IOSR Journal Of Humanities And Social Science (IOSR-JHSS)
Volume 20, Issue 5, Ver. IV (May. 2015), PP 34-38
e-ISSN: 2279-0837, p-ISSN: 2279-0845.
www.iosrjournals.org

Effect of exercise on Haemoglobin Percentage among Three Different Physically Active groups

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Abstract
Introduction:
The aim of this study was to compare and examine the haemoglobin percentage among highly physically active, moderate physically active and low physically active groups in 16 weeks of observation.
Methods: *Thirteen (13) SAI football students as highly physically active group (SAI), twelve (12) professional physical education students as moderate physically active group (B.P.Ed) and ten (10) general college going students as very low physically active group (GEN) who has normal blood cell count at the beginning of the session with an average age of 21.16±1.85 have participated in this study voluntarily. SAI and B.P.Ed groups were involved in their respective training schedule under the supervision of experts. Researcher observed the all the groups for16 weeks and collected the data three times for every sample. After being informed, blood samples of subjects have been taken on an empty stomach at their respective ground between 7:00-8:00 in the morning. Haemoglobin percentage (HBG) has been determined by using Syxmex auto-hemato analyzer.*
Result: *Measurement results were presented as average and standard deviation. Repeated measures ANOVA followed by Newman-Kuels post hoc test was used in order to make the comparison between three groups. P<. 0.05 value was considered to be significant. The result of the study found haemoglobin level of SAI, BPEd and General students was at normal level. No significant difference in Haemoglobin was evident between SAI vs B.P.Ed groups (q=1.50, p>0.05), B.P.Ed vs General students (q= 1.58, p>0.05) and SAI vs General students (q= 1.83, p>0.05).*
Conclusion: *Haemoglobin level of SAI, BPEd and General students remained at normal range. The SAI, BPEd and General students could not show significant change in Haemoglobin level during 2nd and 4th months respectively.*
Key words: *Haemoglobin, physically active, blood, training.*

I. Introduction:

An iron-containing protein present in the blood of many animals that, in vertebrates, carries oxygen from the lungs to the tissues of the body and carries carbon dioxide from the tissues to the lungs. Hemoglobin is contained in the red blood cells of vertebrates and gives these cells their characteristic color. Hemoglobin is also found in many invertebrates, where it circulates freely in the blood. It consists of four peptide units, each attached to a nonprotein compound called **heme** that binds to oxygen.

Some of the physiological changes associated with strenuous exercise and their relationship with athletic performance are well known. In several studies, various physiological responses were associated to cardio-respiratory, metabolic, hormonal, neuromuscular, and immunological parameters. There have been frequent reports of a suboptimal hematological status being observed in athletes involved in intensive physical activity (Biancotti et al. 1992). There have even been reports of "sports anemia" resulting from intensive physical exercise in humans (Hasibeder et al. 1987). Ozyener et al. (1994) showed that acute submaximal exercise significantly increases erythrocyte, hematocrit, hemoglobin, leukocyte, and trombocyte counts in comparison to the levels before exercise. Abbasciano et al. (1998) stated that the RBC decreased during endurance sports. Actually, during physical exercise, red blood cells must deliver oxygen to tissues at a higher flow rate in a more viscous fluid, due to a reduced plasma volume (Gabriel et al. 1992). During the exercise, certain amount of liquid enters into the tissues leaving the veins and the density of erythrocyte, hemoglobin and plasma proteins increases (K. Karacabey et al., 2004, Ozdengul, 1998). However, there is no complete consensus in the literature how exercise affects on blood concept. While some researchers express that exercise increase blood volume (M.Gunay et al., 2006), others state that it does not change (N. Akgun, 1994).

So, in this study researcher wants to find out some fruitful findings about heamoglobin percentage changes with practicing of three different level of physical activity for 16 weeks

II. Methodology:

Selection of subjects:

Thirty five (35) students were selected randomly as the subject for the study. Those 40 students were taken from three groups comprising of thirteen (13) students for highly, twelve (12) students for moderate physically active groups and ten (10) students for very low active sedentary group.
Subjects selected for the study were all male students of age group between 17 to 22 years.

Details of grouping of subjects are as follows:

Group I (HAG): Thirteen (13) fresh male students of SAI training center (soccer), Burdwan will be selected as highly physically trained group. Subjects who are undergoing a coaching program in football under SAI have to follow a vigorous conditioning schedule to improve their general as well as specific fitness followed by a coaching schedule for the development of football skills.

Group II (MAG): Twelve (12) fresh male Physical Education students of Department of Physical Education, Jadavpur University will be selected as moderate physically trained group. Student pursuing the one year program of Physical Education leading to the degree of Bachelor of Physical Education are required to maintain a moderate level of physical fitness in order to follow different practical classes round the year.

Group III (LAG): Ten (10) first years (Arts) male students from Burdwan Raj College and Vivekananda College under Burdwan University will be selected as very low active sedentary group. They generally participate in sports program not in a regular basis and their objective of participation in such program is to have fun, enjoyment and recreation and as such it is voluntary.

