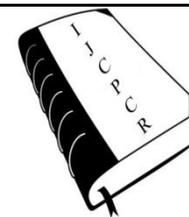




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EFFECTS OF CEMENT DUST ON HEMATOLOGICAL AND LIVER FUNCTION TESTS PARAMETERS

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ABSTRACT

The increased production of cement due to its high demands has led to increased risk of occupational hazard it poses to exposed workers. Production of cement is a dusty industrial process and its effect on the health of workers has been studied for many years but most of the studies found the many significance variation in lung functions, very less significant differences in hematological values. The present study concentrated on hematological values of worker working in cement factories of south India. The present study conducted in cement factory workers in south India cement factories who exposed to cement dust and normal individuals who are not exposed to cement dust. The hematological and liver function tests were performed in individuals. In present study we measured hematological parameters and liver function were performed in 200 workers occupationally exposed to cement dust and 200 matched unexposed controls. The hemoglobin concentration and packed cell volume of exposed workers were significantly lower ($p < 0.05$) and the platelet and white cell counts were significantly higher than in the unexposed workers ($P < 0.05$). There was no significant difference in the total granulocyte and lymphocyte/monocyte counts. The liver function parameters remained similar in the exposed workers compared to the unexposed except serum aspartate aminotransferase and alkaline phosphatase activities which were significantly lower ($P < 0.05$). The present results confirmed that hematological values changed significantly but LFT parameters were not shown any significance difference.

Key words: LFT, Cement duct, Hb, PVC.

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. Further treatment is employed to convert the fines particles into the powder form known as quarry dust. Cement is a dark grey colored powdery substance of alumina, silica, lime, iron oxide and magnesium oxide [1].

A single and short term exposure to cement dust presents with little or no hazard but prolonged or repeated exposure depending on the duration, level of exposure and

individual sensitivity have health implications on the skin, eye, respiratory and hematological systems [2]. The hazardous materials in cement include alkaline compounds such as calcium oxide that are corrosive to human tissue, crystalline silica which is abrasive to the skin and damage the lungs and chromium that causes allergic reactions [3]. Cement causes skin dryness, discomfort, irritation, dermatitis and burns due to its caustic, abrasive and drying properties. Some workers become allergic to the hexavalent chromium in the cement with the development of symptoms ranging from a mild rash to severe skin ulcers.

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Airborne cement dust may cause immediate or delayed inflammation, eye irritation, abrasion, red eye, chemical burns and blindness. Inhalation of cement dust may occur when workers empty bags of cement. In short term, such exposure irritates the nose and throat and cause choking and difficult breathing. The sanding, grinding or cutting processes in cement production releases a large amounts of cement dust which contains high level of crystalline silica and prolonged exposure can lead to silicosis [4]. In study Syed et al [3] indicated a link between crystalline silica exposure and lung cancer. Silicosis increase the risk of tuberculosis. Individuals with lung diseases such as bronchitis, emphysema, chronic obstructive pulmonary disease can be aggravated by cement exposure [5]. The hexavalent chromium content of cement have been implicated as the etiology of allergic occupational asthma that was developed by cement factory workers. Some studies showed an increase incidence of chronic kidney disease and end stage renal disease in workers exposed to respiratory crystalline silica. The study of Okonkwo et al [6] have shown that cement dust have deleterious consequences on hematological indices of human exposed to the dust. In study of Divya and Suja [7] reported that cement workers 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 cement dust particles deposited in the lungs, increase in lymphocytes count and 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 [8], 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 [9-11]. The values of hematological parameters are affected by a number of factors even in apparently healthy populations. These factors include age, sex, ethnic background, body build, social, nutritional and environmental factors, especially altitude [12]. The present study focused on hematological parameters and LFT values in different cement factories in south India.

MATERIAL AND METHODS

200 normal individuals are served as controls in same region who they have not exposed to cement dust, 200 subjects are selected from who they are working in different cement factories located in south Indian region. The parameters such as age, weight, height and years of exposer, the hematological parameters included like Hb,

PCV, Platelets, WBC, Granulocytes and liver functions tests were included such as total bilirubin, conjugate bilirubin, total protein and albumin.

