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Estimation of hematological parameters in people exposed to environmental pollution in Thi-Qar Governorate

1st Sajad Haider Khairy
Department of Biology / College of Science / University of Thi-Qar
Thi-Qar, 64001 / Iraq
sajadh@sci.utq.edu.iq

2nd Afrah Abid Maktoof
Department of Biology / College of Science / University of Thi-Qar
Thi-Qar, 64001 / Iraq
Aftab.m_bio@sci.edu.iq

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***Abstract*— The environmental pollution developed a major problem in the world especially the third world countries with the fast improvement of industry, particularly those dependent on hydrocarbon products as a fuel and its contaminated products as trace metals. This is considered as the biggest threat to the environment and human because, of its impact on human life and other organisms. This study was conducted to the measure hematological parameters (e.g., hemoglobin - Hb, hematocrit - HCT, white blood cells count - WBC, red blood cells count - RBC, mean corpuscular volume - MCV and Mean Corpuscular Hemoglobin - MCH) from the individuals exposed to pollution by heavy metal in the city of Nasiriyah, the center of Dhi Qar Governorate in Southern Iraq. The study participants consisted of 120 men and they were divided into three groups as follows 40 participants from Hawkers with age ranging 26-46 (Mean ± SD = 36.6 ± 9.28). 40 from traffic police with age ranging 26-46 (Mean ± SD = 39.2 ± 5.44) and 40 as a control group with age ranging 26-46 (Mean ± SD = 37.5 ± 6.57). The results showed increased level of Hb in the traffic police group compared with other group. The number of RBCs was similar between Hawkers and traffic police groups compared with control group. However, the rate of MCV was increased in Control group and Hawkers Group Compared with traffic police group. These parameters were statistically significant (p≤0.05). while, we did not record any changes in another parameter such as (WBCs, HCT, MCH). Key words: Environmental pollution, Heavy metals, Hematological parameters.**

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I. INTRODUCTION

Over the last four decades, there has been a growing global concern about the public health consequences of environmental pollution. Human exposure to pollution is thought to be higher currently than at any previous time in human history. Pollution is a global issue with significant potential to affect human health. Human health is related to the safety and cleanliness of the environment in which he lives, as the person becomes more vulnerable to diseases and danger by increasing pollution of the surrounding environment [1]. The environment affected huge impacts from human activity, which has a major role in the spread of various types of polluting particles in nature, including trace elements, which lead to environmental pollution and poisoning of living organisms, including humans [2]. Evidences shows an increasing correlation between environmental pollution and health effects on an exposed population. in the year 2006 the World Health Organization (WHO) estimated that between 23% and 24% of the world's morbidity/ mortality was attributable to environmental factors, and of the considered conditions the ones associated with air pollution occupied 2nd place [3]. Air pollution is considered one of the most common environmental pollution problems due to the ease with which pollutants spread and move with the air from one area to another within a short period of time [4]. Air pollution is the contamination of the indoor or outdoor air by a range of gasses and solids that modify its natural characteristics [5]. Outdoor air pollution is a growing problem, recent estimates indicated that urban outdoor air pollution has risen by 8 per cent globally between 2008 and 2013. Urbanization, which is often associated with rising air pollution, is increasing too – by 2050, up to two thirds of the global population is expected to live in urban areas [6]. The environmental pollution became a major problem in the world associated with the rapid development of industry, particularly those dependent on the hydrocarbons as a fuel and its contaminated products [7]. Workers at gas stations and petrochemical plants, car drivers, traffic police, Hawkers and workshop workers are considered more exposed to metal pollution produced by vehicles [8]. Air pollution is one of the main sources of concern because of its danger and effects on public health, as there is a relationship between increased levels of air pollution and the rate of

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disease and death [9-10]. Naturally, heavy metals are present in the environment and play a crucial role in sustaining life. Heavy metals are a term that is used to describe a set of metallic elements that contain various chemical and electrical properties, characterized by a density above 5g/cm³. However, their accumulation within organisms might potentially pose a hazard. Some heavy metals, such as mercury, cadmium, arsenic, chromium, nickel, copper, and lead, are commonly found to contaminate the environment [11-12] .These pollutants pose a serious threat to the stability of the ecosystem and in particular cadmium and lead are toxic and pose a major threat to human health [13]. The emission of heavy metals from various sources, such as cars, trucks, buses, and motorcycles, is influenced by factors including fuel consumption, engine oil, tire wear, brake wear, and road abrasion. These emission sources contribute to the release of specific heavy metal components, namely Cadmium (Cd), Copper (Cu), Lead (Pb), and Zinc (Zn) [14]. Other studies indicated that living near roads with heavy traffic may considerably increase the risks of adverse health effects [15]. Some of those studies showed the evidence of effects of such metals which are related to the distance from major roads and traffic density [16]. Trace elements have a crucial role as necessary components or cofactors of enzymes during hemopoiesis. The majority of trace elements play a vital role in the process of hemopoiesis through their function in metabolically important enzyme pathways [17]. Furthermore, once entering the body, trace elements have the potential to go through binding with red blood cells, facilitating their transportation to specific organs inside the body [18].

