



A COMPARATIVE STUDY OF HAEMATOLOGICAL PARAMETERS BETWEEN CHRONIC SMOKERS AND NON-SMOKERS.

Physiology

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ABSTRACT

Introduction: Tobacco smoking is the most important preventable cause of human morbidity and mortality. Cigarette smoke is a heterogenous aerosol produced by incomplete combustion of tobacco leaf.

Aim: To compare and correlate the haematological parameters- RBC count, WBC count, Haemoglobin level, Haematocrit (PCV) values between chronic smokers and non smokers.

Materials & methods: 70 male smokers and 50 male non-smokers in the age group of 31 to 50 years residing at Coimbatore were selected. Fresh blood samples were collected for the estimation of RBC count, Total WBC count, Haemoglobin level and Haematocrit. Measurement of Blood Parameters was done by Automatic cell analyser.

Results: This study showed rise in RBC count, WBC count, Haemoglobin and PCV values (P value < 0.05) in chronic smokers compared to non-smokers in all age groups.

Conclusion: Haematological changes indicate that chronic smokers have high liability to cardiovascular risk due to haemoconcentration than non-smokers in future.

KEYWORDS

Haematological parameters, chronic smokers, non-smokers

INTRODUCTION

Cigarette smoking is the most important preventable cause of human morbidity and mortality. Every cigarette reduces the lifespan by about 5 min. If a cigarette smoker smokes a pack per day, he puffs more than 70,000 times per year. Smoking men have 70% higher death rates than non-smokers (1). Globally smoking kills more than 4 million people every year and by 2020 it is likely to cause more morbidity and mortality. Cigarette smoke is a heterogenous aerosol produced by incomplete combustion of tobacco leaf. More than 4000 noxious compounds are found in the form of gases, vapours and particulates (2). It includes pharmacologically active, antigenic, cytotoxic, mutagenic and carcinogenic substances. Nicotine and carbon monoxide (CO) are the selected constituents in smoke that pose greater risk to health. CO binds to haemoglobin in red blood cells and interferes with the body's ability to transport and utilise oxygen (3). The scenario of this study is to compare and correlate the haematological parameters- RBC count, WBC count, Haemoglobin level, Haematocrit (PCV) values between chronic smokers and non smokers.

MATERIALS AND METHODS

This study was conducted in the Department of Physiology, Coimbatore Medical College, Coimbatore. Subjects for the present study were randomly selected from the general public, residing in Coimbatore city, Tamilnadu. The total number of subjects involved in this study was 120 which include 70 male smokers and 50 male nonsmokers as controls ranging from the age of 31 to 50 years.

TABLE 1: CATEGORIZATION OF SUBJECTS BASED ON THEIR AGE:

GROUPS	AGE	SMOKERS n	NONSMOKERS n
I.	31-35	18	8
II.	36-40	22	18
III.	41-45	15	11
IV.	46-50	15	13
	TOTAL	70	50

Inclusion criteria for Non smokers:

1. Healthy male nonsmokers in the age group 31 to 50 years.

Inclusion criteria for smokers:

1. Healthy male smokers in the age group 31 to 50 years.
2. No. of years of smoking : > 10 years
3. No. of cigarettes per day : > 10
4. Smoking index : > 100

Exclusion criteria for smokers and nonsmokers:

1. H/O Recent respiratory infection
2. H/O Allergy & Bronchial asthma

3. H/O Pulmonary Tuberculosis, Diabetes mellitus or Hypertension
4. H/O Occupational lung diseases & other chronic illnesses
5. H/O Heart diseases & Anaemia

The study was done after explaining the procedures in detail and getting written informed consent from the subjects. The Study was approved by the Institutional Ethical Committee. Fresh blood samples were collected for the estimation of RBC count, Total WBC count, Haemoglobin level and Haematocrit. Measurement of Blood Parameters was done by Automatic cell analyzer-(Medonic CA 620-cell guard). The instrument employs the electronic principle of cell counting and sizing. Colorimetric method is employed for measuring haemoglobin level (4).

Statistical analysis was done using software namely SPSS- stat- 11.5 version. Microsoft word and Excel were used to generate graphs, tables etc. Mean and standard deviations were calculated and data were presented as mean and standard deviations. Student't' test and F test were used to compare the mean values. P value less than 0.05 was considered as statistically significant.

