

EFFECT OF ONE HOUR KICK BOXING EXERCISE ON HEMATOLOGICAL PARAMETERS

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Received : 12/03/2023
 Received in revised form : 08/04/2023
 Accepted : 24/04/2023

Keywords:

Hb, RBC count, WBC count, Platelet count, Exercise.

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DOI: 10.47009/jamp.2023.5.3.4

Source of Support: Nil,

Conflict of Interest: None declared

Int J Acad Med Pharm
 2023; 5 (3); 15-18

**Abstract**

Background: Exercise is state of stress. The body responds to exercise by compensatory changes in functions of different systems of body. This study is aimed to study the acute effects of one hour exercise on hematological parameters. The objectives is to compare Hb, RBC count, WBC count, differential leukocyte count and platelet count before and immediately after one hour exercise session. **Materials and Methods:** Study included 30 females in the age group of 20-50 years. Exercise included 10mins warm-up, intense exercise for 40 minutes and 10 minutes of relaxing exercise. Kick boxing exercise included upper limb and lower limb movements mimicking punching. Blood samples were collected from antecubital vein with all aseptic precautions. Two blood samples were collected, one sample before exercise and second sample immediately after exercise within half an hour. 2 ml blood was collected in EDTA anticoagulant. Blood samples before exercise and after exercise were analysed for Hb, RBC count, WBC count, Differential leukocyte count and platelet count using automated cell counter. **Result:** Post exercise samples showed significant increase in HB, RBC count, WBC count and platelet count. Differential leukocyte count after exercise showed significant neutrophilia, lymphocytosis and monocytosis. **Conclusion:** One acute session of intense exercise has increased RBC count, Hb, WBC count and platelet count significantly and it could be due to exercise induced hemoconcentration and sympathetic activation. Variation in the hematological parameters depends on the type, severity and duration of exercise.

INTRODUCTION

Blood is fluid connective tissue composed of plasma and formed elements. Plasma contributes about 55% of total blood and formed elements contribute 45%. The formed elements are red blood cells, white blood cells and platelets. The hematological parameters such as Red blood cell (RBC) count, platelet count and white blood cell (WBC) count are used as clinical indicator of health. Exercise is the most effective way for healthy life. Exercise is condition of acute stress. The World Health Organization defines exercise as , “ exercise is any physical movement produced by the skeletal muscles and requires energy consumption.^[1] Aerobic exercise is a type of exercise that depends on the aerobic energy-generating process.^[2,3] The exercises like Cycling, rowing, running, brisk walking, hiking, swimming, playing tennis, skipping rope, continuous training, and long slow distance training are different aerobic exercises.^[4] The

changes seen in hematological parameters in response to exercise are variable.

Studies showed that these changes in hematological parameters occur immediately following exercise; and it returns to resting levels within 24 hours after exercise.^[5,6] Various international and national studies showed different findings about hematological changes after acute session of exercise. Increase in RBC count, Hemoglobin (Hb) concentration and hematocrit was seen immediately after exercise by Brun et al,^[7] while Mairbaurl et al,^[8] found decrease in hemoglobin and hematocrit values. Pal et al,^[9] found no significant change in RBC count, Hb and hematocrit following exercise. Kordie et al,^[10] found that hematocrit and hemoglobin were significantly increased immediately after exercise and after two hours decreased significantly. Number of red blood cells immediately after the exercise was decreased significantly and after two hours there was a significant increase in RBC count. Results about

WBC count are also variable. Increased WBC count was seen in studies by Pal et al,^[9] Lambert et al,^[11] Mauz et al,^[12] while Ramos-Campo et al,^[13] & Pistavos et al,^[14] found decreased WBC count. Post exercise increase in platelet count was observed by Okeke Chizoba O et al,^[2] Naser Heidari et al,^[15] and Arazi et al.^[16] The changes seen in hematological parameters are affected by type of exercise, duration of exercise and severity of exercise. Changes in hematological parameters are also affected by age, gender, nutritional status and fitness of a person. This study was aimed to study immediate effects of one hour kick boxing exercise on hematological parameters in female participants.