Selection of variable: Haemoglobin percentage.

Experimental design:

Collection of Blood Sample:

The blood samples were taken in the morning between 6.30am to 7.30am. Blood samples from subjects were taken after 12 hour hungry and having refrained from vigorous exercise for at least 24 hours. The subjects were lay down or sat on arm chair. Examination of the superficial veins of the left forearm was made to select the vein for venous puncture. About 3ml of blood was collected from each subjects and captured in the anticoagulant (EDTA) tube.

Groups	Pre-test	Intermediate	Post-test
Highly physically trained (SAI) (N=13)	At the beginning of the session	After 8 week or 2 month of training	After 16 week or 4 month of training
Moderately physically trained (BPEd) (N=12)	At the beginning of the session	After 8 week or 2 month of training	After 16 week or 4 month of training
Low physically active (GEN) (N=10)	At the beginning of the session	After 8 week or 2 month of training	After 16 week or 4 month of training

Analyzing blood sample:

All blood sample was analyzing by Sysmex XP-100 Automatic hematology analyzer (Sysmex corporation , Kobe, Japan). [Code No. BB556095, Manufactured : July 2012, Software version: 00-05 and onwards]

Result and interpretation:

Table :1

	Status of Haemoglobin level (gm/dL) **among three different physically active groups**		
	1st Test M (SD)	2nd Test M (SD)	3rd Test M (SD)
SAI	13.22 (1.14)	14.36 (0.92)	13.48 (1.27)
BPEd	13.62 (0.85)	14.23 (0.79)	14.42 (0.52)
General	13.68 (0.92)	13.71 (0.67)	13.81 (0.48)
Normal value: 14 to 16 gm% or gm/dl			

Table : 2

Result of Repeated Measures ANOVA for Haemoglobin (HBG) level
(SAI, BPEd and General students)

Source of Variation	**SS**	**df**	**MS**	**F**
TOTAL	217.32	44	--	--
Between Subjects (A)	40.46	14	--	--
Within Subjects (B)	86.70	30	--	--
Treatments	9.24	2	4.62	1.60
Residual	80.92	28	2.89	
* p < 0.05 ** p < 0.01				

Overall result revealed that for SAI trainees, the Haemoglobin level during 1st test, 2nd test and 3rd test were same. Similarly, no statistically differences in Haemoglobin level during 1st test, 2nd test and 3rd test were evident for B.P.Ed. and General students (F=1.60, p>0.05).
Depending upon the F-value, although there is no need for a post hoc analysis, the researcher thought to apply Newman-Kuels post hoc test to locate exact values of differences in Haemoglobin between three physically active groups.

The comparative result of Newman-Kuels post hoc test indicates the following results (Table- 3):

Table : 3

Adjusted Ordered Means in Haemoglobin (HBG) during 1st test, 2nd test and 3rd test phases
(SAI Group, B.P.Ed. Group & General students Group)

	1st test (gm/dL)	2nd test (gm/dL)	3rd test (gm/dL)
SAI	13.20	14.39	13.53
B.P.Ed.	13.65	14.18	14.46
General Students	13.70	13.80	13.83
1st test = base level test, 2nd test = after 2nd month of respective training, 3rd test = after 4th month of respective training.			

- For SAI trainees, the Haemoglobin level (gm/dL) during 1st test, 2nd test and 3rd were 13.20, 14.39 and 13.53 respectively.
- For BPEd trainees, the Haemoglobin level (gm/dL) during 1st test, 2nd test and 3rd were 13.65, 14.18 and 14.46 respectively.
- For General students, the Haemoglobin level (gm/dL) during 1st test, 2nd test and 3rd were 13.70, 13.80 and 13.83 respectively.

Table : 4

Newman-Kuels post hoc test difference in Haemoglobin (HBG) level during 1st, 2nd and 3rd test Phases

SAI Group	2nd test	1st test
3rd test	1.16	1.87
2nd test	--	1.59
B.P.Ed. Group		
3rd test	1.03	1.92
2nd test	--	1.64

General Students		
3rd test	0.76	0.85
2nd test	--	0.73
* p<0.05, ** p<0.01		
1st test = base level test, 2nd test = after 2nd month of respective training, 3rd test = after 4th month of respective training.		