RESULTS TABLE 2: COMPARISON OF RBC AND WBC COUNT BETWEEN SMOKERS AND NONSMOKERS

Groups	RBC COUNT (millions/c u. mm) Smokers		RBC COUNT (millions/cu. mm) Nonsmokers		WBC COUNT (thousands/cu.m m) Smokers		WBC COUNT (thousands/c u.mm) Nonsmokers	
	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
I	6.32*	0.39	4.51	0.51	12763.33*	860.63	9216.2	1123.4
II	6.04*	0.65	4.52	0.47	12842.73*	841.65	9112.7	1429.6
III	6.35*	0.51	4.55	0.57	13079.33*	743.65	8902.7	1408.3
IV	6.35*	0.37	4.47	0.57	13078.67*	716.22	9036.9	1235.3

* P value < 0.05 is Significant.

The RBC counts and WBC counts were significantly increased in smokers when compared to non smokers in all age groups.

TABLE 3: COMPARISON OF HAEMOGLOBIN LEVEL AND PCV BETWEEN SMOKERS AND NONSMOKERS

Groups	HB (gm %) Smokers		HB (gm %) Nonsmokers		PCV (%) Smokers		PCV (%) Nonsmokers	
	Mean	S.D	Mean	S.D	Mean	S.D	Mean	S.D
I.	17.22*	0.22	13.75	0.65	50.88*	1.81	42.53	1.92
II.	17.05*	0.39	14.02	0.67	49.90*	2.84	42.88	1.32
III.	17.16*	0.63	14.22	0.78	51.40*	2.72	43.45	1.50
IV.	17.22*	0.36	13.96	0.87	50.26*	2.31	42.61	1.60

*** P value < 0.05 is Significant.**

The Haemoglobin and Packed cell volume values were significantly higher in smokers when compared to non smokers in all age groups.

DISCUSSION

A strong dose-response relationship exists between smoking and blood parameters (5). In this study, RBC count, Haemoglobin and PCV values were significantly increased (P value < 0.05) in smokers when compared to non smokers. This correlates with the study done by **Omolade et al** which showed that PCV values were significantly higher in smokers than non-smokers (6). Increased RBC count, Hb level and PCV in smokers are probably due to hypoxia resulting in increased erythropoietin secretion, stimulating bone marrow to produce more red blood cells. Elevated Hb level and PCV may also be due to increased blood carboxy haemoglobin level in smokers. Smokers usually show high number of red blood cells than non-smokers. This condition is called as secondary polycythemia or smoker's polycythemia.

In this study, WBC counts were also significantly higher (P value < 0.05) in smokers when compared to non smokers. This may be due to smoking induced inflammation and accumulation of neutrophils and lymphocytes in the alveoli. This correlates with the studies done by **Vanfurth et al** and **Corre et al** which showed an elevated WBC count in smokers with respect to non smokers (7, 8). The study by **Vanfurth et al** showed decreased RBC count in smokers with respect to non smokers. **Corre et al** examined 4264 men and reported that smokers showed an increase in number of leucocytes especially granulocytes and monocytes. **Omolade et al** studied the effects of exercise on haematological parameters in young Nigerian smokers. They showed that haematocrit and white cell count were significantly higher in smokers than non-smokers (P<0.01) and in the post exercise period of 30 min, the values were still higher in smokers than non-smokers. The study done by **K. Sasikala et al** at Coimbatore on haematological parameters in active and passive smokers revealed that the RBC count and Haemoglobin content were decreased and WBC count was elevated in smokers than non-smokers(9).

B.J. Bain et al studied the haematological parameters in smokers after 2 weeks of cessation of smoking (10). There was a rapid return towards normal in the elevated haemoglobin concentration, WBC count, PCV and RBC count in smokers. The study by **Haufroid V et al** suggested that benzene metabolites could stimulate the neutrophil lineage and this explains the smoker's leucocytosis (11). A study in **The New England Journal of Medicine** shows that smokers had elevated haematocrit due to elevation in blood carboxy haemoglobin level and left shifted Oxy-haemoglobin dissociation curve (12). They concluded that carbon monoxide exposure from cigarette smoke is the frequent cause of elevated red cell count or smoker's polycythemia. **Anandha lakshmi.S et al** studies also confirmed the increase in Hb, haematocrit, and total leucocyte count in smokers. These changes may lead to future fatal cardiac diseases among smokers. (13).

CONCLUSION

The Haematological parameters - RBC count, WBC count, Haemoglobin, Packed cell volume values were significantly increased in smokers when compared to non smokers in all age groups. Smoking is a slow poison and needs to be banned for several reasons. Cessation of smoking significantly reduces the risk of cancer in smokers (14). It improves their lifespan and also protects them from complications in future.

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