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RESEARCH ARTICLE

Effect of Chronic Smoking on Hematological Parameters

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ABSTRACT

Cigarette smoking is associated with development and progression of numerous chronic diseases worldwide. In India smoking is a common habit in both rural and urban areas. Cigarette smoking is associated with alterations in inflammatory markers among smokers and it causes various effects on body including blood. It is well recognized that smoking is one of the most important factors contributing to the evolution of atherosclerosis and chronic obstructive pulmonary disease. The aim of this study was the smoking habits and its effect on blood parameters like Total Leukocyte Count, Differential Leukocyte Count, Total Red Blood Cell Count, Hemoglobin concentration and Packed Cell Volume. In this study 50 adult healthy male smokers and 50 adult healthy male non-smokers aged 30 to 60 year were taken from locality of Burla town, Sambalpur, Odisha. The smoker and nonsmoker groups were identified by self implemented questionnaire which was filled by the subjects . TLC, TRBC, Hb, PCV, Eosinophils, Lymphocytes were increased and Neutrophils and Monocytes were decreased in light smoker and heavy smoker in comparison to nonsmoker.

INTRODUCTION

Smoking is considered to cause cancer, stroke and heart disease, COPD and has got relationship with gastric ulcer, periodontal disease, sudden infant death syndrome and metabolic syndrome[1-5]. Cigarette smoking is one of the greatest avoidable cause of premature death[6]. The recent mechanisms by which cigarette smoking increases the risk of cardiovascular disease includes haemostatic disturbances, lipid abnormalities and vascular endothelial dysfunction[7-9]. Inflammation is another possible mechanism for the increased risk of cardiovascular disease in smokers. Leucocytes are an essential element of inflammatory process[10] and independent predictor of coronary heart disease and stroke in smokers[11-14]. The ingredients of cigarette promotes increase in leucocytes count. The major one is nicotine. Role of nicotine is to stimulate hormone secretion that leads to increase in leukocyte count[15]. Irritant effect of smoke on respiratory tree leads to inflammation and synthesis cytokines which influence the leukocyte count[16]. Smokers, in comparison with non-smokers, show increases in many other hematological variables, including hemoglobin concentration (Hb), packed cell volume (PCV), red cell count (RBC), mean corpuscular volume (MCV) [17-20]. Increase in packed cell volume in healthy smokers is caused by increase in erythrocyte mass[21-23].

As per WHO report, it was presumed that tobacco smoking killed 100 million people worldwide in 20th century and warned that it could kill one billion people around the world in the 21st century[24]. In India, smoking is a common habit in both the urban and rural areas in the form of cigarettes, beedies, pipes, cigar, hookah, etc [25]. The expert committee observed that tobacco related diseases are rising in developing countries[26]. Because cigarette smoking has become an important public health problem[27], one of the most cost effective intervention available to decrease the incidence of smoking related diseases is to stop smoking. The aim of this study is to create awareness in tobacco smokers about the effect of tobacco smoke on their health and counseling them to stop smoking.

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MATERIALALS AND METHODS

Materials

For this study self employed questionnaires were distributed among 200 adult male of age group 30 to 60 years. The questions in the questionnaire includes physical parameters, smoking habits and health status. Out of 200 questionnaires 140 were returned and analyzing those, 100 subjects were selected. The subjects were divided into two groups

1. Smoker- 50 subjects
2. Nonsmoker- 50 subjects

The persons having history of smoking more than 20 years were included in Smoker group. The smokers again divided into two sub groups

1. Light smoker – consuming < 20 cigarettes per day
2. Heavy smoker-consuming > 20 cigarettes per day

The persons having any disease and less than 20 years history of smoking were excluded from study.

Methods

The study was carried out in hematology laboratory, department of Physiology VSS medical college Burla. An informed consent was taken from each subject.5ml blood was drawn from the medial cubital vein of each subject between 9am – 10am and stored in a container containing EDTA (ethylene diamine tetra acetate, an anticoagulant) to prevent it from clotting.

