

## Effect Of Endurance Sports On Selected Haematological Parameters.

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**Abstract: Background & objectives:** To find out the effect of endurance sports activity on Hemoglobin and Red blood cell count, compare and analyze the results of sports persons and sedentary persons. **Method:** The present work was carried out in the Indian Petro Chemical Ltd (IPCL) Township at the sports complex and IPCL Hospital (Health center). Hemoglobin and red blood cell count was carried out on the sportspersons and the control group using electronic auto analyzer cell counter (SYSMEX). The result obtained was compared by statistical analysis using unpaired-t test. **Results:** The findings of our study revealed lower Red blood cell count and Hemoglobin content in sportspersons than the sedentary group. **Interpretation & Conclusion:** It can be concluded that endurance sports activities over a longer duration reduces the hemoglobin and Red blood cell count.

**Key Words:** Regular Physical Exercise, Hemoglobin, Red Blood cells

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**Introduction:** Body fitness prolongs life. Multiple studies have shown that people, who maintain appropriate body fitness, using judicious regimens of exercise and weight control, have the additional benefit of prolonged life. Studies have shown mortality to be 3 times less in the fit people than in the least fit.

Immediately after exercise plasma and blood volume are decreased as a result of fluid loss through sweat and respiration, filtration to the extra-vascular space following an increase arterial pressure and muscle contraction during exercise. But when a person is exposed to aerobic exercise for longer duration, there is increase in plasma volume and demonstrating decrease in red blood cell count and hemoglobin content<sup>1</sup>

In the present study we have concentrated on the effect of long-term stress in the form of exercise and sports activity on Hb and RBC. Previous studies in this field have shown that sports persons have lower values of Hb and RBC in comparison to counterparts not engaged in any kind of regular exercise.

**Material and Method:** The present work was carried out in the Indian Petro Chemical Ltd. (IPCL) Township at the sports complex and IPCL Hospital (Health centre). The subjects selected were sport persons and residents of IPCL Township who had been playing in their respective fields for 4 years or more<sup>2</sup>. All the

subjects were male between the age group of 20 – 30 years.

The subjects were explained about the purpose and importance of study. Permission from the ethical committee of medical college Vadodara was taken and only those who were motivated consented and without past history and family history of Diabetes Mellitus, HIV, IHD, TB, Asthma etc. were included in the present study. Also the subjects were not having any personal history of tobacco and alcohol consumption. They were free from any disease and were not taking any medicine.

With the similar criterion 30 male persons of same age group of IPCL township who were not involved in any sports activity or regular daily exercise like walking, cycling, jogging etc. were taken as controls. Both subjects and controls were not on any kind of special diet and vitamins or mineral supplementation.

The parameters recorded in our study are Hemoglobin concentration in gm/dl (Hb) and Red Blood Cell count in millions/mm<sup>3</sup> (RBC). Subjects before collection of blood were instructed not to take any food in the morning. In the Nil by Mouth condition subjects were present in the occupational health center of IPCL. After tourniquet application on the right/left upper arm blood was collected in 5 cc syringe through 16-gauge needle taking all aseptic precautions from the right/left cubital vein. EDTA bulb was kept on the shaker of the electronic auto

analyzer cell counter (SYSMEX). After removal of the cap of EDTA bulb, the probe of instrument was inserted into the bulb and was displayed on the screen with Histogram. Hemoglobin concentration and Red blood cell count was obtained by data selection from screen.

#### Result:

**Table 1: Anthropometric parameters**

	Sports Person		Non-sports Person	
	Mean ±SD	Range	Mean ±SD	Range
<b>Age (yrs)</b>	27.77± 4.93	20 – 35	29.80 ±2.71	25 – 34
<b>Height (cm)</b>	168.40 ±4.32	164– 178	167.47 ±5.61	157 – 178
<b>Weight (Kg)</b>	60.90 ±5.98	50 – 72	62.00 ±7.63	47 – 77

**Table 2: Selected haematological parameters**

	Sports Person	Non-sports Person	P value
<b>Hb (gm %)</b>	14.10±0.60	14.73± 0.77	< 0.001
<b>RBC (mill/cmm)</b>	4.91± 0.33	5.68±0.47	< 0.001

Hb (gm %) = Haemoglobin in gram percentage and RBC (mill/cmm) = Red Blood Cell count in millions per cubic millimetres.

The mean age, height and weight of sports person and sedentary individuals are as shown in table 1. The mean age of control subjects was  $29.80 \pm 2.70$  years while that of sports persons  $27.7 \pm 4.93$  years. The mean weight was  $62.00 \pm 7.63$  kg and  $60.90 \pm 5.98$  kg in control and sports persons respectively. Similarly the mean height was  $167.47 \pm 5.61$  cm and  $168.40 \pm 4.32$  cm in control and sports persons respectively.

Table 2 shows that mean Haemoglobin level was lower in sports person ( $14.10 \pm 0.60$  gm %) and higher in control subjects ( $14.73 \pm 0.77$  gm %). Similarly the RBC count also shows difference i.e. sports persons ( $4.91 \pm 0.33$  millions per cmm) and higher count in control subjects ( $5.68 \pm 0.47$  millions per cmm). The differences were significant.

