Section: Miscellaneous

Original Research Article

HAEMATOLOGICAL PROFILE OF TRAINED WATER POLO PLAYERS

Sarita S. Vyas[1], Meghana A. Gaikwad[2], Sunay G. Vyas[3]

[1]*Assistant Professor, Department of Physiology, Dr. PABDMMC, Amravati India.,*
[2]*Assistant Professor, Department of Physiology, Dr. BJ Govt. Med. College, Pune, India.*
[3]*Professor, Department of Medicine, Dr. PABDMMC, Amravati, India.*

Received : *07/05/2025*
Received in revised form : *26/06/2025*
Accepted : *17/07/2025*

Corresponding Author:
Dr. Sunay G. Vyas,
Professor, Department of Medicine, Dr. PABDMMC, Amravati, India.
Email: sarita.sunay@gmail.com

DOI: 10.70034/ijmedph.2025.3.135

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 729-732

ABSTRACT

Background: Water polo is physiologically, a highly demanding activity, where players need technical, tactical, and physical skills to succeed. Hematological parameters allow evaluation of anemic and immunological states of the subjects. The aim of the study was to determine hematological profile of trained water polo players and to compare the values between trained water polo players and non-athletes.
Materials and Methods: Hematological profile of 40 trained male water polo players & 40 healthy male non-athletes was assessed by assaying a venous sample for RBC, HB%, HCT, MCV, MCH, MCHC, SE(Fe), TIBC, WBC, PLT, LYM %, MON %, GRAN %.
Results: SE(Fe) and TIBC values were significantly lower in water polo group. while PLT, LYM% and MON% showed significant increase. In all other variables there was no statistically significant difference.
Conclusion: Hematological profile obtained is probably due to age, androgen affection on erythropoiesis, diet and bear relationship to swimming training. From a practical point of view, the clinician has to take into account not only the age, but also the training status of individuals when evaluating their blood tests.
Key words: Water Polo, Hemtological Parameters.

INTRODUCTION

Water polo, an aquatic team sport, is physiologically, a highly demanding activity, where players need technical, tactical, and physical skills to succeed. It is an 'intermittent' sport comprised of intense bursts of activity of <15 seconds in duration with intervening low intensity intervals. Physiological measurements obtained during game play indicate a cumulative effect of repeated sequences of activities and suggest, there is a high metabolic demand on the athletes.[11] This suggests that high levels of aerobic and anaerobic capacity is necessary for successful participation in water polo players.[1,2]

Athletes are usually monitored by using biochemical and hematological indices for evaluating performance status.[5] The selection and professional guidance of young players is a priority for many sports clubs in order to maintain their sporting status. Potential predictors of swimming talent include anthropometric, physiological, and neuromotor variables. In hematological parameters, the prevalence of iron deficiency anemia in non-athletic population has been estimated to be 3-5%, whereas the prevalence of iron deficiency without anemia is much higher, ranging between 11-13%.[9] The prevalence of inadequate iron balance in male athletes has been reported to be as high as 10%.[2] Decreased work capacity due to iron deficiency anemia has been well documented,[12,13] and is attributed to insufficient O2 transport by hemoglobin to peripheral tissues. Studies have shown that the activities of iron-containing muscle mitochondrial oxidative enzymes and respiratory proteins are decreased during iron deficiency without anemia.[4,10] Because of the role of these iron-dependent enzymes and proteins in oxidative metabolism, it is expected that iron deficiency without anemia would impair the ability to sustain physical performance at 65-85% of maximal capacity, i.e., endurance.[16] Therefore the present study was undertaken to study the hematological parameters of water polo players with special reference to iron status.

Aim

To compare the hematological profile of trained water polo players with non-athletes.

Objectives

To compare hematological parameters i.e. red blood cell count (RBC), hemoglobin (HB%), hematocrit (HCT), mean cell volume (MCV), mean cell hemoglobin content (MCH), mean cell hemoglobin concentration (MCHC), serum iron (Fe), Total iron binding capacity(TIBC), white blood cell count(WBC), platelet count(PLT), lymphocyte% (LYM %), monocyte % (MON %), Granulocyte % (GRAN %) between water polo (study) group & control group.

MATERIALS AND METHODS

Study Set Up

The present study was conducted in Dr. panjabrao Alias Bhausaheb Deshmukh Memorial Medical College, Amravati and Hanuman Vyayam Prasarak Mandal, Amravati (M. S.).

Study Design

Comparative, Cross Sectional study.

Sample Size

40 water polo players and 40 non-athletes were selected.

Study Protocol

The selection and screening of subjects was done at Hanuman Vyayam Prasarak Mandal, Amravati after obtaining clearance of Institutional Ethical Committee. 40 water polo players participating in the study were healthy males between age group of 13 to 17 years.

