IMPACT OF SMOKING ON HEMATOLOGICAL PARAMETERS IN HYPERTENSION SMOKERS

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ABSTRACT-- Objective: *Tobacco smoking considered as the main causes of death in the world which leading to both acute and may chronic impacts on hematological parameters. In addition, hypertension is one of the health problems of the world. It may lead to cause cardiovascular disease furthermore cause functional disturbances to hematological parameters. Subsequently, it may enhance an organ damage. The aim of our study was to estimate the extent of adverse impacts of tobacco smoking on biochemical characteristics in hypertension comparing with healthy smokers.*

Methods: Our study was conducted from October 2019 to January 2020 on a total of 110 smokers who have hypertension and 100 who are healthy smokers individuals at Baqubah Teaching Hospital. The smokers were regularly consuming 30-45 cigarettes per day for at least for 4years. The ethical guidelines constructed by the Scientific Committee of the Institute have been taken where the acceptance have also taken from volunteers. Blood samples have been collected via EDTA tubes 3ml of blood and tested by fully automatic hematological analyzer (DIAGON Ltd- D-Cell 60).

Conclusion: Excessive smoking with hypertension existing causing abnormal and significantly increases of hematological parameters which is lead to early atherosclerosis, cardiovascular diseases, polycythemiavera and chronic obstructive pulmonary disease.

Keywords--*hematological parameters, smoking, hypertension.*

I. INTRODUCTION

In the era of civilized development, people have become very concerned about their health conditions and their avoidance of diseases are among their first priorities. Due to tobacco smoking, every year approximately four millions of people are dying [1]. According to the (WHO), if the current trends of tobacco smoking will continue, it could be 8 millions of people will die at 2030 [2]. Numerous studies indicated that tobacco smoking is the main causal for the modulation of the lipid profile moreover, tobacco smoking is an important factor for causing coronary artery disease, atherosclerosis, peripheral vascular disorders [3], also developing some of pathologic diseases like pathological conditions

and diseases, such as the chronic obstructive pulmonary disease [4], cancer [5], periodontal disease [6], gastrointestinal disorders [7], pancreatitis [8]. Therefore, smoking tobacco has a direct impact on all parts of the body, albeit slight. Many research reports recorded an increasing in the number of deaths amounting to

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approximately 6.4 million, of whom 2.4 million were consuming different types of tobacco in 2015[9]. It is noticeable that the number of residents is constantly increasing, interestingly is that there is an abnormal increase in the number of smokers for tobacco mostly they are young community, this situation is more complicated prompts us to solve this problem and raise awareness of the dangers of smoking[3]. One of damages caused by tobacco smoking is hematological parameters which is need to know more knowldgement to identifying the community for impacts of tobacco damages. A study participated with forty tobacco smokers and forty non-smokers their age was between 25-40 years for checking the impact of smoking on hematological parameters which found that leukocyte count increased with increase in neutrophils. Cross sectional study of seventy subjects healthy male volunteers who were half of them healthy smokers and others were healthy non-smokers, this study resulting that the volunteers which their age between 18-25 years have significantly higher leukocytes with increase in lymphocytes among the smokers, compared to non-smokers [10]. Studies concentrated on the relationship between smoking and WBC count, also between smoking and lung function in healthy men and women for several ages were investigated they found that White Blood Cells were significantly higher in both genders of smokers than non-smokers [11]. while other study of checking the relationship between WBC and hypertension which found that the WBCs count may independently predict hypertension [12]. In Bangladesh, tobacco smoking caused a large proportion of premature deaths, particularly among men.

Our study was undertaken with the people of Diyala city / iraq to estimate the harmful impacts of tobacco on hematological parameters in hypertension smokers comparing with healthy smokers.

II. Material and methods

Our present study was carried out to scrutinize the relationship impacts of tobacco smoking on hematological parameters in a group of clinically healthy smokers and hypertension smokers' subjects. A total of 210 subjects were enrolled in this study, 110 were hypertension smokers and 100 were healthy smokers in the age range 18-55 years. All volunteers were males. The volunteers have been recruited from Baquba Teaching Hospital in Diyala Governorate. The smokers were regularly consuming 30-45 cigarettes per day for at least 4 years. Consent was taken from each subject furthermore; study was approved by the Ethical Review Committee in university of Diyala/ College of Medicine. A questionnaire was completed for each participant, including age, number of cigarettes smoked per day, duration of smoking, and chronic diseases.

Patients with temporary side effects such as influenza, chest infections, digestive system, arthritis, and others were excluded.

The samples were collected by EDTA tubes, where 3ml of venous blood was drawn, then samples were investigated by using complete blood cell count DIAGON Ltd- D-Cell 60 fully automatic hematological analyzer.