**Discussion:** On statistically analyzing the results of our present study the haemoglobin levels of the sports person were lower than the control subjects. Even the red blood cell count showed significant difference in sports person and their counterpart. Gokhan M et al<sup>2</sup> in their study on 25 young male football players found similar results of reduction in HB and RBC values in relation to 25 male medical students having sedentary life style. They have suggested the reason for it to be intensive and chronic physical activity. But as the values were still under the physiological limits: it cannot be termed as 'sports anaemia'. Syzgula Z<sup>3</sup> in his study has found lowered haematological parameters in sportspersons at rest particularly in those involved in endurance disciplines. He has used the term sports anaemia and has given possible causes like post exercise plasma expansion, intensified haemolysis during physical efforts, iron deficiency, losses of erythrocytes by the way of bleeding into the digestive and urinary systems and also some disturbances in erythropoiesis. Same causes were also given by Magazanik A et al<sup>4</sup> and Weight LM et al<sup>5</sup> in their research works with greater emphasis on the intravascular haemolysis. Smith JA<sup>6</sup> and Smith JA et al<sup>7</sup> in their studies have also showed reduction in HB and RBC with more contribution from the oxidative stresses and reduction of antioxidants in the body.

RBCs are vulnerable to oxidative damage because of their continuous exposure to oxygen and their high concentrations of polyunsaturated fatty acids and haem iron. As oxidative stress may be proportional to oxygen uptake, it is not surprising that antioxidants in muscle, liver and RBCs can be depleted during exercise. Oxidative damage to RBCs can also perturb ionic homeostasis and facilitate cellular dehydration. These changes impair RBC deformability which can, in turn, impede the passage of RBCs through the microcirculation. This may lead to hypoxia in working muscle during single episodes of exercise and possibly an increased rate of RBC destruction with long term exercise. Kehat et al<sup>8</sup> had the similar results i. e. lower values in RBC count and hematocrit values in Special force trainees after 2 years of training and remaining unchanged in submariners. They labelled this as 'Sports anaemia'. Kujala et al<sup>9</sup> also had similar results by showing lower haemoglobin content in 20 endurance athletes when compared with

normal subjects who were not engaged in any of the sports activities.

Boyasjiev et al<sup>10</sup> found decreased values of RBC count, Haemoglobin content and packed cell volume in athletes (highly trained persons) when compared with those of control subjects. Consatntini et al<sup>11</sup> investigated the iron status of male and female gymnasts and compared it with other sports persons. They showed that iron store were consistently lower in male gymnasts than non gymnasts and no change in red cell count with less haemoglobin content in the experimental group. Schumacher et al<sup>12</sup> in their study on 39 subjects divided into three groups viz. untrained, moderately trained and highly trained performing different types and volumes of physical activity and soluble transferrin receptor(sTfr) concentration, variables of iron status and haematological indices.

They showed increased values of both the variables as the result of exercise induced hemoconcentration. As a reaction to several days of aerobic exercise, plasma volume increases and hemoglobin and packed cell volume decrease on a long-term basis. Warrington et al<sup>13</sup> found fall in values of RBC count, hemoglobin content and PCV in rugby group than tug of war group and they explained that this decrease was due to haemolysis, hemodilution or difference in body composition. Malcovati et al<sup>14</sup> analyzed the biological variations of haematological parameters in professional athletes. Exercise modalities were found to have important effects on haematological parameters. Hemoglobin and hematocrit values were higher at the beginning of the competition season, and then declined in well-trained athletes.

Aerobic exercise was associated with lower values, suggesting that low hemoglobin values should physiologically be found in endurance sports. Heinicke et al<sup>15</sup> of Dept. of Sport Medicine, Uni. of Bayreuth, Germany showed that athletes have considerably larger blood volumes than untrained individuals, as a result of an increased adaptation to training stimuli and probably also individual predisposing genetic factors. Spodaryk et al<sup>16</sup> compared some hematological and iron related parameters in boys involved in intensive training for National championship with non-trained age matched subjects and found decrease in hemoglobin

content and iron stores after training in sports persons (latent or manifest anemia). Deruisseau et al<sup>17</sup> determined the effect of weight training on measures of iron status, in which they found decline in hemoglobin concentration after 12 weeks of training. Rietjens et al<sup>18</sup> also could see decrease in Red blood cell count and hemoglobin values below the normal level after long-term endurance training. Neumayr et al<sup>19</sup> also conducted a study on effects of training on hematological parameters and found decreased hemoglobin and RBC count along with lower hematocrit values during post training session when compared with pre training data. Fallon et al<sup>20</sup> investigated hematological variations in participants in a marathon run. They could observe that variables like hemoglobin, packed cell volume, mean red cell volume and some other hematological parameters decreased during the session. Increases were also found in red cell count and iron binding capacity.

**Conclusion:** As per the results obtained in our study and in the light of the above discussion it can be concluded that endurance sports disciplines and exercises over a longer duration tends to reduce the haemoglobin and red blood cell count in human beings to an extent which is more of beneficial than detrimental to the body.

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