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EFFECT OF CIGARETTE SMOKING ON HEMATOLOGICAL PARAMETERS: COMPARISON BETWEEN MALE SMOKERS AND NON-SMOKERS

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ABSTRACT
Study was conducted in Gettanjali Medical College and hospital, Udipur, Rajasthan from May 2014 to October 2014.One hundred and forty male subjects participated in this study: smokers (n=70) and nonsmokers (n=70). The smokers were regularly consuming 11-15 cigarettes per day for at least 3.5 years. Complete blood cell count were measured by sysmax fully automatic Hematological analyzer. The smokers had significantly higher levels of white blood cell (p-0.0001), red blood cell (p-0.0001), hemoglobin (p-0.0001) and hematocrit (PCV) (p-0.0001), we did not find any significant changes in platelets (PLT), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) between smokers and non-smokers. We found significantly low value of MCHC ($p<0.009$) among smokers P-value less than 0.05 was consider as a significant. The results of our findings showed that continuous cigarette smoking has severe adverse affects on hematological parameters (*e.g.*, hemoglobin, hematocrit, WBC count, RBC count, and platelet count) and these alterations might be associated with a greater risk for developing atherosclerosis, polycythemia vera, chronic obstructive pulmonary disease and/ or cardiovascular diseases.

KEY WORDS: Cigarette smoking, hematological parameters, blood cells count

INTRODUCTION

Tobaco ciggarate smoking is one of the major leading cause of death throughout the world[1]. Smoking has both acute and chronic effect on hematological parameter of blood. 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[2-6]. Cigarette smoking is one of the greatest avoidable cause of premature death[7]. The recent mechanism by which cigarette smoking increases the risk of cardiovascular disease includes haemostatic disturbances, lipid abnormalities and vascular endothelial dysfunction[8-10]. Inflammation is another possible mechanism for the increased risk of cardiovascular disease in smokers. Leucocytes are an essential element of inflammatory process[11] and independent predictor of coronary heart disease and stroke in smokers[12-15]. The ingredients of cigarette promote increase in leucocytes count. There are more than 4000 chemicals are found in ciggarate smoke. The major one is nicotine. Role of nicotine is to stimulate hormone secretion that leads to increase in leukocyte count[16]. Irritant effect of smoke on respiratory tree leads to inflammation and synthesis cytokines which influence the leukocyte count[17]. During past decade, it was suggested that cigarette smoking affect the blood characteristics as well that leads to death. For example, relation between smoking and white blood cell count has been well established [18-20]. In a number of studies, it has been found that smokers have higher white blood cell counts than nonsmokers[19,20-22]. Although in some earlier studies relationship between smoking and red blood cell was found in smokers. 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. In India, smoking is a common habit in both the urban and rural areas in the form of cigarettes, beedies, pipes, cigar, hookah, *etc*. The expert committee observed that tobacco related diseases are rising in developing countries. Because cigarette smoking has become an important public health problem, one of the most cost effective interventions 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.

MATERIALS & METHODS

The study was carried out in central laboratory of Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India An informed consent was taken from each subject 5ml blood was drawn from the medial cubital vein of each subject 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.

Inclusion Criteria: The persons having history of smoking more than 20 years were included in Smoker group.

Participants having no current or past history are considering as a control.

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

RESULTS

Statistical analysis was done by students' unpaired t- test with the help of online student t test calculator. The P value < 0.05 was considered to be significant.

TABLE 1. (Mean ± SD) Comparison of different leucocytes between nonsmoker and smoker group

parameter	Non smokers(n=70)	smokers(n=70)
Neutrophil	66.67±2.9	58.56 ± 5.3
Eosinophil	2.79 ±0.8	3.29 ± 1.0
Lymphocyte	25.3± 2.5	38.9 ± 6.1
Monocyte	3.12 ± 1.0	1.16 ± 1.2
Basophil	0	0

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

parameter	Non smokers(n=70)	smokers(n=70)
TLC	5812 ± 512	8342± 723
T.RBC	4.72± 0.33	5.33± 0.29
PCV	39.2 ± 0.95	45.3 ± 1.3
HB	13.2± 0.9	16.2 ± 0.83
Platlet count(10^3/µl)	270.28 ±60.25	252.25 ±71.53
MCV(fl)	88.61 ±8.62	90.26 ±14.23
MCH (pg)	28.84 ±2.97	28.19 ±4.10
MCHC (g/dl)	32.56±2.18	31.50 ±2.55

TABLE 3: comaparision of various hematological parameter in smokers and non smokers

Parameter	Pair compared	Group	Subjects(N)	Average	P-value
Neutrophil	Nonsmoker Vs Smoker	Nonsmoker	70	66.67	0.0001
		Smoker	70	58.87	
Eosinophil	Nonsmoker Vs Smoker	Nonsmoker	70	2.79	0.0014
		Smoker	70	3.29	
Lymphocyte	Nonsmoker Vs Smoker	Nonsmoker	70	25.3	0.0001
		Smoker	70	38.9	
Monocyte	Nonsmoker Vs Smoker	Nonsmoker	70	3.12	0.0001
		Smoker	70	1.16	
Basophil	Nonsmoker Vs Smoker	Nonsmoker	70	0.0	NA
		Smoker	70	0.0	
TLC	Nonsmoker Vs Smoker	Nonsmoker	70	5812	0.0001
		Smoker	70	8342	
T.RBC	Nonsmoker Vs Smoker	Nonsmoker	70	4.72	0.0001
		Smoker	70	5.33	
PCV	Nonsmoker Vs Smoker	Nonsmoker	70	39.2	0.0001
		Smoker	70	45.3	
HB	Nonsmoker Vs Smoker	Nonsmoker	70	13.2	0.0001
		Smoker	70	16.2	
Platlet count(10^3/µl)	Nonsmoker Vs Smoker	Nonsmoker	70	270.28	0.107
		Smoker	70	252.25	
MCV(fl)	Nonsmoker Vs Smoker	Nonsmoker	70	88.61	0.404
		Smoker	70	90.26	
MCH (pg)	Nonsmoker Vs Smoker	Nonsmoker	70	28.84	0.283
		Smoker	70	28.19	
MCHC (g/dl)	Nonsmoker Vs Smoker	Nonsmoker	70	32.56	0.009

There was no mean age difference between smoker and nonsmoker groups. Table 1, 2, 3 showed the result of various hematological parameter and comparison with non smoker in Nonsmoker and smoker. In this study the result of smoker is compared with nonsmokers.(Table 3)There was significant decrease in Neutrophil count in smoker ($p<0.001$) and comparison to nonsmoker. There was significant increase in Eosinophil count in smoker ($p<0.05$) comparison to nonsmoker. There was significant increase in Lymphocyte count in smoker ($p<0.001$) comparison to nonsmoker. There was significant decrease in Monocyte count in smoker ($p<0.001$) and in comparison to nonsmoker. The Basophil count in this study was zero, so its significance did not find out. There was significant increase in TLC in smoker ($p<0.001$) comparison to nonsmoker. There was significant increase in TRBC in

smoker ($p<0.05$) and comparison to nonsmoker. There was significant increase in Hb concentration in smoker ($p<0.001$) comparison to nonsmoker. There was significant increase in PCV in smoker ($p<0.001$) 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*[23]. 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[24]. 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 *et al*.[25]. 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[26] and Jackson DV et al[26]. 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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