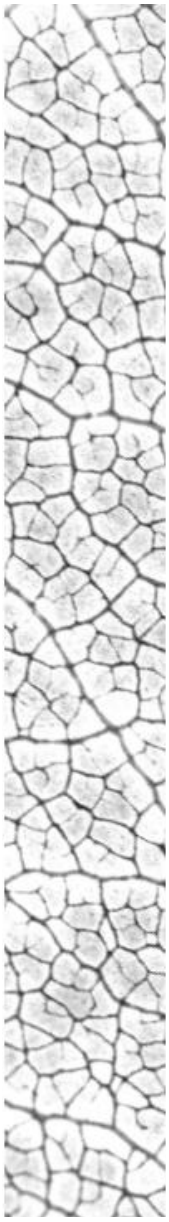

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Estimation of some hematological parameters among cement factory workers in Kirkuk City

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Abstract

Background: Cement contains different types of chemicals in addition to lime and silica, and these chemicals lead to various health complications, especially for the respiratory system and blood. The primary occupational hazards for cement workers are allergies and complications related to respiratory illnesses. The study was aimed to explore the effect of cement dust on hematological parameters in construction workers.

Method: The study was done among workers in cement factory in Kirkuk city from the period of10/3 till 30/4/2019and 100 volunteers was taken by special questionnaire sheet and full hematological examination was done to them through taken Erythrocytes: Mean corpuscular volume (MCV), White blood cell (WBC), Mean corpuscular hemoglobin concentration (MCHC), Mean corpuscular hemoglobin (MCH), Packed cell volume (PCV) Red blood cell (RBC), Hemoglobin, Lymphocytes, Granulocytes and Platelets.

Results: Most of the studied sample were exposed to cement dust with a p. value (0.777).
The most of studied sample show a normal percentage of PCV value (90.0%) with a p. value (0.001). On the other hand, Hb value show a normal limit (86.0%) among the exposed group in comparison to (63.0%) of hemoglobin level in non-exposed group with a p. value (0.008).

Conclusion: Reduced pack cell volume, red cell count, hemoglobin content and platelet count could indicate that cement dust has a harmful effect on the hematological system. An elevated total white blood cell count indicates a reaction to the irritating cement dust present in the lungs.

Keywords: hematological parameters, cement factory, estimation, Kirkuk city

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INTRODUCTION

Industrialization is regarded as the main terms of country advancement now a day's which has a direct effect on the environment so building and infra structures are the most common visual characteristic feature of industrialize (Dawson, et al., 2019).

These industrial like processes, manifestation, energy product effect the environment in two ways, the first are by exhausting the natural sources and the second are by amazing wastes. The building construction of rods and a mention are the common actual of urbanize (Jude et al., 2002).

The permanent dangerous component in building material is the cement which leading to many health problems and air pollution with the interference of occupational diseases among workers (Dawson, et al., 2019; Tajuddeen et al., 2011).

The cement composed from limestone, laterites, clay and gypsum with the main organic compounds which are calcium oxide [called lime], aluminum oxide, silicon dioxide [called silica], iron oxide and many other materials (Tajuddeen et al., 2011;Fell et al., 2010). These organic compounds enter to the body and causing several health diseases like respiratory, genetic, hematological, cardiac failure with brain damage and chromosomal abnormalities (Fell et al., 2010; Swaran et al., 2010).

Cement dust causing many health damage to skin, eye and this damage depend on the duration of the exposure and the exposure level with the personal sensitivity (Swaran et al., 2010; Meo, 2004).

The circulatory systems quietly sensitive to these environmental hazards because of extensive damage to cells by rapid synthesis and destruction of cells in comparism to metabolic need (Abdul-Wahab, 2006; Lazar et al., 2020). While the hematological parameters with the differential counts of WBC are very sensitive which are used for in direct diagnostic or prognostic

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guideline in evaluating the cement dust toxicity (Mohsen et al., 2001; Mojiminiyi et al., 2008). Many factors affect the hematological like (age, ethnic, back ground, sex, immune system, socio economic, environmental and nutritional factors (Mwaiselage et al., 2005; Abood Alsaadia and Abass 2020).At the end few studies are available to prove the effect of cement dust on the blood system. This study was designed with the aim of exploring the effect of cement dust on hematological parameters of construction workers.

MATERIAL AND METHODS

Administrative agreement

Official permission was taken from medical college and cement factory before establishing the study and both verbal and written consents were taken.

Study period and setting

The study was done among workers in cement factory in Kirkuk city from the period of 10/3 till 30/4/2019.

Study design and sampling technique

Cross section all study was done on100 volunteer male workers were collected randomly from cement factory after full clinical examinations of workers were done by the specialist doctors including: height and weight with full data collection from each participants like age, history, of expose, smoking, and alcohol, with drug history.