The following methods were used for this study

1. Glass slide method for differential leukocyte count
2. Hemocytometry for TLC and TRBC using Improved Neubauer Chamber
3. Sahli′s acid hematin method for estimation of hemoglobin
4. Wintrobe′s method for estimation of PCV

RESULTS

Statistical analysis was done by students' unpaired t- test with the help of statistical software SPSS version 16. The P value < 0.05 was considered to be significant. Microsoft excel and word were used to generate tables and graphs. There was no mean age difference between smoker and nonsmoker groups. Table 1 showed the result of DLC in Nonsmoker, Light smoker and Heavy smoker.

Table 1. (Mean ± SD)

GROUP	Neutrophil	Eosinophil	Lymphocyte	Monocyte	Basophil
Non Smoker	65.68 ± 3.03	2.82 ± 0.71	26.8 ± 2.77	3.14 ± 1.14	0
Light Smoker	59.66 ± 6.23	3.33 ± 0.95	36.16 ± 5.97	1.5 ± 0.5	0
Heavy Smoker	51 ± 6.99	4 ± 1.77	43.75 ± 8.28	1.25 ± 1.33	0

Comparison of different leucocytes between nonsmoker and smoker group

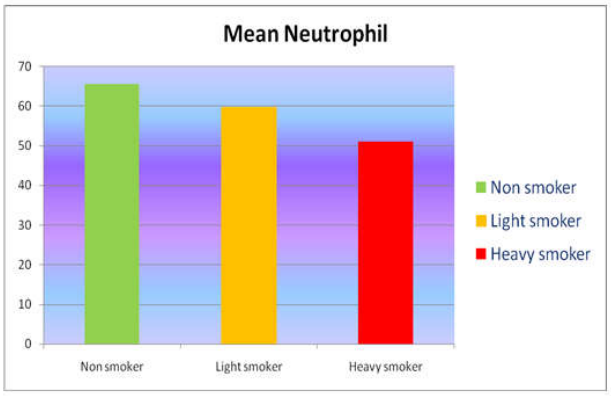

Fig. 1

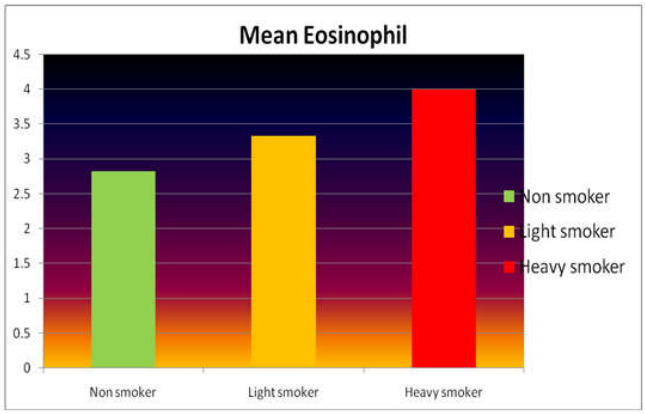

Fig. 2

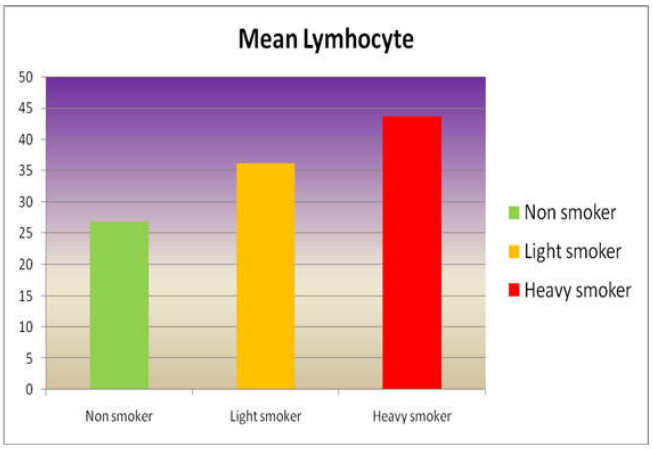

