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ASSESSMENT ON THE EFFECT OF CEMENT DUST ON HAEMATOLOGICAL PARAMETERS OF SOME CEMENT BLOCK MOULDERS IN KHANA L.G.A RIVERS STATE NIGERIA

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ABSTRACT
Cement is an adhesive used in building; it is made of chemicals like calcium, magnesium aluminum and iron. To investigate the effect of cement dust on haematological parameters of cement block moulder in khana LGA, 80 Adult males, aged 18-40years who have been exposed to cement dust for at least 5years participated in this study. 5ml of venous blood were collected from each participant into ethylene-diamine tetra acetic acid anticoagulant containers for haematological analysis using standard operative procedure. SPSS version 20.0 was used for the statistical analysis and test of significant was calculated using student T-test. The result revealed significant decreased in haemoglobin, (HB), Neutrophils, packed cell volume (PCV), redblood cell (RBC), lymphocyte, monocytes, platelet and increase in TWBC ($p<0.05$). This result pattern demonstrates that cement dust does not only affect respiratory system but also alter some haematological parameters and white blood cell (WBC) of cement block moulders. Haematological assessment may be included in periodic monitoring of the health status of industrial workers exposed to cement dust.

KEYWORDS: Haematological, Dust**,** Cement, Moulder, and Block.

INTRODUCTION
Cement is manufactured from 4 major components, limestone, laterites, clay and gypsum; the first three components are gotten from operational processes called quarry in operations. In most cases, the rocks are fractionated to small particles sizes known as quarry fines. Cement dust is formed during the production, packing, loading and offloading of cement. Every individual in the cement industry form the director to the manager, staff, customer and bricklayer are exposed to the inhalation of cement dust. People living within the vicinity of the cement industry and those passing by are not excluded from inhaling dust from the cement industry. Consistent exposure of cement dust over relatively long periods can cause toxicity to man due to the accumulation of the toxic constituent of the cement dust. The chief chemical constituents of cement are calcium, silica, alumina and iron. Calcium is derived from limestone or chalk while silica, alumina and iron are derived from sand, clay and iron are sources (Butt et al., 1971). Different organs, tissue and cells in biological system are affected in different ways and to different degree when exposed to toxic elements. The result of creatinine and potassium agrees with the study carried out by Haithan (2010) which shows a significant increase in creatinine of subject when compare to control and no significant increase in sodium of subject when compare to control. This research is aimed at assessing the effects of cement dust on some haematological parameters of some cement block moulders in Khana local government area, Rivers State, Nigeria. Several studies have demonstrated linkages between cement dust exposure, chronic impairment of lung function and respiratory symptoms in human population. Cement dust irritates the skin, the mucous membrane of the eyes and the respiratory system. Its deposition in the respiratory tract causes a basic reaction leading toincreased pH values that irritates the exposed mucous membranes (see, Zeleke et al. 2010, and references cited therein). Occupational cement dust exposure has been associated with an increased risk of liver abnormalities, pulmonary disorders, and carcinogenesis. Decreased antioxidant capacity and increased plasma lipid peroxidation have been posed as possible causal mechanisms of disease (Aydin et al. 2010). There is good evidence for cement dust exposure acting as a tobacco, alcohol and asbestos independent risk factor for laryngeal carcinoma (Dietz et al. 2004). The hematopoietic system of human is extremely sensitive to some environmental influences because of rapid synthesis and destruction of cells with

consequent heavy metabolic demand (Jude *et al*., 2002). They studied and reported that cement dust caused indirect haematological damage resulting in abnormal blood cell count. The effect of cement dust adversely affects the health status of human. It can also alter skin colour, hair colour and texture of skin and haematological system. Acute exposure to cement does not significantly affect the health of a citizen. However, prolonged or repeated exposure depending on the duration, level of exposure and individual sensitivity have health implications on the skin, eye, respiratory and haematological systems (Jude *et al.*, 2002).

