

The Effect of Cement Dust Exposure on Haematological Parameters of Cement Factory workers in Nalagonda, Andhra Pradesh.

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Abstract

This study was measured on haematological parameters in workers exposed to cement dust in order to test the hypothesis and to identify a simple, readily available, cost effective screening test that could help in identifying the presence of disease, its severity, that Cement dust exposure may perturb these functions related to their workplace. Assessment of haematological parameters were performed in 100 exposed workers occupationally exposed to cement dust and 50 matched unexposed controls with ages ranging from 20-35, 35-50, 50-65 years. The blood samples were taken from them and percentage of hemoglobin, Lymphocytes / monocytes count were analysed. The hemoglobin percentage of exposed workers were significantly lower ($P < 0.05$). Lymphocytes/Monocytes counts of exposed workers was insignificant ($P < 0.05$). These results suggest that long term occupational exposure to cement dust may perturb haemopoietic function.

KEYWORDS: Cement dust exposure, haematologic parameters, workers.

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INTRODUCTION: Production of cement is a dusty industrial process and the healths of the workers have been studied for many years (Smailye et al, 2003). Respiratory illnesses in workers of Cement industries are a significant problem all over the world. One million people are dying annually in the world. 1.7 million Area affected in India alone. Billions of rupees are spent on their treatment annually. Exposure to Cement dusts is even a larger problem in non-industrialized countries as personal protection equipment is limited (OLERU,1984). A study in Andhra Pradesh stone crushing workers revealed an increased prevalence of chronic cough due to dust exposure (dust level in the stone dust depot was 30.81 mg/m³) in Cement crushing units. Cement industries units are situated in the near by villages of Kodad and in some areas of Nalagonda district. These sectors (small and large scale industries) are few with hundreds of labours. During the different process of operation dust is evolvable and contains high percent of free silica, which may lead to silicosis and other respiratory disorders. In Cement processing units the occupation is associated the development of silicosis including quarry mining, sand blasting, and drilling, tunneling and stone crushing. Silica dust is released during operations in which rocks, sand, concrete and some ores are crushed or broken. Work in mines, quarries, foundries, and construction sites, in the manufacture of cement, ceramics, and abrasive powders, and in masonry Workshops are particularly risky (Elems&Gordon, 2000). Stone quartz grinders who are involved in crushing quartz stone into powder from are exposed to excess risk of silicosis as the stone contains approximately 100% free silica and the process liberates huge amount of silica dust in the working environment Cement industries are depositories of various toxicants which include chromium products of incomplete combustion of silica, lead, fly ash, etc. This contamination on exposes my lead sub clinical and clinical effects in all exposed group of labour. The principal compounds used in the manufacture of cement are a combination of calcium, silicon, iron, and aluminum compounds in the form of limestone and clay (Fairhurst et al., 1997). We took this study because hundreds of labours are spread around our city, in Kodad, Nalagonda District, employing thousands of workers. They are frequently seen in the hospital in pulmonology unit and hematological imbalance of labours. The impact of pulmonary hazards and blood purity is also influenced by age, smoking history and nutritional statues of the labours. They are reportedly occupying around 60% of pulmonology ward beds. To get the actual picture we did this field study. By our study, we established that a number of workers are suffering from respiratory diseases than those of ornamental workers (non- exposed).

MATERIALS AND METHODS

Type of study: - cross – sectional

Study design: - Field based by questionnaire

Sample size: - A set of 150 workers (50 samples normal, 100 samples exposed) from cement occupational were studied regarding collection of Blood sample from the different age group of workers (20-35, 35-50, 50-65)

Clinical method:-

A Estimation of Hemoglobin by Cyanmethemoglobin drakin's method) b. Lymphocytes/Monocytes count.