Objectives

1. To compare RBC count and Hemoglobin concentration before and immediately after one hour exercise.
2. To compare total WBC count and differential leukocyte count before and immediately after one hour exercise.
3. To compare platelet count before and immediately after one hour exercise.

MATERIALS AND METHODS

Type of study: Comparative study

Study design: Cross sectional study

Sample size: 30 females between age group 20 years to 50 years and performing exercise regularly at least for 5 days in a week at 'Shape it Up' health club, Kalaburagi.

Institutional ethical committee permission was taken: KBNU-FM/IEC/92 dated 12.2.22

Written permission was obtained from; 'Shape it up' health club incharge and informed written consent was taken from all the participants who volunteered for the study. The study was done at Department of Physiology, KBNU faculty of Medical Sciences, Kalaburagi, with the help of "Shape it Up" health club, Kalaburagi. Vital parameters like pulse, blood pressure, respiratory rate and temperature was

recorded for all the study participants before starting exercise.

Exercise type: Kick boxing exercise

Exercise method: Initial warm up exercise for 10 minutes, followed by intense exercise for 40 minutes and then last 10 minutes was for relaxing exercise. Kick boxing exercise includes upper limb and lower limb movements mimicking punching.

Sampling method: Convenient Sampling method

Blood sample collection method: Blood samples were collected from antecubital vein with all aseptic precautions. Two blood samples of 2ml were collected in EDTA anticoagulant, one sample just before exercise and second sample immediately within half an hour after exercise. Blood samples were analyzed at Naglikar diagnostic and scanning center, Kalaburagi. Automated six part hematology analyser HORIBA YUMIZEN 500 was used for studying hematological parameters viz Hemoglobin, RBC count, total WBC count, differential WBC count and platelet count.

Inclusion Criteria

Healthy non- smokers, non- alcoholic females between age group of 20 years to 50 years and those who attended the health club regularly for at least 5 days in a week since one year were included in the study.

Exclusion Criteria

Subjects with history of any hematological disorders. Subjects with history of diabetes, hypertension, asthma. Subjects with history of any other health disorder. Subjects with endocrinal disorder. Subjects on any treatments for acute or chronic disease. Subjects on any medication.

Statistical Analysis

All data collected was entered in excel sheet after appropriate data filtration, and it was analyzed using 'SPSS' version 26.0 software. Descriptive data like proportion, ratio, mean, standard deviation was used and appropriate inferential statistics, i.e., paired 't' test was used for statistical analysis.

RESULTS

Table 1: The mean values of vital parameters of the study subject at the beginning of study

Vital Parameters	N	Mean ± SD
Age	30	38.8 ± 5.93
Pulse	30	73.93 ± 5.14
SBP	30	105.13 ± 4.32
DBP	30	69.5 ± 4.01
Respiratory rate	30	14.5 ± 1.72
Temp	30	36.28 ± 0.37

Table 2: Table showing Blood parameters before and after exercise.

		Paired Mean Statistics				t	Sig (2-tailed)	Sig			
		Mean	SD	SE	95% CI of the difference						
					Lower				Upper		
Hb	Before	12.78	1.05	-0.50	0.27	0.05	-0.60	-0.40	-10.03	0.000	HS
	After	13.28	1.09								
RBC	Before	4.67	0.43	-0.12	0.24	0.04	-0.21	-0.02	-2.706	0.011	S
	After	4.79	0.35								

TLC	Before	7006.3	1823.7	-503.6	420.8	76.84	-660.82	-346.50	-6.554	0.000	HS
	After	7510	1921.8								
Platelet count	Before	3.04	0.75	-0.48	0.37	0.06	-0.62	-0.34	-7.073	0.000	HS
	After	3.52	0.80								

Hb – Haemoglobin, RBC – Red Blood Cells, TLC – Total Leukocyte count

SD – Standard Deviation, SE – Standard Error, Sig- Significance, S – Significant, HS – Highly Significant

Table 3: Table showing differential leukocyte count before and after exercise.