Statistical analysis was calculated by using SPSS version 21.0 (SPSS Inc.). Groups were compared using Student's unpaired t test for parameters with normal distribution or Mann–Whitney test for parameters with non-normal distribution. Correlations between parameters were analyzed using the Pearson R test for variables with normal distribution and the Spearman test for variables with non-normal distribution. Data are expressed as mean ± standard deviation or medians (interquartile range). P < 0,05 has been considered significant.

III.   Results

Our current study involved 210 volunteers who were grouped into (a hundred healthy smokers and hundred ten of hypertension smokers). Table 1 shows according to demographic and anthropometric. Table 1 shows the characteristics of 210 subjects. The Mean ± SD age of subjects were 68.60±22.68 years for healthy smokers (P-value 0.001), while Mean ± SD age of subjects who have hypertension smokers were 87.85±25.97 (P-value 0.001). The same applies to BMI, Mean ± SD BMI of subjects who are healthy smokers was 53.8±9.56 and for the hypertension smokers was 54.9±9.49.

Table (1) comparison between anthropometric characters between study groups

| | | | Groups | | Total |
			Healthy (n=100)	Hypertension (n=110)	
Age (year)	1-20	N	8	2	10
		%	8%	1.8%	4.7%
	21-40	N	70	23	93
		%	70%	20.9%	44.3%
	41-60	N	20	52	72
		%	20%	47.3%	34.3%
	61-80	N	2	31	33
		%	2%	28.2%	15.7%
	>80	N	0	2	2
		%	0.0%	1.8%	1%
BMI (kg/m2)	<25	N	29	22	51
		%	29%	20%	24.3%
	25-29	N	40	49	89
		%	40%	44.5%	42.4%
	≥30	N	31	39	70
		%	31%	35.5%	33.3%

The results of hematological parameters showed that the smoker subjects who have hypertension faced a significant increasing of WBC, Lymphocyte, HCT, MCV, MCH (P-value 0.001). RBC, HGB, RDW, MPV (P-value <0.05) comparing with hematological parameters for healthy smokers as shown in table (2). While the rest of the hematological parameters were not statistically significant.

Table (2) hematological parameters Hypertension smokers comparing with Healthy smokers

Hematological parameters	Hypertension smokers (N=110)	Healthy smokers (N=100)	P-value
WBC (x10e9/L)	8.25 (7.0-9.5)	6.25 (5.2-7.3)	0.001*
Lymphocyte (%)	29.82 (28.49-30.29)	28.7 (27.05-29.75)	0.001*
Monocyte (%)	3.98 (1.26-5.88)	3.9 (0.1-5.7)	0.54
Granulocyte (%)	57.2 (49.8-63.78)	56.1 (50.5-65.9)	0.57
RBCs (x10e12/L)	5.4 (4.75-5.9)	4.88 (4.51-5.2)	0.02*
HGB (g/dl)	150.7 (137.8-160.0)	140.5 (127.3-155.3)	0.02*
HCT (%)	43.6±1.8	40.98±0.9	0.001*
MCV (fL)	89.73 (82.3-93.65)	85.5 (80.9-89.6)	0.001*
MCH (pg)	30.4 (28.9-31.9)	29.1 (27.95-39.1)	0.001*
MCHC (g/L)	324 (316.9-327.7)	330 (327-339.05)	0.09
RDW (%CV)	14.7 (13.68-15.01)	14.01(13.6-15.07)	0.05*
MPV (FI)	11.0±1.00	10.0±0.95	0.04*

IV. Discussion

Previous studies have shown that smoking has a negative impact on blood parameters. Therefore, we evaluated the hematological parameters for hypertension smokers and compare them with healthy smokers. The impact of smoking on hematological parameters, especially WBC, HGb, hematocrit - HCT, RBC, MVC, MCH also the other physiological parameters (age, BMI) were observed. The white blood cell is one of the vital important component which play a critical role in immunity in normal condition but the abnormal increase of WBCs number makes harmful implications of human body by causing different diseases. Our present study proved an elevated of white blood cells count in of hypertension smokers compared to healthy smokers in various ages and smoking levels. The values of hemoglobin parameters were significantly larger in hypertension smokers than in healthy smokers regardless of the age, while monocyte, granulocyte and MCHC values were showed no significant differences. Numerous studies suggested that WBC counts were significantly increase in heavy (7500 ± 324/µl, p< 0.001) or light (6829 ± 352/µl, p = 0.001) smoking groups as compared to non-smokers (5590 ± 178/µl) [13]. Other recent study involved 6902 male and 8405 female smokers sample, higher WBC counts were estimated [14].