Collection of blood sample: Five ml of blood was collected from each subject by a venipuncture and a disposable syringe. Three ml of blood was transferred to a bottle containing ethylene diamine tetra acetic acid, in a concentration of 1.5 mg/ml to be used for lymphocyte & monocytes count and 1.6 ml of blood was collected in another bottle containing 0.4 ml of 3.8% of sodium citrate for Hb%. Each bottle was labeled with the subject identification code number. Total leukocyte count was performed on an electronic cell counter (auto-analyzer). Difference in the mean values of the 2 age groups was regarded statistically significant if the p-value was less than 0.05. **Effects of duration of exposure (Average of 8 hours per day and >8 years) on Hemoglobin Percent and total leukocyte count.** The comparison of Hb% and LC/MC parameters in cement workers on the basis of duration of exposure 8 hours per day and >8-years, compared with their matched control.

Results:

Hematological studies: The mean values of hematological (Hb% and MC/LC) parameters for 100 cases of cement workers and 50 controls are presented in Table1, 2&3. According to results, cement workers show a statistically Non significant increase in the mean values of Hb%, Monocytes & lymphocytes at ages 20-35 ($p > 0.05$) and Hb%, Monocytes & lymphocytes at ages 35-50, 50-65 is Significant at ($P < 0.05$). Considering the effects of exposure to cement dust, this study incorporated 3 basic hematology parameters, hemoglobin estimation and MC/LC. The idea was to recognize a simple, readily available and cost effective screening test that could help in identifying the presence of disease or its severity in cement workers, or both. Estimation of the hemoglobin% is used in clinical practice and is a useful screening test in routine medical check-up. The most frequently reported symptoms in cement mill workers were cough and phlegm production, dyspnea, chest tightness, impairment of lung function, sinusitis, and bronchial asthma Al-Neaimi and Lloyd (2001).

Discussion: Hematological parameter studied in the present work to confirm the involvement of cement dust in changing the blood picture. High TLC count represents a primary disorder of leukocyte production or may reflect a secondary response to some disease process or toxins. This may indicate an inflammatory change in the lungs of cement mill workers as described (Oleru 1984; AbouTaleb 1995; McDowell 1984). A search revealed no such study that could describe the effective of dust exposure in cement workers On the basis of such relation, our results suggest that cement dust effecting different systems including respiratory systems and thus, involving blood parameters to deviate from their normal values. A rise in hematological parameters mean values of has been demonstrated and it has been suggested that due to ongoing effect of cement dust but the parameters did not reveal significant difference between three age groups on the basis of period of exposure. It probably reflects the low degree of severity of disease expressed in terms of hematological changes.

In this study we found a significant increase in the mean values of Hb% ($p > 0.05$, Table;1) and is significant ($P < 0.05$) of Lymphocytes count at ages 35-50, 50-65. changes illuminating a significant difference between three age groups on the basis of duration of exposure in the cement workers.

High monocytes/Lymphocyte count represents a primary disorder of leukocyte production or may reflect a secondary response to some disease process or toxins Coates and Baehner (1991). The peripheral blood leukocyte count is a marker of inflammatory activity and ongoing tissue inflammation from whatever underlying cause. It thus might be viewed as a bio-marker of inflammatory response. Longitudinal studies have linked elevations of the peripheral blood leukocyte count to increased mortality from decreased pulmonary function, Weiss (1995) ischemic heart disease Friedman (1991) and cancer Grimm and Neaton 1985. In the present study High monocytes/Lymphocyte count was found to be significantly higher in cement workers compared to healthy controls (Table 2&3). It probably reflects the low degree of severity of disease expressed in terms of hematological changes. Although as per obtained hematological result, the above values of monocytes/lymphocytes count cannot be reliably translated into clinical benefit for the cement workers. However, a study involving 36-65 years of exposure in cement industry might bring out significant hematological changes

Redlich (1996) reported that, various occupational exposures cause lung injury and initiate a chronic inflammatory process that may either progress to initiate fibrosis or result in repair. Alternatively, it is also possible that chronic exposure to irritating material might lead to adaptation process, which resists inflammation and leukocytosis. On the basis of suggestion given by Hauser *et al.*, (1995) the similar adaptation to a certain extent may be responsible for non-significant rise in TLC with regard to period of exposure in this study.

