



Effect of Aerobic Exercise on Hematological Parameters of Football Players at University Level

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Abstract: Physical activities play an active role in the hematological parameters of the human body. These changes have been found to involve the enhancement of Red Blood Cells (RBCs), White Blood Cells (WBCs), and Platelets depending on the nature of exercise. Duration of exercise and intensity of the exercise also fluctuate these parameters. This study's primary goal was to examine the influence of aerobic exercise (one-mile run) on the hematological parameters of the football players who participated in intervarsity sports competition during the year 2021-22 from the Gomal University Dera Ismail Khan (KPK), Pakistan. The voluntarily participating individuals were divided into two groups of similar size, the Experimental Group (EG, n=15), and the Control Group (CG, n=15). Keeping in view the nature of the research design pre-post experimental design the researcher gets the hematological parameters before and after the completion of an 8-week aerobic exercise program.

Key Words: Hematological Parameters, Aerobic Exercise, Pulse Rate.

Introduction

Blood is a major factor in regulating the thermostat of the human body (Isaac et al., 2013). Blood plasma plays a major role in stabilizing the human body temperature (Dutton, 2012). RBC, WBC, and platelets in plasma also regulate thermostat levels. In plasma 7 g/dl protein content was found in which approximately 4 g/dl of albumin is present along with 3 g/dl of globulins (Berne et al., 2008).

Football is a dynamic sport that needs strength and stamina for quick response, therefore, aerobic exercise plays an important role in maintaining long-run performance without undue fatigue (Reilly, 2006). One-mile runs have a characteristic to improve the cardiorespiratory level of elite athletes (Hoeger et al., 2008; Turpin, 2019).

It is observed that exercise has an effect on the physiological components of the human body, where the amount of blood along with hemoglobin increases (Uzun, 2016). A well-planned exercise program has a significant effect on hematological parameters (Törpel, Peter & Schega, 2019). One can regulate how the exercise affects the blood parameters by changing its type and intensity (Ceylan et al., 2014). The values of hematological parameters can change during and after exercise, depending on the duration and intensity of exercise (İbiş et al., 2010). The parameters of hematological are dependent on different factors such as age, gender, and exercise environment (Cengiz & Çınar, 2014). Regular exercises were found to be beneficial in the increment of hematological parameters of players (Kantyka et al., 2015; Duzova et al., 2016). The nature of exercise is also a

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key point in the improvement of hematological parameters. As a result, aerobic exercise was found to be more significant as compared to the strength training program (Çiçek, 2018). Red blood cells play an important role in oxygen carriers from the lungs to muscle tissues (Mairböurl, 2013).

This study's primary goal was to examine the influence of aerobic exercise (one-mile run) on the hematological parameters of football players who participated in intervarsity sports competitions.

Method

Football players who were all in good health were split into two equal groups randomly. One group was comprised of 15 participants. These groups were the experimental group (EG, n=15 age 24.7±1.78) and the control group (CG, n=15, age 24.2±2.11). The participants of the study was football players, who were selected for intervarsity sports competition and remained in a camp for preparation of competition. After getting prior permission from the Advance Study and Research Board (ASRB) of the university, an informed consent form was filled and signed by the participants. Although the participants were football players but Physical Activity Readiness Questionnaire was filled out to get the perfect participants for the study without having any chronic heart disease history.

A mile run was an exercise which is used as an extra treatment for the experimental group along with their routine training load. This aerobic exercise started at 65% of the maximum heart rate and increasingly finished at 80%. 10-minute warmup and cool down exercise was mandatory for the participants of the experimental group throughout the 8 weeks (3 days a week).

The height of the participants was measured through a stadiometer by standing them barefooted with the wall. Weight was measured in kilogram (kg), and pulse rate, and diastolic and systolic blood pressure were measured by digital sphygmomanometer OMRON 907 (OMRON, Hoofddorp, Netherlands).

Using a sterile syringe venous blood sample of five millimeters (5ml) was collected from the players of both groups into EDTA bottles before and after the completion of the 8-week aerobic exercise program. Hematological parameters were measured before the start and after the completion of the 8-week duration of aerobic exercise. At 9:00 am a laboratory worker took a blood sample from them while they were fasting. Platelets, RBC, and WBC, which are part of hematological characteristics, were measured using an automated cell analyzer (Beckman Coulter, USA).

Statistical analysis

Descriptive statistics including mean and standard deviation were calculated using the Statistical Program for Social Science (SPSS) version 26. The t-test was used to measure the difference between aerobic exercise on anthropometric measures and hematological parameters of football players. In this study, p<0.05 was considered as the level of significance. The Kolmogorov-Smirnov test was performed to determine whether the data were normal (p>0.05).

Results

Table 1. Anthropometric measurement of experimental and control group (Mean and Standard deviation).

Variable	EG (M± Sd)	CG (M± Sd)
Age (Years)	24.7±1.78	24.2±2.11

Table 1 shows the age group of the participants. The experimental group (n=15, age=24.7±1.78), while the control group was (n=15, age=24.2±2.11).

Table 2.

Variable	EG (M± Sd)		CG (M± Sd)	
	Before	After	Before	After
Height (cm)	180.88±1.3	180.88±1.3	183.28±2.4	183.28±2.4

Weight (kg)	66.46±1.57	65.18±1.29	67.88±3.21	68.18±2.21
BMI (kg/m ²)	20.30±1.57	19.9±4.70	20.20±1.23	20.30±2.11

Table 2 shows the anthropometric measurements of the participants. The mean difference was observed in weight and BMI in the experimental group as compared to the control group after the completion of the 8-week aerobic program.

