematological profile of some selected Ethiopian premier league male soccer players and to compare the value of hematological variables as well as anthropometric and performance variables between playing position. The knowledge of differences in hematological variable parameters between different playing positions in players should provide useful information for the clinical assessment of soccer players. There was a lack of information regarding hematological parameters during the period of competition relative to playing position. In this sense, there are significant differences in only WBC, RBC and MCH hematological variables were observed when compared among the four playing positions (goalkeepers, defenders, midfielders and attackers). In conclusion, Hematological parameters can be crucial for predicting optimal physical performances have been scarcely examined in professional soccer players. Therefore, from a practical point of view, the clinician has to take into account playing position of soccer players. Because training intensity, type of training and energy system may

affect players when evaluating their blood samples. Adequate and timely monitoring of blood parameters represents one of the most important measurements for controlling training intensity and preventing overtraining state in endurance sport like soccer and by considering different playing position.

Limitations

It is important to point out that this study did not attempt to control the type of food that contains essential nutrient and the degree of hydration of the players. These variables may have led to a bias or lack of reliability in the results. In fact, we suggest that in future studies the assessment of hematological parameters should take place from a longitudinal perspective that should enable more specific and tighter control of the variables.

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