Hematology refers to the study of the numbers and morphology of the cellular elements of the blood and the use of these results in the diagnosis and monitoring of disease. Hematological studies are useful in the diagnosis of many diseases as well as investigation of the extent of damage to blood [19]. The values of the complete blood count (CBC) parameters can vary according to analytical, pathological and physiological factors such as age, sex, environment, nutritional state, lifestyle consumption of tobacco, alcohol or medicine [20]. The relationship of air pollution with hematological parameters remains controversial. While some studies reported the association of short-term9 and long-term10 exposure to air pollution with WBC count, some other studies did not confirm such association [21-22]. It is suggested that differences in the extent of the response to air pollutants are influenced by the variation in susceptibility among individuals. For example, those with old age or underlying cardiovascular risk factors may show stronger association [23-24]. The present study was conducted to determine the effect of Air pollution by heavy metal on some hematological parameters in The Traffic Police and Hawkers groups.

II. MATERIALS AND METHODS

A. Samples

The samples of this study was collected from The city of Nasiriyah. The study has included (120) participants (They were all men) with the ages ranged (26-46) year. These were divided into three groups, 40 samples of (Hawkers), 40 samples of (Traffic Police) And 40 samples as (control group).

B. Methods

Blood was withdrawn from anterior vein, it was obtained 5 mL of blood, 2ml of blood was put in the EDTA tube for measuring blood parameters by Hematology analyzer. Hematological parameters such as Hemoglobin concentration (Hb), Hematocrit level (HCT), number of Red Blood Cells (RBC), number of White Blood Cells (WBC), Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Volume (MCV) were calculated by Hematology Analyzer (BC-10) of Mindray is an automated hematology .

C. Stastical Analysy

Statistical analysis was performed with Excel application (version 2016) for Windows 10 and Statistical Package for the Social Sciences (SPSS) (version 26). The data were analyzed using independent sample t test, One Way ANOV , LSD and p. value of LSD.

III. RESULTS

Table 1 shows the mean ages, work duration and smoking for samples of this study (Hawkers, Traffic police and control groups). The current study showed that the mean ages of samples were (36.6 years ± 9.82, 39.2 years ± 5.44) in Hawkers, Traffic police groups respectively . While, the mean age of control individuals was (37.5 years ± 6.57). However, the mean of Work duration (14.9 years ± 8.17 and 13.9 years ± 5.57) in Hawkers and Traffic police groups. 52% and 47% in Hawkers and Traffic police were smokers respectively. Just 10% Control group were smokers, with significant differences between study groups at a significant level of p≤0.05.

TABLE I. DEMOGRAPHIC CHARACTERISTIC OF STUDIED GROUPS

Demographic		Hawkers	Traffic police	Control	p. value
		Mean ± S. D			
Age		36.6 ± 9.28	39.2 ± 5.44	37.5 ± 6.57	0.281
Work duration		14.9 ± 8.17	13.9 ± 5.57	------	0.504
Smoking	Yes	21 (52.5)	19 (47.5)	4 (10)	< 0.01
	No	19 (47.5)	21 (52.5)	36 (90)	

M±S.D Mean ± Standard division, P. value ≤ 0.05 means significant

Table (2), shows the hematological parameters count in the groups study. In this study, the highest concentration of Hb was (15.0 g/dl ± 1.40) in traffic police group with significant differences to other study groups (p.value ≤ 0.01). however, the lowest concentration of Hb was (13.9 g/dl ± 1.76) in Hawkers group. The high number of RBC was close in Traffic Police and Hawkers groups (5.36 ± 0.77 and 5.28 ± 1.39). while it was (4.70 ± 0.57) in control group with significant differences (p.value ≤ 0.01). MCV was rise in Control group compared to other groups of study it was (87.0 ± 5.47 , 85.4 ± 6.64 and 82.2 ± 8.27) in control , Hawkers and Traffic police groups with high significant differences (p.value ≤ 0.01). on the other hand, the (WBC , HCT , MCH) did not record any significant differences between study groups.