MATERIALS AND METHODS

Sample Collection

A total of 80 (eighty) cement block moulders in Khana Local Government Area Rivers State were randomly recruited for this study. This study was carried out between September and November, 2019. 5mL of venous blood samples were collected from each subject through the antecubital vein following the standard procedure for venous blood collection. The blood samples was dispensed into Ethylene diamine tetra acetic acid (EDTA) anticoagulant bottles and mixed gently by inversion.

Haematological Analysis

The blood samples of each subject collected were transported to the Laboratory between 1 – 2 hours of collection for haematologicalanalysis of the following using the Automated Haematology Analyser KX-21, (Sysmex Coporation, Kobe, Japan):

1. Red blood cell (RBC) count,
2. Packed cell volume (PCV),
3. Haemoglobin (Hb) concentration
4. Red blood cell indices
5. White blood cell (WBC) count and differential counts such as lymphocytes, monocytes, basophils, neutrophils, and eosinophils and
6. Platelet count.

Laboratory Procedure for Packed Cell Volume (PCV)

Microheamatocrite method

Filled the capillary tube two-thirds full with well mixed venous blood.

Sealed one end of the capillary tube with plasticine.

The filled tubes were then placed in the microhaematocrit centrifuge and spinned at 12,000rpm for 5minutes,. Place the spun tube into a specially designed scale (microhaematocritreader), and read the pcv as a percentage fraction.

Procedure for Haemoglobin Estimation

Added N/10 HCl into tube up to mark 2.

Mixed the EDTA sample by gentle inversion and filled the pipette with 0.02ml blood. Wipeed the external surface of the pipette to remove any excess blood.

Added the blood into the tube containing HCl. Washed the contents of the pipette by drawing in and blowing out the acid two to three times. Mixed the blood with the acid thoroughly.

Allowed to stand undisturbed for 10minutes.

Place the hemoglobinometer tube in the comparator and add distilled water to the solution drop by drop stirring with the glass rod till it's color matched with that of the comparator glass.

Laboratory Procedure for Total White Blood Cell Count (TWBC)

Added 0.02ml of blood to 0.38ml of diluting fluid. Charge the improved Neubauer counting chamber with well mixed diluted blood. Allowed the cells to settle in a moist chamber for 5mins using 10x objective of the microscope, located the four large corner square areas 1, 2, 3, and 4. The area of these squares is $4mm^2$. Checked that the cells wre evenly distributed.

Counted the total number of white cells in the four large corner squares in the same pattern ascribed for the red cell count.

Differential Count – by Manual Method

The differential count is expressed as percentage of the total number of cells counted.

Maked a thin film with rabbit blood Allowed to dry. Then flood the surface of the thin film leshiman stain. Left it for 2 minutes, Diluted it with water, Left it for 8 minutes. Then rinsed in a low running tap water. Blot the back of the slide, then air dried. Examined under 100x oil emmersion.

Procedure for Platelet Count

Added 0.02ml of blood to 3.98ml of diluting fluid. Charge the improved Neubauer counting chamber with well mixed diluted blood. Allowed the platelet to settle in a moist chamber for 3 to 5 minutes. Located the ruled area of the counting chamber under 10x objective.

Reduced the illumination by closing the iris diaphragm, platelet appeard as highly refractile particles. Counted the total number of platelets using a high power (40x) objective in the four large corner squares ($4mm^2$)

Procedure for Red Blood Cell Count (RBC)

Whole blood was diluted appropriately using an isotomic dilution to avoid lysis of red cell. The number of red cell in a known volume and of known dilution is counted using a counting chamber.

Techniques

Added 0.02ml of blood to 3.98ml of diluting fluid. Charge the improve Neubaur counting chamber carefully with the well mixed diluted blood.

Allowed all to settle in a moist chamber for 3-5minutes. Located the ruled area of counting chamber under 10x objective of the microscope. Checked that the cells are evenly distributed using 40x, counted the total number of red cells in five groups of 16 small squares in the central ruled area.