		Paired Mean Statistics							t	Sig (2- tailed)	Sig
		Mean	SD	SE	95% CI of the difference						
					Lower	Upper					
Neutrophils	Before	56.67%	9.56%	-3.70%	4.40%	0.80%	-5.34%	-2.06%	-4.61	0.000	HS
	After	60.37%	8.70%								
Lymphocyte	Before	35.23%	9.05%	2.73%	5.15%	0.94%	0.81%	4.65%	2.91	0.007	S
	After	32.50%	7.62%								
Eosinophil	Before	4.37%	2.41%	0.33%	1.24%	0.23%	-0.13%	0.80%	1.47	0.152	NS
	After	4.03%	2.68%								
Monocyte	Before	3.73%	1.05%	0.63%	0.81%	0.15%	0.33%	0.94%	4.29	0.000	HS
	After	3.10%	1.06%								

SD – Standard Deviation, SE – Standard Error, Sig- Significance, S – Significant, HS – Highly Significant

DISCUSSION

Our study group included the participants performing exercise regularly for one hour daily at least for five days in a week since one year. From these participants blood sample before and immediately after one hour exercise were collected. In this study the mean age of subjects is 38.8 ± 5.93 . In our study Hb, Total WBC count and platelet count showed highly significant increase in after exercise. RBC count was also significantly increased in post exercise samples. Comparison of differential leukocyte count before and after one hour exercise showed significant increase of lymphocytes and highly significant increase in neutrophil and monocyte count. Change in eosinophil count was not significant. Our results showing increased RBC count and Hb after one hour exercise are consistent with that of Brun et al, but not with findings of Mairbaurl et al,^[8] and Pal et al.^[9] The erythrocytosis seen immediately after exercise can be explained as an effect of hemoconcentration due to plasma loss during exercise. It is described as short term effect by Brun JF.^[7] Hypoxia is a known stimulus for erythropoietin release. Dastbarhagh et al,^[18] in their study found that the hypoxia caused a significant increase in the red blood cells and hemoglobin as oxygen demand increases during exercise.

Our results showed significant increase in total WBC count with neutrophilia, lymphocytosis and monocytosis in postexercise samples. Our results showing increased WBC count are similar to results of Pal et al,^[9] Lambert et al,^[11] Mauz et al,^[12] and Ghanbari et al,^[19] but the results are not consistent with observations of Ramos-Campo et al,^[13] & Pistavos et al.^[14] Exposure to acute stress of exercise leads to leukocytosis. The extent of postexercise leukocytosis is dependent on the duration and intensity of exercise.^[20-22] Transient lymphocytosis and monocytosis was seen in study conducted by Neves et al.^[21] Post exercise neutrophilia,

lymphocytosis, eosinophilia and monocytosis was observed by Pal et al.^[9] Increase in WBC count in response to stress is mainly due to neutrophilia, lymphocytosis and monocytosis. Exercise induced stress is responsible for increased release of neutrophils, lymphocytes and monocytes into circulation.^[22,23] In various studies it is observed that neutrophilia in response to exercise is due inflammatory response associated with exercise induced skeletal muscle damage and cardiac stress.^[24] The lymphocytosis seen after exercise may be due to sympathetic activation induced release of epinephrine and norepinephrine that leads to increased release of lymphocytes from lymphoid organs, increasing circulating lymphocytes.^[25,26] In our study platelet count is increased significantly in post exercise samples. Our findings are consistent with Okeke Chizoba O et al,^[2] and Naser Heidari et al.^[15] Brun JF observed that thrombocytosis seen after exercise is due to hemoconcentration and release of platelets from mainly spleen and to a small extent from liver and lungs.^[7] Release of epinephrine is responsible for splenic contraction and platelet release. From various national and international studies it is seen that the changes seen in hematological parameters immediately after acute session of exercise are variable and also dependent upon type, duration, severity of exercise and person's nutritional status.

Limitations of Study

Hematological parameters during recovery period were not studied.

CONCLUSION

One acute session of intense exercise has increased RBC count, Hb, WBC count and platelet count significantly. Variation in the hematological parameters depends on the type, severity and duration of exercise.

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