Conclusion: In this study, responses from the questionnaires and interview of the workers indicated that Protective measures were provided and that they were used. Thus the observed deleterious effect of cement dust exposure may be due to the ineffectiveness of the protective gears. However non compliance of the workers in the use of protective gears cannot be ruled out in spite of contrary questionnaire and interview responses. Consequently we recommend that the cement factory management embark on health education of workers, acquire effective protective gadgets and enforce their usage. These measures would help to decrease the effects of occupational hazards of cement dust and detect the disease in initial stage when treatment is achievable in cement industrial workers.

TABLE: 1
HEMOGLOBIN PERCENTAGE OF CEMENT EXPOSED GROUP

AGE	MEAN	STANDARD DEVIATION	T-TEST VALUE	TABLE VALUE
20-35	11.8525	±1.9308	38.8225	1.96
35-50	12.1533	±1.6891	39.4076	1.96
50-65	11.6967	±1.8435	34.7496	1.96

HEMOGLOBIN PERCENTAGE OF CONTROL GROUP

AGE	MEAN	STANDARD DEVIATION	T-TEST VALUE	TABLE VALUE
20-35	12.8333	±1.7321	22.2226	1.860
35-50	13.7143	±3.6041	10.0677	1.943
50-65	13.625	±4.174	7.0077	2.353

Hemoglobin percentage of exposed age group 20-35,40 observations are the mean value which is Divided by standard error value and is not significant at $P>0.05$.

Hemoglobin percentage of exposed age group 35-50,30 observations are the mean value which is divided by standard error value and is significant at $P<0.05$.

Hemoglobin percentage of exposed age group 50-65,30 observations are the mean value which is divided by standard error value and is significant at $P<0.05$

TABLE: 2

LYMPHOCYTES COUNT OF CEMENT EXPOSED GROUP

AGE	MEAN	STANDARD DEVIATION	T-TEST VALUE	TABLE VALUE
20-35	33	± 10.8674	19.2050	1.96
35-50	43.5667	± 7.9149	30.1479	1.96
50-65	37.3	± 10.9305	18.6911	1.96

LYMPHOCYTES COUNT OF CONTROL GROUP

AGE	MEAN	STANDARD DEVIATION	T-TEST VALUE	TABLE VALUE
20-35	34.3333	± 8.9567	11.4996	1.860
35-50	31	± 11.4143	7.1856	1.943
50-65	31.5	± 1.6583	37.9884	2.353

Lymphocytes of exposed age group 20-35,40 observations are the mean value which is Divided by standard error value and is not significant at $P>0.05$.

Lymphocytes of exposed age group 35-50, 30 observations are the mean value which is divided by standard error value and is significant at $P<0.05$.

Lymphocytes of exposed age group 50-65, 30 observations are the mean value which is divided by standard error value and is significant at $P<0.05$.

TABLE: 3

MONOCYTES COUNT OF CEMENT EXPOSED GROUP

AGE	MEAN	STANDARD DEVIATION	T-TEST VALUE	TABLE VALUE
20-35	2.625	± 2.3842	6.9647	1.96
35-50	1.5333	± 2.0122	4.1734	1.96
50-65	2.2333	± 2.5519	4.7935	1.96

MONOCYTES COUNT OF CONTROL GROUP

AGE	MEAN	STANDARD DEVIATION	T-TEST VALUE	TABLE VALUE
20-35	1.4444	± 1.5713	2.7575	1.860
35-50	2	± 2.6459	2.6459	1.943
50-65	1.75	± 1.479	2.3665	2.353

Monocytes of exposed age group 20-35,40 observations are the mean value which is Divided by standard error value and is not significant at $P>0.05$.

Monocytes of exposed age group 36-50, 30 observations are the mean value which is divided by standard error value and is significant at $P<0.05$.

Monocytes of exposed age group 36-50, 30 observations are the mean value which is divided by standard error value and is significant at $P<0.05$.

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