Inclusion criteria: All workers in five units including and no healthy workers were excluded.

Exclusion criteria: we excluded females from this study.

Data collection tool

Certain specific questionnaire was prepared by the investigators containing the followings:

A-Demographic character like age, sex, employment year, educational level.

B- Full detailed information about the smoking and physical activity.

C- History of drug taking.

D- History of using a protective apparatus like hand washing, gloves, environment.

Sampling and hematological analyses:

Three milliliters (3.0 ml) of blood was collected from each worker with the assistance medical presence in the industries in appropriate sterile tube by venous arm and put it immediately in EDAT tube and shake it gently to mix it with anticoagulant to prevent coagulation of the blood that using in hematological analyses. Analysis of The hematological indices is including: Hemoglobin, Mean corpuscular hemoglobin (MCH), Mean corpuscular volume (MCV), Mean corpuscular hemoglobin concentration (MCHC), White blood cell (WBC), Packed cell volume (PCV), Red blood cell (RBC), Lymphocytes, Granulocytes and Platelets, QBC II machine (Becton Dickinson, Franklin Lakes, NJ, and USA) was used for analyses hematological parameters. The QBC II machine was calibrated before use (Mandal, 2014).

Table 1. Frequency distribution of study sample according to demographic character

Character		Frequency	%
Age group	<30 year	4	4.0
	30-40 year	29	29.0
	>40 year	***67***	***67.0***
			100.0
Physical activity	Yes	34	34.0
	No	***66***	***66.0***
			100.0
Smoking	Yes	41	41.0
	No	***59***	***59.0***
			100.0
Employment year	<10 year	9	9.0
	10-20 year	***68***	***68.0***
	>20 year	23	23.0
			100.0
Educational level	Illiterate	6	6.0
	Primary	30	30.0
	Secondary	***48***	***48.0***
	University	16	16.0
			100.0

Table 2. Study sample distribution according to exposure to cement dust

Expose state	No.	%	P. value
+ ve Expose	***51***	***51.0%***	***0.777***
- ve Expose	49	49.0%	
Total	100	100.0%	

Statistical analysis

All questions with yes and no number and % were used. Chi-square test was used to detect the relation between variables and the levels of > 0.05 were considered significant.

RESULTS

Table 1 show that the most studied group was between the age above 40 years (67.0%), with no physical activity (66.0%), without smoking (59.0%), with employment year between 10-20 years (68.0%) and secondary educational level (48.0%).

Table 2 revealed that the most of studied sample were exposed to cement dust (51.0%) with P. value= 0.777.

The most of studied sample show a normal percentage of PCV value (90.0%) with a p-value (0.001). On the other hand, Hb value show a normal limit (86.0%) among the exposed group in comparison to (63.0%) of hemoglobin level in non-exposed group with a p- value (0.008).

Regarding the MCH level (98.0%) of exposed group show a normal level of MCH in comparison to (76.0%) in non-exposed group with a p-value (0.001).

Table 4 show that (90.2%) of studied exposed group show a normal limit of lymphocyte cell in comparison to

Table 3. Prevalence of cement dust exposure and non-exposure according to the hematological parameters

hematological parameters		+ ve Expose No=51	- ve Expose No=49	P. value
		No. (%)	No. (%)	
PCV (42-47)%	Normal	***46 (90 %)***	***30 (61%)***	***0.001***
	Abnormal	5 (10%)	19 (39%)	
Hb (12-16)g/dl	Normal	***44 (86%)***	***31 (63%)***	***0.008***
	Abnormal	7 (14%)	18 (37%)	
RBCs $(4.5\text{-}6)*10^6 mm^3$	Normal	*36 (71%)*	*26 (53%)*	0.071
	Abnormal	15 (29%)	23 (47%)	
MCV $(74\text{-}95)\mu m^3$	Normal	*44 (86%)*	*34 (69%)*	0.042
	Abnormal	7 (14%)	15 (31%)	
MCH (25.5-34) pg	Normal	***50 (98%)***	***37 (76%)***	***0.001***
	Abnormal	1 (2%)	12 (24%)	
MCHC (31-37)%	Normal	*43 (84%)*	*42 (86%)*	0.845
	Abnormal	8 (16%)	7 (14%)	

Chi-square is used

Table 4. Prevalence of cement dust exposure and non-exposure according to the hematological parameters (WBC, LYM, GRA and PLT)

hematological parameters		+ ve Expose No =51	- ve Expose No= 49	P- value
		No. %	No. %	
WBC $(4\text{-}11)*10^3$	Normal	*49 (96.1%)*	*46 (93.9%)*	0.614
	Abnormal	2 (3.9%)	3 (6.15)	
LYM (20-45)%	Normal	***46 (90.2%)***	***43 (87.8%)***	***0.097***
	Abnormal	5 (9.8%)	6 (12.2%)	
GRA (60)%	Normal	*36 (70.6%)*	*40 (81.6%)*	0.196
	Abnormal	15 (29.4%)	9 (18.4%)	
PLT $(150\text{-}400)*10^3/mm^3$	Normal	*49 (96.1%)*	*45 (91.8%)*	0.372
	Abnormal	2 (3.9%)	4 (8.2%)	

Chi-square is used

(87.7%) of non-exposed group with p-value (0.097), on the other hand (9.8%) of the exposed group show abnormal limit of lymphocytes.