Table 3. Hematological Parameters (Pre and post-test data)

Variable	EG (M± Sd)		CG (M± Sd)	
	Before	After	Before	After
Pulse Rate (Beat per minute)	68.54±3.21	66.66±2.11	69.39±1.21	71.22±3.14
Diastolic BP (mm Hg)	74.65±2.11	77.33±1.17	77.68±2.21	77.21±4.34
Systolic BP (mm Hg)	119.23±2.21	121.15±3.30	118.22±2.15	118.65±3.23
RBC (10 ¹² /L)	5.27±1.21	6.12±2.21	5.17±2.21	5.74±0.67
WBC (10 ⁹ /L)	5.71±2.31	7.01±3.17	5.67±3.76	5.68±2.11
Platelets (10 ⁹ /L)	231.22±0.23	239.14±1.19	229.14±3.11	230.26±4.22

Table 3 shows the hematological parameters of the players along with cardiorespiratory parameters.

Table 4. Hematological Parameters (Pre and post-test data)

Variable	EG (M± Sd)		Sig.	CG (M± Sd)		Sig.
	Before	After		Before	After	
Pulse Rate (bpm)	68.54±3.21	66.66±2.11	.057	69.39±1.21	71.22±3.14	.989
Diastolic BP (mm Hg)	74.65±2.11	77.33±1.17	.049	77.68±2.21	77.21±4.34	.667
Systolic BP (mm Hg)	119.23±2.21	121.15±3.30	.033	118.22±2.15	118.65±3.23	.711
RBC (10 ¹² /L)	5.27±1.21	6.12±2.21	.030	5.17±2.21	5.74±0.67	.221
WBC (10 ⁹ /L)	5.71±2.31	7.01±3.17	.004	5.67±3.76	5.68±2.11	.232
Platelets (10 ⁹ /L)	231.22±0.23	239.14±1.19	.010	229.14±3.11	230.26±4.22	.141

P=0.05

Table 4 shows a significant change in cardiorespiratory indices along with the hematological parameters of football players. All variables of hematological parameters like RBC, WBC, and Platelets values were found significant (<.05) in the experimental group while there was no significant change observed in the control group.

Chart 1. Mean comparison

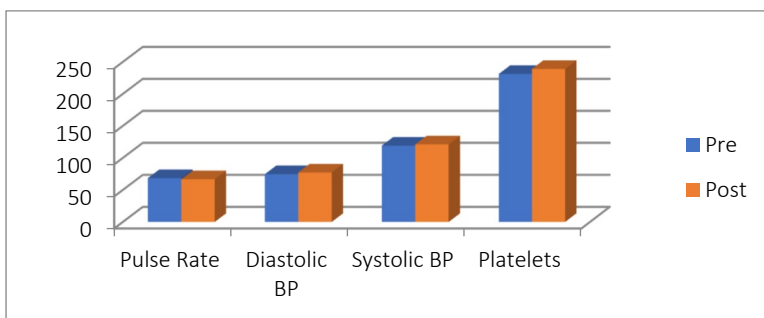


Chart 2. Mean comparison

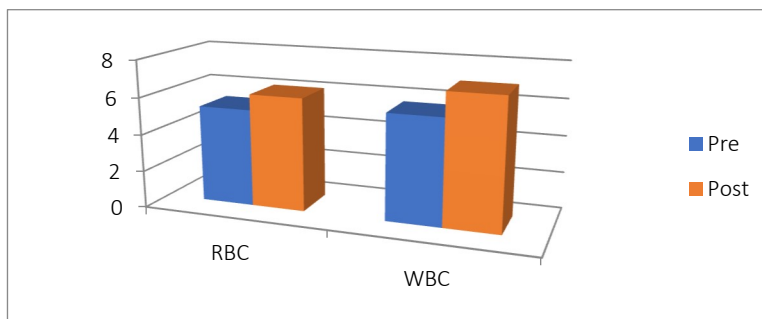


Chart 2 shows a mean difference of improvement in RBC and WBC before and after the exercise program.

Discussion

After completion of the 8-week aerobic exercise program, a significant increase was observed in the RBC, WBC, and Platelets of football players. Exercise and sports have been shown to have an impact on hemoglobin concentration (Fujitsuka et al., [2005](#)). Similarly, research was done on hematological parameters to check the effect of aerobic morning exercise, which shows a significant increase in red blood cells (Sazvar et al., [2013](#)). Conversely, a study found that the red blood cells of inactive athletes did not significantly alter after a two-week workout program. (Ümit et al., [2004](#)). The study has proved that eight weeks of bicycle ergometer exercise program elevated the level of RBC, WBC, and platelets of the participants in the experimental group (Lamina & Okoye, [2009](#)). A 16-week aerobic exercise group showed a significant level at the end of the duration in platelets and red blood cells of the athletes of the experimental group (Çiçek, [2018](#)).

Another study found that three months of running had a significant effect on the hematological markers that were assessed, including RBC, WBC, and platelets (Jafari, [2019](#)).

In a study, it was found that platelets increased after the completion of the twelve-week aerobic training program (Sharma et al., [2018](#)). In general, a week-long aerobic program improves RBC, WBC, and platelets which may lead to improved cardiovascular functions. Platelets are found to safeguard against diseases while an excessive amount of red blood cells carries more amount of oxygen, this may also lead to improved physiological functions.

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