A written consent was obtained from coach and parents of participants in the study. All the subjects were assessed through history taking and detailed clinical examination.

Inclusion Criteria

1. Trained male water polo players (WP), practicing for more than 2 years.
2. Subjects practicing swimming for 1 to 1.5 hours per day for five to six days per week.
3. Subjects between the age group of 13-17 years.
4. For control (non-athlete group), age matched healthy male subjects who were not involved in athletic activity, except school physical education class.

Exclusion Criteria

1. Subjects with P/H of haematological diseases.
2. Subjects using medications, steroids or other banned substances.

Methodology: Venous blood samples were collected from a forearm vein in a sitting position between 7 am to 8 am, after an overnight fast and at least 24 hours from the last workout. Blood was collected in EDTA & plain bulbs.

Assays - We measured the following hematologic parameters by ABX MICROS 60 autoanalyzer.

Red blood cell count (RBC), hemoglobin% (HB%), hematocrit (HCT), mean cell volume (MCV), mean cell hemoglobin content (MCH), mean cell hemoglobin concentration (MCHC), platelet count (PLT), white blood cell count (WBC), lymphocyte % (LYM %), monocyte% (MON%), granulocyte% (GRAN %).

Serum iron SE(Fe) & Total iron binding capacity (TIBC) were measured by Ferrozine colorimetric method.

Statistical Analysis

Descriptive statistics was applied like mean and standard error of mean. Study groups were compared for anthropometric parameters like age, sex, height and weight with chi square test. Student's unpaired 't' test was applied to the data to test the significant difference between the two groups. The significance was tested at 5% (0.05) level of significance.

All the statistical calculations were done with the help of SPSS version 17.0.

RESULTS

Table 1: presents the basic descriptive statistics for the hematological variables.

Parameter	Group	Mean	Std. Deviation	P- value
RBC	Water Polo Players	**4.78**	**0.25**	P>0.05
	Control	**4.89**	**0.17**	
HB%	Water Polo Players	**12.92**	**0.30**	P>0.05
	Control	**13.30**	**0.88**	
HCT	Water Polo Players	**39.87**	**1.85**	P>0.05
	Control	**40.70**	**1.74**	
MCV	Water Polo Players	**83.46**	**1.79**	P>0.05
	Control	**83.37**	**2.09**	
MCH	Water Polo Players	**27.60**	**0.93**	P>0.05
	Control	**27.82**	**0.99**	
MCHC	Water Polo Players	**31.93**	**0.74**	P>0.05
	Control	**32.89**	**0.66**	
SE(FE)	Water Polo Players	**70.59**	**13.51**	P<0.05
	Control	**128.57**	**26.37**	
TIBC	Water Polo Players	**338.86**	**40.83**	P<0.05
	Control	**177.62**	**47.42**	

There was no statistically significant difference in mean values for RBC, Hb%, HCT, MCV, MCH, MCHC between 2 groups (P>0.05). SE (FE) and TIBC values were significantly lower in water polo group (P<0.05).

Table 2: Presents parameters related to WBC

	Group	Mean	Std. Deviation	P- value
WBC	Water Polo Players	**7164.53**	**704.35**	P>0.05
	Control	**6822.00**	**690.50**	
LYM%	Water Polo Players	**37.39**	**0.93**	P<0.05
	Control	**34.33**	**0.63**	
MON%	Water Polo Players	**7.30**	**0.52**	P<0.05
	Control	**5.57**	**0.57**	
GRAN%	Water Polo Players	**59.49**	**2.54**	P>0.05
	Control	**60.22**	**2.74**	
PLT	Water Polo Players	**284.50**	**6.27**	P<0.05
	Control	**259.30**	**9.81**	

There was no significant difference between total WBC and GRAN% (P>0.05).
But Lymphocytes (LYM%) and Monocyte (MON%) was increased significantly (P<0.05).
Also there was significant increase in Platelet (PLT) in water polo group (P<0.05).