TABLE II. HEMATOLOGICAL PARAMETERS COUNT

Hematological Parameters	Hawkers	Traffic police	Control	p. value and LSD
	Mean ± SD			
Hb g/dl	13.9 ± 1.76[b]	15.0 ± 1.40[a]	14.0 ± 0.82[b]	< 0.01 (0.61)
WBC *10^3	7.48 ± 1.79	7.67 ± 1.97	7.65 ± 1.12	0.856
RBC *10^6	5.28 ± 1.39[a]	5.36 ± 0.77[a]	4.70 ± 0.57[b]	< 0.01 (0.43)
HCT %	43.2 ± 4.92	43.8 ± 5.03	44.1 ± 4.66	0.752
MCV	85.4 ± 6.64[ab]	82.2 ± 8.27[b]	87.0 ± 5.47[a]	< 0.01 (4.7)
MCH	27.5 ± 2.40	28.4 ± 3.68	27.8 ± 2.16	0.410

The different letters refer to a significant difference, The same letters refer to no significant differences at a significant level P≤0.05.

IV. DISCUSSION

In Iraq, the hazards effect of heavy elements on hematology especially in persons exposed (Traffic police and Hawkers groups) to heavy elements have not received a great deal of attention in the scientific researches, so the current study shows that average of Hb increased in Traffic police group compared to other groups and recorded significant differences (P. value < 0.01). A study conducted by [25] indicated that increasing the concentration of copper in the body may increase the level of hemoglobin, because copper helps in building bones and is involved in the synthesis of enzymes, which contributes to the formation of blood cells and hemoglobin. On the other hand, [26] have shown that continuous exposure to gaseous and thermal pollutants leaded to the interference of the action of these pollutants and thus leads to a decrease in the concentration of Hb. Previous studies previous important relationship between hemoglobin and exposure to some heavy metals. The high level of hemoglobin may be an independent risk factor, however, its effect may be secondary because it is directly related to other factors [27-28]. The findings of present study; Red Blood Cells increased in the Traffic police and Hawkers group and showed a significant increase compared to the control group (P. value < 0.01). RBCs are increased in these groups due to hypoxia by heavy metals for this reason, the number of RBCs increased. Several studies showed that heavy elements lead to hypoxia which cause an increase in the factor (HIF-1). This has very important role in increased Erythropoietin hormone which stimulate stem cells in bone marrow to production of RBCs [29]. Also our study found an increase in lead, cadmium and copper concentrations in the study groups compared to the control group, which indicates that the increase in RBCS results from continuous exposure to car exhaust smoke in the streets of the study area, as the element lead binds with RBCs, which leads to Inhibiting it thus affects the efficiency of the lungs in the gas exchange process, so that the body of human needs large amount of RBCs to replace the lack of oxygen [30]. The current study is Contradictory to [28] which shown that increased high level of RBCs in generator Workers. In Other words, in the study by [31]. found that decrease the level of RBCs in the people who effected by heavy elements. The current study shows an increase in the rates of HCT in the control group compared to the traffic police and Hawkers groups, While the study did not notice any statistically significant differences between the three groups (p value = 0.752). These results agreed with the study by [31] Which noted an increase in HCT rates in the Control group compared to the work group. As for White Blood Cells The results of this study showed an approximation in the number of WBC with study groups and also, didn't find Statistically significant differences (P value = 0.856). The finding of this study are consistent with the results of the study conducted by [32] to study Genotoxic effects and serum abnormalities in e-waste workers in Iraq. On other hand, this contradicts a research carried out by [33] to measure the blood parameters in battery manufacturing workers where he noticed an increase in WBC between the workers and the control group. The present study showed an increase in the rates of MCV in the control group compared to the groups of traffic police and Hawkers group, and recorded statistically significantly increased in the Control group compared to other study groups (P value = 0.01). These results are consistent with [34] a decrease in the size of the red blood cell (microcytic) after exposure to air pollutants. This condition is known as generalized secondary polycythemia. This condition is observed in patients who suffer from congenital heart disease, lung disease, and lack of oxygen, as there is an increase in the number of RBCs with decrease in MCV accompanied by a decrease in iron levels. The current study didn't show any difference in the rates of MCH in study groups, also the study did not find statistically significant differences between studies group The results of this study agreed with the results of the studies conducted by [31-32] while, the results of this study disagreed with the the study conducted by [36].

V. CONCLUSION

In this study, the association of blood parameters with outdoor air pollutants was determined and their increase in the study groups (traffic police and Hawkers as they are among the groups constantly exposed to air pollutants, the most important of which are car exhaust smoke and heavy metals, as they play an important role within the cells of the human body and cause major changes. In hematological parameters

CONFLICT OF INTEREST

Authors declare that they have no conflict of interest.

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