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IMMEDIATE EFFECT OF AEROBIC TO ANAEROBIC EXERCISE ON HEMATOLOGICAL PARAMETERS



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Abstract:

Introduction:

This study was conducted in order to determine the immediate changes occurred on hematological levels during anaerobic to aerobic exercise of male Interuniversity players.

Methods:

Six male cricket players with an average age of 22.16 ± 1.85 years participated in this study on voluntary basis. Hematological levels of the players were analyzed just after 400m running (R4) and after the 1000m running (R1) in a continue course. In order to determine hematological levels, blood samples with 5 ml EDTA were taken from the forearm ante-cubical area before and after running, and erythrocyte, leucocytes and blood platelet parameters were analyzed in laboratory with using auto-analyzers.

Result:

Measurement results were presented as average and standard deviation. Student T-test for dependant samples was used in order to make a comparison between R4 and R1 values. $P < 0.01$ value was considered to be significant. The result of the study revealed that, the decrease in R4 than R1 values for Hemoglobin, MCH, MCHC and the increase in PCV, Platelet were found significant.

Conclusion:

Conclusively, the erythrocyte indices become decrease and numbers of platelets were increase as the changes of hematological parameters during anaerobic to aerobic exercise in continue single course.

Keywords: Hematology, PCV, MCV, MCHC, erythrocyte, leukocyte, platelet.

INTRODUCTION

Exercise and physical activity is an important function of living systems. It may affect hematologic and biochemical parameters of most systems. Human adaptation to exercise is characterized by adaptation of cardiovascular activity and changes in hematological and biochemical parameters (Arslan et al., 1997; Baltacı et al., 1998). Hematology comes from the Greek words haima, meaning blood, and logos, meaning study or science. So, hematology is the science of blood. Hematology was practiced in various forms throughout history. Blood is generally composed of plasma, red blood cells (RBCs), white blood cells (WBCs) and platelets. The analysis of hematology shown that, the effect of regular exercise on hematology is different. It is stated that these differences depend on the severity, duration and frequency of exercise as well as physical and physiological conditions of subjects (Buyukyazi and Turgay, 2000). Furthermore, the severity, duration and frequency of exercise should be well-organized to have similar positive

influence on blood biochemistry (Baltacı et al., 1998; Shephard and Shek, 1994). Boyajiev et al. reported a significant decrease in RBC counts of adolescent boys and girls with sub maximal exercise, and attributed it to the exercise factor for both sexes. Ahmadizad et al. reported a significant increase in platelet count and mean plasma volume following 3 types of endurance exercise at different intensities. Similarly, Hui Jun et al. observed a significant rise in WBC and platelet counts after a 24-hour ultramarathon, but not significant variation was observed in other variables. There is not a full consensus as to how exercise makes an effect on hematology. Anaerobic exercise is exercise intense enough to trigger anaerobic metabolism. It is used by athletes in non-endurance sports, leading to greater performance in short duration, high intensity activities which last from mere seconds up to about 2 minutes. It contrasts with aerobic capacity, which is your body's capacity to use its systems while using oxygen as fuel. Aerobic exercise is physical exercise of relatively low intensity that depends

primarily on the aerobic energy-generating process. Aerobic literally means "living in air", and refers to the use of oxygen to adequately meet energy demands during exercise via aerobic metabolism. With this view in mind the researcher conducted the present study to investigate the immediate changes of hematological parameters during anaerobic to aerobic exercise.

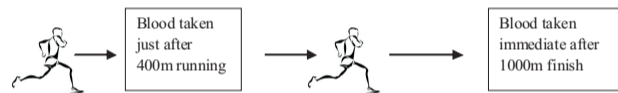
MATERIALS & METHOD:

Participants:

Six male cricket players with an average age of 22.16±1.85 years who played in Inter-University competitions participated in this study on voluntary basis. These subjects were healthy, nonsmokers, without history of hematological disease and free of infection.

Study design:

After the permit of the ethical board required for the study was granted, players were informed about the tests. Just after 400m running (R4) and after the 1000m running (R1) in a continue course measurements were made.



DATA COLLECTION:

Blood samples were taken in the morning from 7:00 to 8:00 am. Blood samples with 5 ml EDTA (Ethylene diaminetetraacetic acid) were taken from players in the forearm ante cubical area, in line with hygiene rules before and immediate after the running. Hematological levels including Red Blood Cells (RBC), Hemoglobin (HBG), Pack cell volume (PCV), Mean Red Cell Volume (MCV), Mean Cell Hemoglobin (MCH), Mean Cell Hemoglobin Concentration (MCHC), White Blood Cells (WBC;), Lymphocyte Percentage (LYM%), Neutrophil Percentage (NE%), Eosinophil Percentage (Eos%), Blood Platelets (PLT), were analyzed by the expert pathologist at standard laboratory.