Other study was carried out on 105 adult subjects proved that the smokers had significantly increase of WBC counts than non-smokers. At the same time, it has been observed that the increase in WBCs increases with the

increase of smoking intensity [15]. while the other studies also noted that there is a positive relationship between WBCs and male smokers [3, 10, 16].

Due to the vital role which is presented by neutrophil, eosinophil, lymphocyte and monocyte in human immune system, our study proved that there is a significant increase of WBCs and neutrophil in hypertension smokers comparing with healthy smokers (P=0.001). No significant difference was recorded in monocytes and granulocyte.

Study related with white blood cells and its types conducted by schwartz and weiss who are noted that a significant increase of neutrophil in smokers [17]. Other study found that WBCs, neutrophil and eosinophil [18]. Recently, studies noted that the lymphocyte was higher while the neutrophil was lower in smokers [19].

According to the age, we found that the values of hematological parameters are higher in hypertension smokers, especially in [21-40] compared healthy smokers. it may be because of the number of cigarette smoking per a day. The reason of increasing WBCs may because of number of smoking per day or the intensity of nicotine in the body. As it known, hypertension has a high impact on the human body health. study in china has been conducted on adult subjects found that WBCs increases by increasing hypertension[12]. As some of studies classified the hypertension as inflammatory disease whereas increase by increasing inflammatory levels including WBCs and their types [20]. Because of this it is clearly that the increases of WBCs in hypertension smokers occurring normally. Numerous studies have shown that the significant increasing of hemoglobin with increased haematocrit[21,22]. Lakshmi et. al. noted that the hematocrit levels also hemoglobin was significantly high and increase when increasing the smoking severity [23]. Other study by White head et. al. found that hemoglobin concentration increasing when the smoking been more than 15 cigarettes per a day [24]. Probably the increase of hemoglobin due to increasing of Carbon monoxide , according to several studies it is a kind of compensatory mechanisms whereas Carbon monoxide will attach to hemoglobin to consist of Carboxyhemoglobin which is inactive as it does not have the ability to carry sufficient oxygen atoms then lead to reduce the activity of hemoglobin to transfer oxygen to the tissues as a recovering oxygen lacking [25]. Therefore, the lack of oxygen in the tissues is the result of the carboxyhemoglobin manufacturing, which in turn increases erythropoietin lead to leads to increased red blood cells. Other studies show that carbon monoxide from tobacco smoke will increases the permeability of capillaries and reduced the plasma volume [26,27]. Excess increase of mean corpuscular volume , mean corpuscular hemoglobin and RDW have been explained in studies due to hypercholesterolemia, kidney dysfunction and hyperuricemia[28] Which contradicts the results of our current study

V.   Conclusion

Through our current study, we concluded that the increase and persistence of smoking in patients with hypertension will increases the level of blood concentrations and thus will increase the incidence of pressure patients with atherosclerosis, cardiovascular diseases, polycythaemiavera and chronic obstructive pulmonary disease. On the other hand, our study refuted some studies that concluded that excess increase of mean corpuscular volume , mean corpuscular hemoglobin and RDW caused by just hypercholesterolemia, kidney

dysfunction or hyperuricemia but we can add or linking the smoking with hypertension lead to increase these parameters.

References

1. Willi C, Bodenmann P, Ghali WA, Faris PD, Cornuz J. Active smoking and the risk of type 2 diabetes: a systematic review and meta-analysis. JAMA 2007; 298: 2654-64.

2. Wu F, Chen Y, Parvez F, Segers S, Argos M, Islam T et al. A prospective study of tobacco smoking and mortality in Bangladesh. PLoS One 2013;8:e58516.

3. Lakshmi SA, Lakshmanan A, Kumar GP, Saravanan A. Effect of intensity of cigarette smoking on haematological and lipid parameters. J Clin Diagn Res 2014;8: BC11-3.

4. Buist AS, Vollmer WM, McBurnie MA. Worldwide burden of COPD in high- and low-income countries. Part I. The Burden of Obstructive Lung Disease (BOLD) Initiative. Int J Tuberc Lung Dis. 2008; 12: 703-8.

5. Vineis P, Alavanja M, Buffler P, Fontham E, Franceschi S, Gao YT, et al. Tobacco and cancer: recent epidemiological evidence. Journal of the National Cancer Institute. 2004; 96(2): 99-106.

6. Gautam DK, Jindal V, Gupta SC, Tuli A, Kotwal B, Thakur R. Effect of cigarette smoking on the periodontal health status: A comparative, cross sectional study. Journal of Indian Society of Periodontology. 2011; 15(4): 383-7.

7. Barreto SG. How does cigarette smoking cause acute pancreatitis? Pancreatology : official journal of the International Association of Pancreatology. 2016; 16(2): 157-63.