DISCUSSION

The study show that majority of studied sample were from secondary primary educational level and aged over 40 years of age, not smoker with period of employment year between 10- 20.

A study was conducted by Dr. Salh et al (2014) in Sulaimaniyah city/Kurdistan/ Iraq during the year 2013to find out any biochemical and hematological parameters among three major stations in the Bazian basin they found that their mean age was (34 ±2) years with average employment year of (4) years with approximately daily work activity about 7-9 hours. The questionnaire for each subject was filled contained, age, work of time, safety equipment measures, smoking habits and self-reported complains. In contrast, 21 individuals with an average age of (32±3) years of the general population of Sulaymaniyah who have an almost negative history of working in cement factories or oil refining.

Regarding **Table 2** presents that most of the workers were exposed to cement dust and this will lead to occurrence for much health problems in the future time in comparsium to non-exposed workers.

Okonkwo *et al*. (2015), was conducted a similar study in Nigeria/ Asaba, Delta State, during 2013 among cement workers including, they found that majorly of studied sample were exposed subjects with years of exposure was between 10-15 years. Smokers, alcoholics and people having chronic illness were extracted from the study. The study design was prepared in accordance with the Helsinki Declaration and was agreed by the Faculty of Basic Medical Science, Nnmadi Azikiwe University, Nnewi campus. Further approval sheet was sought and obtained from each individual subject. Blood samples (10ml) were also obtained from the subjects for hematological parameters, and multiple parameters such as hemoglobin (Hb) level, white blood cell count additional like (neutrophils, eosinophils, basophils, lymphocytes and monocytes), platelet counts and packed cell volume (PCV) were estimated using standard hematological techniques.

Concerning **Table 3** about the hematological parameters among the exposed and non-exposed sample the current study shows that about half of the non-exposure group having abnormal PCV and Hb level in comparsium to exposure group. There is a significant relationship between the exposure state and the hematological parameters.

A study was done by Ashwimi et al (2016), in South India region on 200 normal individuals and 200 concerned cases on different cement factories. They found that there was a significance difference in hematological parameters but not in liver function tests. Thus hematological parameters useful in assessing and monitoring the health of cement factory workers more over to the respiratory function tests. The hemoglobin concentration and packed cell volume (PCV) of the exposed workers were significantly lower than those of the unexposed group. The reduced hemoglobin concentration and reduced PCV may not be due to nutritional deficiency as both groups were matched by socio-economic status.

For **Table 4** about the hematological parameters on WBC, lymphocyte, Granulocyte, and platelet level, this study show that there was a significant relationship between lymphocyte level among exposure and non-exposure group which present that two third of the non-exposure group having a higher level of lymphocyte cell in comparsium to exposed group.

Emmanual et al (2015), was done a similar study on the effect cement dust on the workers in Objana cement factor by collecting (5.0 ml) of blood from each worker with the assistance medical of laboratory scientist, Federal Medical centre, Lokoja, Nigeria. Sample collection was done once in every November for three years. They found that, the WBC and PLT were significantly higher in several of workers in lower than those workers that are not exposed to cement dust (unexposed group). The rise in WBC and PLT cells count perhaps suggest a response to toxic effect of cement dust inhaled into the lungs causing health problems.

Further studies were done on cement factory worker in Nigeria to assess the effect of cement dust on exposure workers by Ayesha et al., (2017), who conducted study on cement dust exposure to evaluate the effect of occupational exposure of cement dust on hematological parameters by taking a sixty-five healthy adult half aged 25-50 years. They reported that an increase in the number of eosinophils was observed. This may be an indication of a hypersensitivity reaction to the body to solidify dust. There was a slight decrease in neutrophils after exposure in our study. They also indicated a significant decrease in the number of platelets after the work shift.

Reducing packed cell volume, red cell count, hemoglobin content, and platelet count may indicate that cement dust has a detrimental effect on the blood system. An elevated total white blood cell count indicates a reaction to the irritating cement dust present in the lungs.

RECOMMENDATION

1. Future advance large studies on big population groups to assess the effect of cement dust on healthy workers in these factories
2. More scientific training programs for health workers to protect themselves from health hazards
3. Updated scientific educational program through mass media to increase public health awareness about the effect of cement among exposure group.

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