Haemoglobin Concentration and RBC Count In Smokers of Andhra Region

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Abstracts: Introduction: Cigarette smoking is the most common type of tobacco use. Smoking is also a major cause of atherosclerotic disease and is considered one of the three major risk factors for coronary heart disease along with high blood pressure and cholesterol disorders.Materials and Methods: One hundred twenty healthy male smokers and one hundred twenty healthy male non-smokers among hospital employees and people from surrounding areas of Narayana Medical College, Nellore (India) were studied. The haemoglobin concentration and RBC count were done using Beckman Coulter Automatic Analyzer, A^{c}T 5diffCP.Observations and Results: The mean haemoglobin concentration for smokers was 16.05 g/dl and for non-smokers was 12.839 g/dl. The mean RBC count for smokers was 5.74 millions/cm^3 and for non-smokers 4.72 millions/cm^3. The difference between mean haemoglobin concentration and mean RBC count of smokers and non-smokers were statistically significant ($p<0.0001$). Discussion& Conclusion: Cigarette smoke contains carbon monoxide. Smoking reduces tissue oxygen delivery and stimulates erythropoiesis. Thus we concluded that in smokers haemoglobin concentration and RBC count increase significantly.[Gitte R NJIRM 2012; 3(1) : 30-33]

Key Words: Cigarette smoking, haemoglobin concentration, RBC count

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Introduction: Cigarette smoking is one of the major lifestyle factors influencing the health of human beings. Cigarette smoking is the most common type of tobacco use. In average, to date 47.5 % of men and 10.3 % of women are current smokers. Tobacco continues to be the second major cause of death in the world [1].

It is known that cigarette smokers have a high mortality. Smoking is also a major cause of atherosclerotic disease and is considered one of the three major risk factors for coronary heart disease along with high blood pressure and cholesterol disorders. Smoking has both acute and chronic effect on haematological parameters [2]. A cigarette smoker is exposed to a number of harmful substances including nicotine, free radicals, carbon monoxide and other gaseous products. All these substances potentially affect atherogenesis and thrombosis [3]. Nicotine is now speculated to be responsible for development of dependence while carbon monoxide and other combustion substances are responsible for smoking related cardiovascular disorders [4].

Cigarette smoke contains carbon monoxide. The carbon monoxide forms COHb which interferes with oxygen transport and utilization. Chronic mild elevation of COHb is common cause of mild polycythaemia [5]. Cigarette smoke results in numerous pathologic effects including changes in the central and peripheral airways, capillaries and the immune system. Smoking reduces tissue oxygen delivery and stimulates erythropoiesis [6].

Several studies on haematology and smoking had been conducted on Caucasian and other ethnic groups, but very less studies done in the past on Indian population. Thus present study was undertaken to find out effect of cigarette smoking on two haematological parameters (haemoglobin and RBC count) and to apply this information for better investigation and management.

Material and Methods: Subjects: One hundred twenty healthy male smokers and one hundred twenty healthy male non-smokers following an informed consent were studied. Both smokers and controls (non-smokers) were hospital employees and people from surrounding areas of Narayana Medical College, Nellore (India). Both smokers and controls were aged 30-60 years. This cross sectional study was carried out during February – September 2008 at Department of Physiology, Narayana Medical College, Nellore (India) with

prior permission of ethical and research committee of Narayana Medical College, Nellore.

Male smokers with frequency of 20 or more cigarette per day with more than 20 year duration of smoking were selected for study. Male smokers with blood pressure 100-140 mm Hg systolic and 60-90 mm Hg diastolic were selected for study. Male smokers had no history of Diabetes mellitus and their random blood sugar was 100-140 mg/dl.

Controls (non-smokers) had no history of Diabetes mellitus and their random blood sugar was 100-140 mg/dl. They had blood pressure 100-140 mm Hg systolic and 60-90 mm Hg diastolic.

Method: Informed written consent was taken from each subject. Five milliliters of venous blood was withdrawn with minimum stasis into a clean disposable syringe 5 ml. The blood samples were stored in EDTA bulb. The haemoglobin concentration and RBC count were done using Beckman Coulter Automatic Analyzer, A^cT 5diffCP.

Statistical Analysis: The data was entered in computer and analyzed using NCSS statistical package. The differences in means of haemoglobin concentration and RBC count were tested for statistical significance by independent sample "t" test.

Result: Result shown in Table 1 shows the mean, maximum, minimum, standard deviation, and standard error of age, haemoglobin concentration and RBC count of smokers and non-smokers. The mean haemoglobin concentration for smokers was 16.05 g/dl and for non-smokers was 12.839 g/dl. The difference between mean haemoglobin concentration of smokers and non-smokers was statistically significant ($p<0.0001$). The mean RBC count for smokers was 5.74 millions/cm^3 and for non-smokers 4.72 millions/ cm^3. The difference between mean RBC count of smokers and non-smokers was statistically significant ($p<0.0001$). The mean age for smokers was 44.93 years and for non-smokers was 43.84 years. The difference between mean age of smokers and non-smokers was statistically non-significant (p=0. 0.0646).