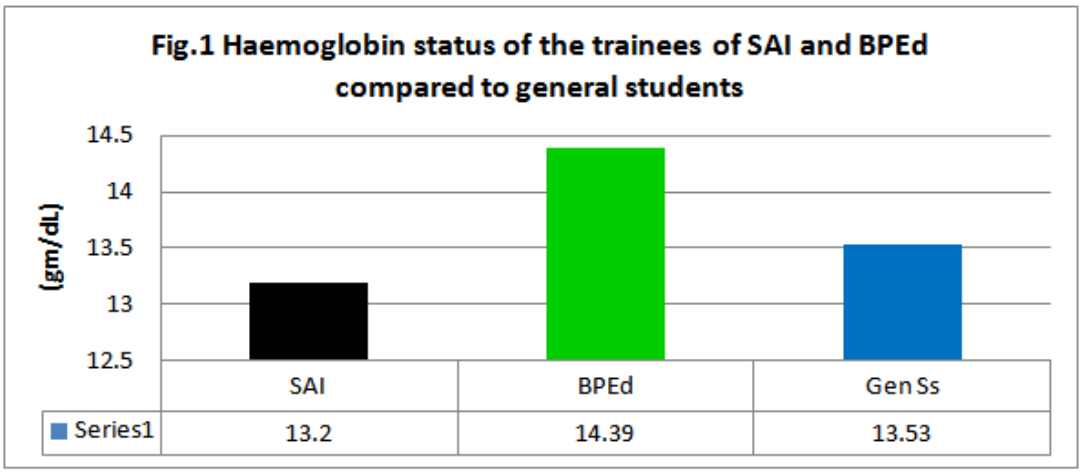
- For SAI group no significant change in Haemoglobin was evident after 2nd months (q=1.59, p>0.05) and 4th months of training (q= 1.16, p>0.05).
- For B.P.Ed group no significant change in Haemoglobin was evident after 2nd months (q=1.64, p>0.05) and 4th months of training (q= 1.03, p>0.05).
- For general students group no significant change in Haemoglobin was evident after 2nd months (q=0.73, p>0.05) and 4th months of training (q= 0.76, p>0.05).

Table : 5

Newman-Kuels post hoc test indicating difference in Haemoglobin (HBG) level between three physically active groups

Group	B	A
C	1.58	1.83
B	--	1.50
* p<0.05, ** p<0.01		
A = SAI group, B = B.P.Ed. group, C = General students group		

- Haemoglobin level of SAI, BPEd and General students was at normal level.
- No significant difference in Haemoglobin was evident between SAI vs B.P.Ed groups (q=1.50, p>0.05), B.P.Ed vs General students (q= 1.58, p>0.05) and SAI vs General students (q= 1.83, p>0.05).



Major Findings

Hemoglobin is the component of red blood cells that carries oxygen and carbon dioxide. Screens for anemia and may detect red blood cell breakdown or hemolytic anemia. In fact, low values indicate anemia, blood loss, deficiencies of iron, foliate, or vitamins B12 or B6. High values indicate sickle cell anemia (Peripheral blood smear will show sickle cells: means red blood cells take shape of sickle) Thalassemia, transfusion reaction, hemolysis, dehydration, Polycythemia Vera, high altitude. However, the findings on this variable are as follows:

In case of SAI trainees, no significant change in Haemoglobin was evident after 2nd months (q=1.59, p>0.05) and 4th months of training (q= 1.16, p>0.05). Similar result was seen in case of BPEd trainees (after 2nd months: q=1.64, p>0.05 and 4th months: q= 1.03, p>0.05) and General students (after 2nd months: q=0.73, p>0.05 and 4th months: q= 0.76, p>0.05).Thus, the result infers that the SAI, BPEd and General students could not show significant change in Haemoglobin level during 2nd and 4th months respectively.

Newman-Kules post hoc result indicates that no significant difference in Haemoglobin was evident between SAI vs B.P.Ed groups (q=1.50, p>0.05), B.P.Ed vs General students (q= 1.58, p>0.05) and SAI vs

General students (q= 1.83, p>0.05). Thus, Haemoglobin level of SAI, BPEd and General students remained at normal range.

III. Discussion:

Our result infers that the highly physically trained group (SAI), moderate physically trained group (BPEd) and General students could not show significant change in Haemoglobin level during 2nd and 4th months respectively and when we interpreted among the three groups we found that no significant difference in Haemoglobin was evident between highly physically trained group (SAI) vs moderate physically trained group (B.P.Ed), B.P.Ed vs General students and highly physically trained group (SAI) vs General. It support the study of Joksimovic et al. (2009) who found insignificantly increased of hemoglobin concentration when he compare hematological profile between Sebrian youth national soccer players with non-athlete. Cagri Celenk (2012) investigates hematologic parameters among different branches (weightlifting, handball and volleyball) of elite female athletes and found no significant changes in term of HBG. Rietjens et al. (2002) did not find significant alterations in elite Olympic distance tri-athletes in HBG over a period of 3 years.

In other hand G.Buyukyazi and F.Turgay found in their study on male sportsmen that hemoglobin levels increased significantly after interval trainings (G. Buyukyazı et al.2000). Haemodilution with a decrease in [HBG] is a wellknown phenomenon occurring with regular highly endurance training in adults (El-Sayed et al. 2005). Halson et al. (2003) reported increase of HGB parameters in trained individuals and Patlar and Keskin (2007) emphasized decreases in HGB levels after exercise.

IV. Conclusion:

Haemoglobin level of SAI, BPEd and General students remained at normal range. The SAI, BPEd and General students could not show significant change in Haemoglobin level during 2nd and 4th months respectively.

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