RESULTS

The average age of normal individuals was 37.1 ± 0.8 and exposed were 35.6 ± 2.2 , the mean weight was 63.4 ± 2.7 kg and in exposed subjects it was 67.5 ± 3.3 kg, the mean height of controls was 171.6 ± 1.7 cm and 171.2 ± 1.2 cm in exposed subjects and average years of exposer in cement factory workers to cement dust was 12.2 ± 2.6 years. the hematological values were as follows the hemoglobin(g/dl) was 14.3 ± 0.4 in normal and 11.9 ± 0.7 with significant difference ($P < 0.05$), packed cell volume(%) (PCV) was 43.1 ± 0.9 in normal subjects and 39.1 ± 1.4 in exposed subjects with significant difference ($P < 0.05$). The platelets($\times 10^9/l$) were 194 ± 7.7 control subjects and 277.9 ± 23.1 in exposed subjects, the WBC($\times 10^9/l$) were 7.2 ± 0.4 in normal individuals and 8.7 ± 0.7 in exposed individuals. The hematological values such as Hb, PCV, Platelets and WBC were shown significant difference ($P < 0.05$) but Granulocytes, Granulocytes(%), monocytes and monocyte(%) were not shown any significance difference ($P > 0.05$). in liver function test the total bilirubin, Conjugate bilirubin and total protein, albumin were not shown any significance difference but AST, ALP, LT shown the significant difference ($P < 0.05$).

DISCUSSION

The present study results shown the 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 in addition to the lung function tests. The hemoglobin concentration and packed cell volume (PCV) of the exposed workers were significantly lower than those of the unexposed. The reduced hemoglobin concentration and reduced PCV may not be due to nutritional deficiency as both groups were matched by socio-economic status. This results in agreement with study of Mojiminiyi et al [13] in there study also there is significance difference in PCV and Hb parameters. The white blood cell and platelet counts were shown significant difference in between control and cement dust exposed individuals it was higher in cement exposed group than unexposed group.

The raised white blood cell count may be due to reaction to irritant cement dust lodged in the lungs. The observed lowered hemoglobin concentration and PCV and raised white cell and platelet counts suggest that cement dust exposure may have a deleterious effect on the bone marrow, the source of these cells. Indeed, severe bone lesions have been seen in weanling pigs fed cement kiln dust as a way of boosting dietary calcium, the similar explanation is found in Pond et al study [14]. Our study present findings on hematologic parameters are in agreement with studies of Jude et al [15] study, in that study reported a fall in red cell count, packed cell volume

and hemoglobin concentration in exposed workers but in their study found significant fall in the red cell count. Although they reported an insignificant rise in white cell counts in the exposed workers, differential counts revealed an increase in lymphocyte count and a decrease in monocyte count both of which were significant. In the present study, the hemoglobin concentration and PCV were significantly lower in the exposed subjects. The total white cell count increased significantly while the rise in granulocyte and granulocyte counts remained insignificant. This results were in agreement with study of Mojiminiyi et al [13].

The study of Jude et al [15] reported a significant fall in platelet counts in the exposed group compared to the unexposed, the present study had contrast result a significantly higher platelet count in the former. This disparity may be due to racial factors or variation in duration of exposure to cement dust. There was a general depression in the liver function parameters of cement factory workers compared with those of the control subjects. The present study results were in agreement with study of Pagana and Pagana [16].

The results suggest that the liver may not be adversely affected by cement dust exposure. A rise in the liver enzymes generally suggests a lesion in the liver. The

results of the present study suggest that chronic exposure to cement dust has deleterious effect on the hemopoietic system. Thus cement dust exposure may be more. This finding was strengthened by the reported genotoxic effects seen in people occupationally exposed to cement dust. Such genetic damage comprised of minor chromosomal aberrations, decrease in mitotic index and increased frequency of sister chromatid exchanges [15].

CONCLUSION

The present study suggested that cement dust exposure affects the hematological parameters which leads to ill-health, the management and workers should take the preventive measure to inhale less cement dust.

CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

STATEMENT OF HUMAN AND ANIMAL RIGHTS

All procedures performed in human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

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