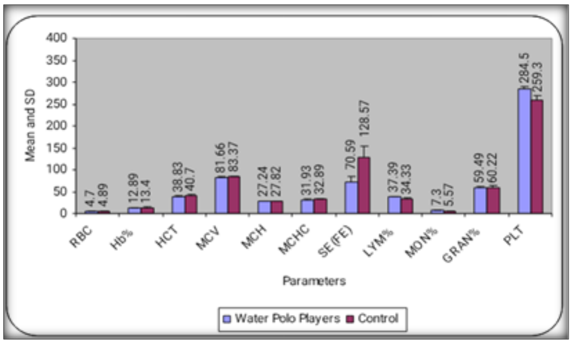

Figure 1: Comparison of hematological parameters

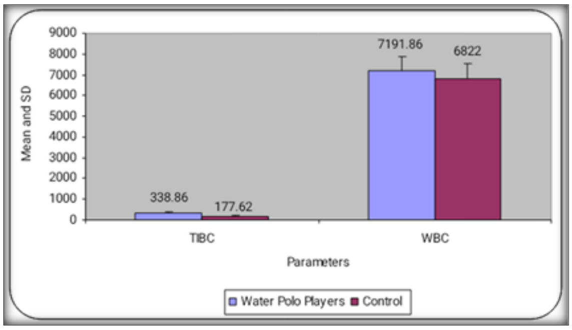

Figure 2: Comparison of TIBC and WBC

DISCUSSION

Hematological and biochemical tests are used widely to assess health and fitness of the intensively training athletes. There have been frequent reports of a sub-optimal hematological status in athletes.[3]
The number of leukocytes increases in response to stressful stimuli including exercise. Their source is in the marginated pool that is located along vessel walls. Our findings show there is no statistically significant difference in WBC count between the 2 groups. But there is significant increase in number of lymphocyte% and monocyte% in study group, compared to control group (p<0.05).
During exercise, the activated sympathetic nervous system increases blood flow to muscle as blood flow to splanchnic organs decreases. A change in blood flow to these organs could affect the number of circulating lymphocytes and monocytes. The fluctuations of the number of total leukocytes and subpopulations seemed to be physiological.[5,3]

A high oxygen uptake is a prerequisite for athletic success in endurance sports. Iron is an important mineral necessary for many biologic pathways. Different levels of deficiency can occur in the athlete, resulting in symptoms that range from none to severe fatigue.
Our study shows no statistical difference in HB%, HCT, RBC, MCV, MCH, MCHC between study group and control group. But the values of serum Iron and TIBC were low in the study group (P<0.05).
These findings suggest that daily exercise is closely associated with the increased risk of iron deficiency state, particularly in the adolescent athletes. The mechanism of haemolysis in athletes may partly depend on the increased fragility of iron deficient red blood cells on mechanical strength.[15]
Iron Deficiency, defined as diminished total body iron content, develops in sequential stages over a period of negative iron balance. The loss of iron can be divided into 3 stages.[19] Stage 1 is “iron depletion”, at which there is an isolated decrease in serum ferritin levels. Stage 2 is “iron deficient erythropoiesis”. At this stage, the supply of iron to the erythroid marrow is inadequate, the serum ferritin level is low (10-20 µg/L), transferrin saturation is decreased (<16%), and the total iron binding capacity is increased. The anemia of iron deficient erythropoiesis may be too mild to be detected by some arbitrary value for hemoglobin, which is used to distinguish normal from anemic states. Stage 3 is “iron deficient anemia” (IDA), in which hemoglobin levels are subnormal.[3]
Anemia is defined by 2 criteria: the decrease of iron stores and the decrease in hemoglobin levels. Thus, an isolated decrease in ferritin does not indicate anemia, but it does indicate a risk of immediate anemia if the iron stores continue to be depleted.
Low levels of iron in the body are caused by several mechanisms, and become symptomatic with the onset of iron deficiency anemia. Athletes are a special group with additional reasons for iron or blood loss, such as plasma expansion, increase perspiration, 'foot strike hemolysis, and occasionally--malnutrition. However, the most common cause for low hemoglobin levels in an athlete is dilutional pseudoanemia, which is caused by exercise-induced fluid retention.[14] Athletes are more sensitive to the

effects of anemia and iron deficiency, as exercise performance depends on maximal oxygen carrying capacity to the active muscle, and efficient oxygen utilization. Iron deficiency without anemia can also reduce athletic performance. Diagnosis is ultimately made by a blood count and red blood cell parameters, with ferritin serving as an index of body iron stores. Treatment requires iron supplements, as it is nearly impossible to refill the iron stores through diet alone.[14]

Physical exercise and training induce changes in the hemostasis of healthy people. We have found significant increase of PLT count. The increase is attributed to the release of platelets from vessels in the spleen, bone marrow and lung and quickly returns to normal. The effects of training on the platelet count have only been investigated in a few studies to date. Athletes have a much less pronounced and transient increase in platelet counts.[17]

CONCLUSION

It could be stated that hematological profile obtained is probably due to age, androgen affection on erythropoiesis, diet and bear relationship to swimming training. From a practical point of view, the clinician has to take into account not only the age, but also the training status of individuals when evaluating their blood tests.

Practical Application

The results emphasized that there is a need for systematic screening and evaluation in adolescent water polo players who have undergone year-long periods of training. Nutritional counselling and iron supplementation should be provided when necessary.

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