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Full Length Research Paper

Hematological Changes Induced by Heavy Cigarette Smoking

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Cigarette smoking considered to be as a major cause of deaths from lung cancer and cardiovascular disease. Variable hematological changes occur in smokers. The aim of this study to estimate the effects of cigarette smoking on hematological values. The study included sixty subjects 40 smokers and 20 non-smokers. Smokers categories base on number of cigarettes per day for at least 3 years. Complete blood cell count was analyzed by automatic blood cell counter Sysmex 21, to assess hemoglobin (Hb). packed cell volume (PCV), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), white blood cell (WBC), red blood cell (RBC) and platelets (Plt) counts. The present study revealed significantly increased in Hemoglobin level (P = 0.001), PCV (P = 0.003), MCH (P value = 0.005) MCHC (P = 0.001). RBC count (P = 0.004), WBC count (P = 0.002) respectively. Our results did not show differences related to the number of cigarettes smoked per a day. In conclusion, heavy cigarette smoking lead to gross changes in hematological values leading to risk for developing , secondary polycythemia, pulmonary and/or cardiovascular diseases.

Keywords: Cigarette smoking, Hematological values, Polycythemia

INTRODUCTION

Cigarette smoking leads to lung cancers, emphysema and chronic bronchitis. causing chemicals in addition to nicotine (Temperance and Robert, 2015). The inhaled smoke contains many harmful substances such as, Co_2, hydrogen cyanide heavy metals and free radicals (Pooja and Luca, 2015). Free radicals in tobacco smoke bind with cholesterol to damage the blood vessels and heart muscle. Smoking is a major cause of heart diseases which include Coronary artery disease, heart attack and stroke (Jane and Joseph, 2009). The damage caused by cigarette smoking is influenced by: The number of cigarettes smoked, how the tobacco has been prepared and cigar filter (Johnson et al., 2009). Smokers show increase in many hematological variables, including hemoglobin concentration and blood cell indices (Majid et al., 2016). There are many mechanisms by which cigarette smoking may rise Hb, Cigarette smoke contains carbon monoxide, this binds to hemoglobin which is an irreversible reaction (Ivan et al., 2009). The effect of carbon monoxide reduces the oxygen carrying capacity of red blood cells and erythropoietin-mediated increase in erythropoiesis therefore occurs. Chronic heavy smokers

may also have hypoxia a further drive to erythropoiesis (Qiangwei et al., 2016). The number of RBCs could not remain unaffected by smoking overtime, however, changes in the amount of smoking can alter its count. Increase smoking definitely alters and decreased the oxygen – carrying capacity of the RBCs (Haufroid et al., 1997). Passive smoking associated with an increased risk for cardiovascular events. Passive smoking leads to platelets activation and impairment of endothelial function (Mohammed et al., 2011). The cause of the increased leukocytes count in smokers in not known The leukocytosis may simply be a marker of smoking induced tissue damage, the high count can promote cardiovascular disease through multiple pathologic mechanisms that mediate inflammation, plug the microvasculature and induce hypercoagulability (Noble and Penny, 1975; Anandha et al., 2014).

METHODS

This is a cross sectional study conducted in KH. State in period 15 January to 25 March. This study was designed to determine heavy smoking related hematological changes. 2.5 ml venous K^2EDTA blood were collected from each subject Hb , PCV, MCV, MCH, MCHC, WBC count, RBC count and platelet count levels were determined by Sysmex 21 blood cells counter

Ethical consideration

Written informed consent was taken from the participants enrolled.

Data analysis

All results were analyzed by using SSPS (Version 20), < 0.05 considered as significant level and results were displayed as tables.

RESULTS

Table 1. The frequencies of smokers, non smokers and categories on bases of number of cigarettes smoked per day

Subject	Frequency	Percent%
Smokers	40	66.7
Non- smokers	20	33.3
Total	60	100.0
No. of cigarettes/day	**Frequency**	**Percent%**
1 - 5 cigarette	16	40.0
6 - 10 cigarette	15	37.5
11 - 15 cigarette	7	17.5
16 - 20 cigarette	2	5.0
Total	40	100.0

Table 2. Show a significance increased in Hb, PCV MCV, MCHC and blood cell counts in smokers compared to non smokers.