Fig. 3

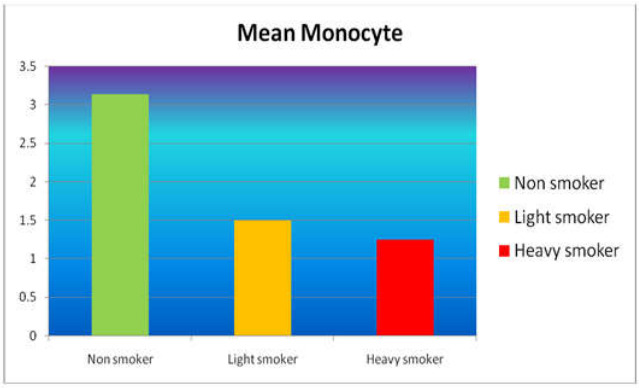

Fig. 4

In this study the result of light smoker and heavy smoker compared separately with heavy smoker. (Fig 1)There was significant decrease in Neutrophil count both in light smoker ($p<0.001$) and heavy smoker ($p<0.001$) in comparison to nonsmoker. (Fig 2)There was significant increase in Eosinophil count in both light smoker ($p<0.05$) and heavy smoker (<0.001) in comparison to nonsmoker. (Fig 3) There was significant increase in Lymphocyte count in both light smoker ($p<0.001$) and heavy smoke ($p<0.001$) group in comparison to nonsmoker. (Fig 4)There was significant decrease in Monocyte count in both light smoker ($p<0.001$) and heavy smoker ($p<0.001$) in comparison to nonsmoker. The Basophil count in this study was zero, so its significance did not find out.

Table 2. Showed the result of TLC, TRBC, PCV and Hb of Nonsmoker, Light smoker and Heavy smoker (Mean ± SD)

Group	TLC	TRBC	PCV	Hb
Non Smoker	6054 ± 609	4.72 ± 0.33	41.2 ± 0.75	12.9 ± 0.7
Light Smoker	8116 ± 1182	5.07 ± 0.72	46.5 ± 4.01	15.2 ± 1
Heavy Smoker	8462 ± 843	5.65 ± 0.17	47 ± 2.61	16.3 ± 0.63