STATISTICS ANALYSIS:

Measurement results were presented as average and standard deviation. Student T-test for dependant samples was used in order to make a comparison between R4 and R1 values. P<0.01 value was considered to be significant.

RESULT:

The findings of the study indicate that among the hematological variables studied, Hemoglobin, MCH and MCHC and were significantly decreased after R1 than R4 where significant increase also was found in case of Platelet and PCV. But no significant differences were found at before running and after running for MCV, RBC, Neutrophil%, Lymphocyte%, White Blood Cell count and Eosinophil Percentage.

Mean, Standard deviation and P value of participants' characteristics.			
Variables	After 400m running(R4)	After 1000m running(R1)	P Value
RBC (Million)/cmm	5.57 ± 0.017	5.52 ± 0.136	0.392
HBG gm/dl	16.7 ± 0.036	16.2 ± 0.409	0.0001*
PCV (%)	49.33 ± 0.516	50.33 ± 0.186	0.001*
MCV (fl)	88.99 ± 0.821	89.79 ± 0.856	0.192
MCH (pg)	29.98 ± 0.0051	29.95 ± 0.023	0.010*
MCHC (%)	33.97 ± 0.173	33.35 ± 0.325	0.002*
PLT (lac)/cmm	2.85 ± 0.093	3.05 ± 0.062	0.001*
WBC (Thousand)	8.40 ± 1.088	9.50 ± 0.709	0.064
NEU%	54.66 ± 4.50	55.66 ± 3.38	0.672
LYM%	40.33 ± 2.58	39.66 ± 2.73	0.671
ESO%	3.33 ± 1.36	4 ± 0.894	0.337

Red Blood Cells (RBC), Hemoglobin (HBG), Pack cell volume (PCV), Mean Red Cell Volume (MCV), Mean Cell Hemoglobin (MCH), Mean Cell Hemoglobin Concentration (MCHC), White Blood Cells (WBC;), Lymphocyte Percentage (LYM%), Neutrophil Percentage (NE%), Eosinophil Percentage (Eos%), Blood Platelets (PLT). P<0.01

DISCUSSION:

This study was conducted in order to determine the immediate changes of hematological parameters during anaerobic to aerobic exercise of University level players; it was observed that there were changes in terms of decrease in Hemoglobin, MCH and MCHC after 1000m running in comparison with after 400m running. The changes in terms of increase in PCV and Platelet levels after the 1000m running were also significant whereas the changes in MCV, RBC, White Blood Cell count, Lymphocyte%, Neutrophil % and Eosinophil% were not significant. When a comparison was made between these changes and those found in other studies carried out on hematological levels, both similarities and differences were observed.

In this study it was seen that, there was a declining change of Hemoglobin, MCH and MCHC parameters during anaerobic to aerobic exercise which supported the study of Magazanik et al. (1988) examined the chronic effects of exercise and found out a decrease in red blood cell parameters and Ricci et al. (1988) found that hematological parameters decreased after chronic exercise. But Baltacı et al. (1998) examined blood biochemistry at the end of an acute maximal exercise and found that hematological parameters increased depending on severity and duration of an exercise. Unal (1998) also found that there was a significant increase in hemoglobin values of subjects after 8-week aerobic exercises. Whereas Spiropoulos and Trakada (2003) expressed in their study on marathon runners that, there was no significant difference in hematological parameters before and after the marathon competitions. In the present study, changes in MCV, MCHC and MCH were not found significant.

In this study it was found that, there was significantly increase in platelet number and PCV which also supported the study of Ozyener et al. (1994) found out that, short-term exercises at maximal severity do not have any impact on red blood cell levels, but it had an influence on white blood cell and blood platelet parameters. Patlar and Keskin (2007) stated that sub-maximal exercise had a significant impact on WBC, RBC, HGB, HCT and PLT levels. Ersoz (1997) stated that sub-maximal exercise did not result in any statistically significant increase in Hematocrit value and red blood cell numbers whereas he reported an increase in the white cell number and not a significant change in blood platelet numbers. But in this study it was found that,

there was significantly decrease in platelet number. There is a rapid decrease in the number of lymphocytes after the exercise. The decrease in lymphocytes is attributed to the lymphopenic effect of the increased cortisol. Exercise does not have long or short term effects on neutrophil functions. The increase of eosinophilic cationic proteins in blood after the maximal exercise shows that eosinophils increase with exercise. In this study researcher found no significant change in MCV, RBC, Neutrophil%, Lymphocyte%, White Blood Cell count and Eosinophil Percentage. However, it is yet to be well determined how it varies according to different exercise types and what function it fulfills during the exercise (Ozgurbuz, 2003).

CONCLUSIONS:

From the result of the study it can conclude that the erythrocyte indices become decrease and numbers of platelets were increase as the immediate changes of hematological parameters during anaerobic to aerobic exercise in continue single course. Though there is some controversy with the other studies, researcher thought that experiment with more number of subjects may thorn more light on this problem.

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