RESULTS AND DISCUSSION

Table 1: Comparative mean ± SD standard values of Haematological Parameters of cement block moulders in Khana LGA, Rivers State.

Haematological Parameters	Cement block moulders value	Normal standard reference values	p - value
PCV (%)	40.29 ± 4.52	43.36 ± 4.64	0.207
RBC ($X10^9$/L)	4.91 ± 0.74	4.63 ± 0.34	0.68
Hb (g/dl)	13.41 ± 1.53	14.90 ± 1.54	0.314
WBC ($X10^9$/L)	9.43 ± 9.33	7.39 ± 2.06	0.011*
Lymphocyte (%)	41.00 ± 6.63	36.86 ± 9.59	0.720
Neutrophil (%)	49.13 ± 7.27	54.93 ± 9.67	0.095
Monocyte (%)	6.65 ± 3.17	5.89 ± 1.27	0.320
Eosinophil (%)	3.39 ± 2.38	3.63 ± 1.31	0.961
Platelet ($X10^9$/L)	266.84 ± 65.46	279.53 ± 88.95	0.840

*Data are presented as mean ± SD; n = 80. *: Significant at p < 0.05.*
Standard Haematological values (*Dacie and Lewis*, 2006).

DISCUSSION

In this study, the assessment of effect of cement dust on haematological parameters in block moulders were obtained and compared with their normal reference values. From the result obtained in table 4.1. there is a significant increase in the total WBC(9.43±9.33) in block moulders and (7.39±2.06) in reference value. This agreed with the investigation made by (mojiminiye *et al*. 2008) which reported that higher white blood cell WBC count may be due to deposition of cement particles in lungs. The result of these investigation also shows a decrease level in packed cell volume, haemoglobin and red cell count when compared with the reference value i.e (PCV of block moulders; 40.29±4.52) reference value (43.36±4.64), (Wilson, 1993). Jude *et al.,* (2002) observeddecrease in haemoglobin concentration and packed cell volume (PCV) are signs of anaemic condition. (HB of block moulder; 13.41±14.90) reference value (14.9±1.54), It has been reported that chronic exposure to calcium hydroxide causes adecrease in Total Erythrocyte Count (TEC) and Haemoglobin (Hb) (Proctor *et al.,* 1988). (RBC of block moulders; 4.91±0.74) reference value (4.63±0,34). This work correlate with the investigation carryout by AL Salhen (2014) which reported that, in the haematological parameters in labourers expose to cement have significant decrease in total erythrocyte count (TRBC), haemoglobin (HB) and packed cell volume (PCV). He further reported cement molders exposed to cement dust have decrease in red blood cell (RBC) which may due to responses of body to irritation, higher white blood cell (WBC) which may be due to irritant of cement dust particles deposited in the lungs, decrease monocytes count, increase in platelets count which are sign of stress response which lead to RBC swelling or haemoconcentration plasma volume reduction as a result of cement dust, a decrease in hemoglobin concentration and packed cell volume (PCV) which is a sign of anemic condition, an increase in mean corpuscular volume (MCV) which may be due stimulation of erythropoiesis, increased in platelets (PLT) due to excess production of hematopoietic regulatory elements such as colony stimulating factors, erythropoietin and thrombopoietin by the stromal cells and macrophages in the bone marrow, increased in MCH due to structural damage to red blood cell membrane resulting in hemolysis synthesis, stress related of RBC from the spleen and hypoxia.

From this finding the decrease in monocyte, lymphocyte neutrophil, eosinophil and basophil may be due to inflammation of the lungs, which act as an anti-inflammatory agent (Zeyede, et al., 2011).

CONCLUSION

In conclusion, the significant different in cement block moulders haematological parameters value has an increase in TWBC of (9.43±9.33) when compared to the normal reference value (7.39±2.06). indicate a significance difference of (P>0.05) and decrease in PCV, HB, RBC, NEU, LYMP, MONO, BASO, EOS which is therefore take into cognizance change in haematological parameters in cement block moulders in Khana LGA.

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