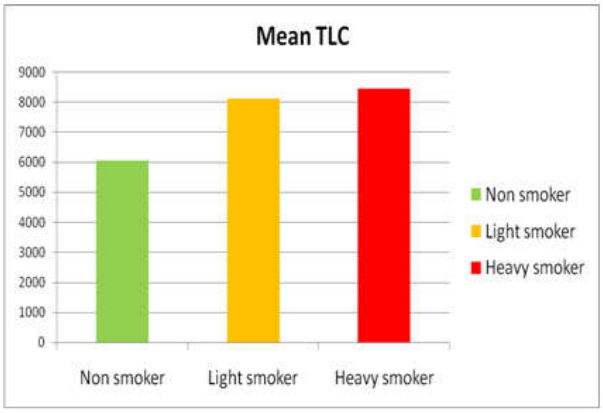

Fig. 5. TLC= Thousand/ cmm of blood,

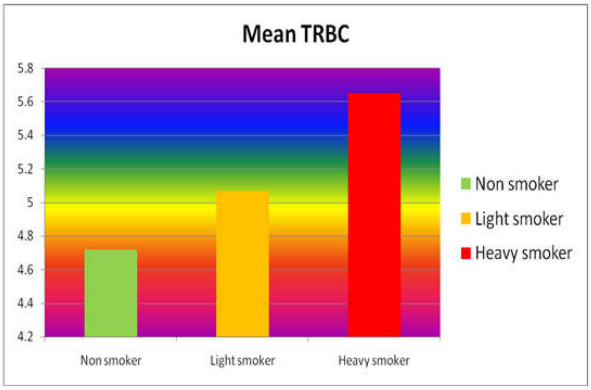

Fig. 6. TRBC= Million/cmm of blood,

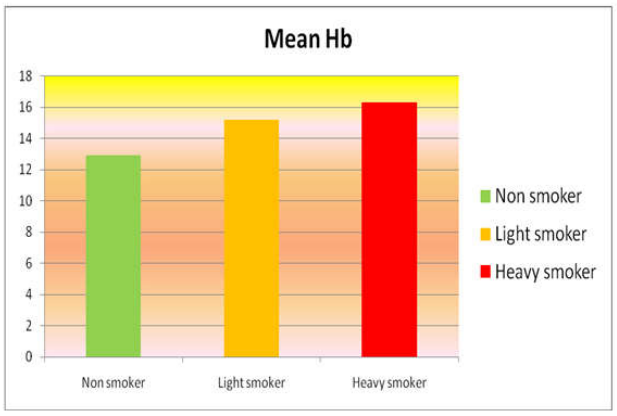

Fig. 7

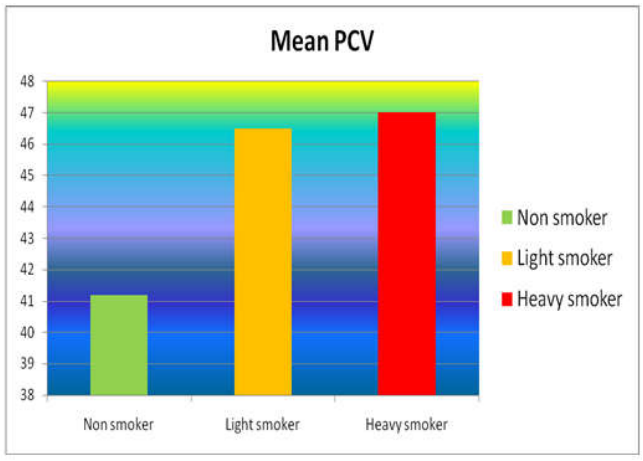

Fig. 8. PCV= %, Hb= gm%

(Fig 5) There was significant increase in TLC in light smoker ($p<0.001$) and heavy smoker ($p<0.001$) in comparison to nonsmoker.(Fig 6) There was significant increase in TRBC in light smoker ($p<0.05$) and heavy smoker ($p<0.001$)in comparison to nonsmoker.(Fig 7)There was significant increase in Hb concentration in both light smoker ($p<0.001$) and heavy smoker($p<0.001$) in comparison to nonsmoker. (Fig 8)There was significant increase in PCV in light smoker ($p<0.001$) and heavy smoker($p<0.001$) in comparison to nonsmoker.

DISCUSSION

Significant decrease in Neutrophil count and increase in Lymphocyte count in smoker groups is correlated with previous study by Taylor and Gross et al[28]. The increase in lymphocyte count may be due to residual chronic inflammation of respiratory tract. As DLC is a relative count the decrease in Neutrophil count may be due to increase in lymphocyte count. The significant increase in Eosinophil count in smoker groups is correlated with a study published in British Journal of Hematology[29]. The possible cause of increase in Eosinophil count may be due to smoking allergy in respiratory tract. The significant increase in Monocyte count in smoker groups does not correlate with previous study and this may be due to relative count of DLC. The significant increase in TLC in smoker groups is correlated with previous study of Friedman GD, Stegelaub AB, Seltzer CC et al[30]. The possible cause may be , nicotine induced release of catecholamine's and steroid hormones and chronic inflammation of respiratory tract. The significant increase in TRBC, PCV, Hb in smoker groups is correlated with previous study by Stonesifer LD[31] and Jackson DV et al[32]. The possible cause may be (i) CO released from smoke combines with hemoglobin to form carboxyhemoglobin that causes tissue hypoxia which leads to increase in erythropoietin secretion and increase erythropoesis. (ii) CO increases capillary permeability that decreases plasma volume which mimics relative polycythemia. Summarizing our study, it was found that TLC, TRBC, Hb, PCV were increased in light smoker and heavy smoker in comparison to nonsmoker which correlate with previous study, where as DLC did not correlate exactly with previous study. So TLC may be used as a biomarker of inflammation and TRBC, PCV and Hb may be used as a biomarker of thrombosis in smokers.

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