Table 1: Showing the mean, maximum, minimum, standard deviation, and standard error of age, haemoglobin concentration and RBC count of smokers and non-smokers.

Variable	n	Min.	Max.	Mean	S.D.	S.E.	P Value
Hb% of smokers (g/dl)	120	12.50	19.00	16.05	1.241	0.1133	<0.0001
Hb% of non-smokers (g/dl)	120	11.10	14.00	12.83	0.7273	0.0664	<0.0001
RBC count of smokers (millions/ mm^3)	120	4.4	6.8	5.74	0.5315	0.04852	<0.0001
RBC count of non-smokers(millions/ mm^3)	120	3.8	6.4	4.72	0.5395	0.04924	<0.0001
Age of smokers (years)	120	39	56	44.93	4.168	0.3805	0.0646
Age of non-smokers(years)	120	32	56	43.84	4.911	0.4483	0.0646

RBC – Red blood cells, Hb – Haemoglobin, COHb – Carboxyhaemoglobin, EDTA – Ethylene Diamine Tetra-acetic Acid, Min. - Minimum, Max. – Maximum, S.D. – Standard deviation, S.E. – Standard error, n – Sample size, *** - Highly significant

Discussion: In the present study mean haemoglobin concentration of smokers showed sharp increase with respect to the control subjects. The mean RBC count for smoker showed increase with respect to the control subjects.

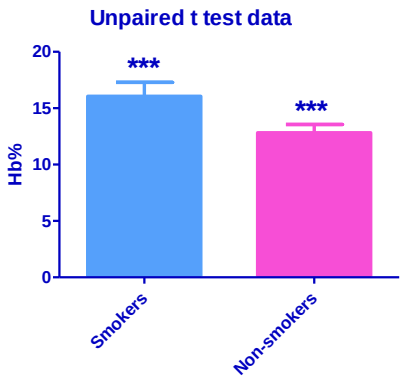
This increase in haemoglobin concentration of smokers in the present study is supported by the findings of Tirlapur V.G. et al[7]. They evaluated 230 healthy subjects and compared them with 66 light smokers and 50 heavy smokers. They divided subjects into three groups: group1 (20-39 years), group2 (40-59 years) & group3 (60-75 years). The mean haemoglobin concentration for non-smokers is 13.80 g/dl and for light and heavy smokers is 14.60 g/dl for group 2. They conclude that smokers generally show mild erythrocytosis similar to that seen in relative polycythemia [7].

According to Galea G. and Davidson R. J. L. [8] smoking is a cause of disease and death to present generation. They had undertaken study to establish the haematological changes associated with cigarette smoking in 20 heavy smokers. Highly significant difference was observed in haemoglobin concentration of smokers and non-smokers. The

mean haemoglobin concentration for non-smokers was 13.9 g/dl and heavy smokers were 14.6 g/dl. Their study showed that cigarette smoking has several deleterious effects on properties of blood flow [8].

Forrest R.D. et al, undertaken a prospective survey of the level of haemoglobin concentration in 1057 subjects (including 607 women) over the age of 40, randomly selected from age-sex register of a North London group practice. The mean haemoglobin concentration level was 15.04 ± 1.41 g/dl in men. Smokers had significantly higher haemoglobin concentration level than non-smokers ($p<0.002$). There was a weak correlation with number of cigarettes smoked [9].

Graph 1: Showing Hb% of smokers and non-smokers.



Graph 2: Showing RBC count of smokers and non-smokers.

Nordenberg D. et al, evaluated relationship among cigarette smoking, haemoglobin concentration, and carboxyhaemoglobin concentration using data from the Second National Health and Nutrition Examination Survey. The mean haemoglobin concentration level for smokers was 15.6 ± 0.4 g/dl and for non-smokers was 15.2 ± 0.5 g/dl. Cigarette smoking seems to cause a generalized upward shift of the haemoglobin distribution which reduces utility of haemoglobin level to detect anemia. This study suggests that minimum haemoglobin cutoff value should be adjusted for smokers to compensate for the masking effect of smoking on the detection of anemia [10].

Tarzi I. S. et al evaluated the effect of cigarette smoking on diagnostic reliability of HbA_2. A total of 2,867 (654 smokers and 2,213 non-smokers) male subjects were involved in study. The result showed a significant increase in RBC count and haemoglobin concentration in smokers [11].

Conclusion: Thus we concluded that in smokers of Andhra region haemoglobin concentration and RBC count increase significantly. Regular monitoring of these two parameters in smokers is advised so that changes can be detected at an earlier stage for implementation of preventive measures such as cessation of smoking.

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