Hematological values	Smokers	Non - smokers	P-value
HB g/dl	16.1 ± 1.1	13.6 ± 1.0	0.001
PCV %	45.9 ± 2.7	41.2 ± 2.1	0.003
RBC x 10^{21}/L	5.3 ± 0.3	4.7 ± 0.4	0.004
MCV/fl	87.6 ± 3.6	86.5 ± 4.5	0.297
MCH /Pg	30.6 ± 1.7	29.0 ± 2.5	0.005
MCHC g/dl	35.0 ± 1.0	33.0 ± 1.0	0.05
TWBCx10^9/L	6.2 ± 1.6	4.9 ± 0.85	0.002
Pltsx10^9/	228.6 ± 42.3	239.4 ± 55.1	0.403

Table 3. Hb levels, RBC, WBC and platelet counts show no significance differences related to number of cigarettes smoked per day.

No. of cigarettes/day	Frequ-ency	Hb g/dl (mean)	Std division	P-value
1- 5 cigarettes	16	15.7	1.5	0.962
6 – 10 cigarettes	15	15.7	1.4	
11–15 cigarettes	7	17.2	1.2	
16–20 cigarettes	2	17.1	1.1	
No. of cigarettes/day		**RBC x 10^{21}/L (mean)**	**Std division**	**P-value**
1- 5 cigarettes	16	5.2	0.24	0.680
6–10 cigarettes	15	5.1	0.34	
11–15 cigarettes	7	5.4	0.24	
16–20 cigarettes	2	5.5	0.50	
No. of cigarettes/day		**TWBCx10^9/L (mean)**	**Std division**	**P-value**
1- 5 cigarettes	16	6.1	1.87	0.919
6–10 cigarettes	15	6.0	1.62	
11–15 cigarettes	7	6.9	1.31	
16–20 cigarettes	2	6.5	2.47	

DISCUSSION

In present study cigarette smoking revealed adverse effects on blood cell counts , including (Hb, PCV, MCH and MCHC, red cell count, white blood cells count). Our study revealed significant increased in Hb, PCV, MCH and MCHC values of smokers in relation to non smokers, in contrast MCV and platelet count did not show significant differences, the findings consistent with previous studies Simila increased in PCV and MCH and MCHC were obtained by Kondo et al (Shah et al., 2012; Jena et al., 2013).

The higher values of PCV as revealed by our study are documented by previous studies also in Saudi Arabia and India respectively also found the similar rise in hematocrit in the smokers. The similar study in Nigeria stated increased values Hb and PCV (Hassan and

Fathelrahman, 2012; Jayballabh et al., 2013; Erhabor et al., 2013). Elevated Hb concentration in smokers due to state of hypoxia, which occurs when high concentrations of carboxy hemoglobin is formed leading to decrease oxygen tension increasing released of EPO that enhance compensatory mechanism of erythropoiesis to maintain increased hemoglobin levels, RBC count and indices, and polycythemia may develop (Aitchison and Russell, 1988; Kondo et al., 1993).

The study showed significant increased in white blood cell count and insignificant differences in platelet count in comparison between smokers and non smokers, which in consistent with Butkiewcz et al. (Butkiewicz et al., 2006). Increased white blood cell count might be resulted from smoking induced tissue damage and considered as a muatifactorial marker of cardiovascular disease. The smoking increase the platelet activation and aggregation, which play an active role in the development of the atherosclerosis and arterial thrombosis. Despite that Al-Dahr et al. (Al-Dahr, 2010) found that there was no significant difference between the platelet count and mean platelet volume in smokers compared to nonsmokers. Regarding to categories on bases, number of smoked cigarette per day, the results showed that increases in hemoglobin levels, RBC counts and WBC count associated with increased number of cigarette per day. We concluded that full blood count is highly recommended for heavy smokers to monitor adverse effects of cigarette smoking considerers as risk leading to secondary polycythemia, pulmonary or cardiovascular disease.

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