8. Li LF, Chan RL, Lu L, Shen J, Zhang L, Wu WK, et al. Cigarette smoking and gastrointestinal diseases: the causal relationship and underlying molecular mechanisms (review). International journal of molecular medicine. 2014; 34(2): 372-80.

9. Watanabe N, Fukushima M, Taniguchi A, Okumura T, Nomura Y, Nishimura F et al. Smoking, white blood cell counts, and TNF system activity in Japanese male subjects with normal glucose tolerance. Tob Induc Dis 2011;9:12.

10. Iyer RA, Joshi AR, Esmaeil H. Effect of cigarette smoking on leukocytes count in human adult males. Int J Phys 2014;2:107-11.

11. Fernandez JA, Prats JM, Artero JV, Mora AC, Farinas AV, Espinal A et al. Systemic inflammation in 222.841 healthy employed smokers and non-smokers: white blood cell count and relationship to spirometry. Tob Induc Dis 2012;10:7.

12. Sun YT, Gong Y, Zhu R, Liu X, Zhu Y, Wang Y et al. Relationship between white blood cells and hypertension in Chinese adults: the Cardiometabolic Risk in Chinese (CRD) study. Clin Exp Hypertens 2015;37:594-8.

13. Watanabe N, Fukushima M, Taniguchi A, Okumura T, Nomura Y, Nishimura F et al. Smoking, white blood cell counts, and TNF system activity in Japanese male subjects with normal glucose tolerance. Tob Induc Dis 2011;9:12.

14. Smith MR, Kinmonth AL, Luben RN, Bingham S, Day NE, Wareham NJ et al. Smoking status and differential white cell count in men and women in the EPIC-Norfolk population. Atherosclerosis 2003;169:331–7.

15. Islam MM, Amin MR, Begum S, Akther D, Rahman A. Total count of white blood cells in adult male smokers. J Bang Soc Physiol 2007; 2:49-53.

16. Khaled S, Al Salhen P, Abdalslam RDP. Effects of cigarette smoking on hematological parameters in male smokers in Al-Bayda city, Libya. Al Mukhtar J Sci 2014;29:40-57.

17. Andreoli C, Bassi A, Gregg EO, Nunziata A, Puntoni R, Corsini E. Effects of cigarette smoking on circulating leukocytes and plasma cytokines in monozygotic twins. Clin Chem Lab Med 2015;53:57–64.

18. Williams KA, Labidi-Galy SI, Terry KL, Vitonis AF, Welch WR, Goodman A et al. Prognostic significance and predictors of the neutrophil-to-lymphocyte ratio in ovarian cancer. Gyn Oncol 2014;132:57-64.

19. Khand F, Shaikh SS, Ata MA, Shaikh SS. Evaluation of the effect of smoking on complete blood count, serum C-reactive protein and magnesium levels in healthy adult male smokers. J Pak Med Assoc 2015;65:59-61.

20. Rajkumari R, Laishram D, Thiyam J, Javan N. Hypertensive leukocytosis. J Indian Med Assoc 2013;111:226–9.

21. Shah BK, Nepal AK, Agrawal M, Sinha AK. The effects of cigarette smoking on hemoglobin levels compared between smokers and non-smokers. Sunsari Technical College Journal. 2012; 1(1): 42-4.

22. Jena SK, Purohit KC, Misra AK. Effect of Chrnoic Smoking on Hematological Parameteres. International Journal of Current Research 2013; 5(2): 279-82.

23. Lakshmi AS, Lakshmanan A, Kumar GP, Saravanan A. Effect of Intensity of Cigarette Smoking on Haematological and Lipid Parameters. Journal of Clinical and Diagnostic Research. 2014; 8(7): 11-3.

24. Whitehead TP, Robinson D, Allaway SL, Hale AC. The effects of cigarette smoking and alcohol consumption on blood hemoglobin, erythrocytes and leukocytes: a dose related study on male subjects. Clinical and laboratory hematology. 1995; 17(2): 131-8.

25. Aitchison R, Russell N. Smoking - a major cause of polycythaemia. Journal of the Royal Society of Medicine. 1988; 81(2): 89-91.

26. Nadia MM, Shamseldein HA, Sara AS. Effects of Cigarette and Shisha Smoking on Hematological Parameters: An analytic case-control study. International Multispeciality Journal of Health. 2015; 1(10): 44-51.

27. Verma RJ, Patel CS. Effect of smoking on Haematological parameters in Human Beings. Journal of Cell and Tissue Research 2015; 5(1): 337.

28. Pankaj J, Reena J, Mal KL, Ketan M. Effect of cigarette smoking on haematological parameters: comparison between male smokers and non-smokers. IJSN. 2014; 5(4): 740-3.