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A COMPARATIVE STUDY OF DIFFERENT BLOOD PARAMETERS AMONGST THE CEMENT AND NON CEMENT WORKERS OF GUWAHATI CITY – A CROSS SECTIONAL STUDY

Physiology

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ABSTRACT

Background: Cement dust exposure not only leads to respiratory symptoms but also to skin, ocular and haematological disturbances. This study evaluates the changes in haematological parameters in relation to cement dust exposure.

Methods: Cross sectional study of 100 exposed and 100 controls groups amongst the age group of 18 to 60 years. Blood parameters were evaluated via Haemocytometry, Colorimetry and Westergren's method for TLC, Hb% and ESR respectively. Results were obtained by statistical analysis and p value of <0.5 was considered significant.

Results: There is significant increase in the levels of TLC and ESR with significant decrease in Hb% in groups exposed to cement dust as compared to control groups as evident by p value <0.5.

Conclusions: We concluded that cement dust exposure can lead to decrease in haemoglobin counts and increase in TLC and ESR respectively

KEYWORDS

Cement dust exposure, haematological parameters, Haemocytometry, Colorimetry, Westergren

INTRODUCTION:

The growing industrialisation and rapid urbanisation has led to serious tempering with the environment and along with it comes the hazardous effects on human beings. The demand for housings and multi-storeyed buildings has led to tremendous growth of the cement works and factories. In developing countries like India, cheap labour is abundant and the factories make use of this labour by employing them with minimal safety features which exposes them to the risk of developing many disorders associated with cement dust inhalation. Respiratory and dermatological symptoms associated with cement dust inhalations are widely known and have been extensively studied; but it has also been known to affect the haematological parameters and have ocular manifestations.

Cement dust can cause ill health by inhalation, skin contact or eye contact and the extent of damage depend on the duration of exposure, level of exposure and individual sensitivity [1].Toxic effects of airborne pollutants on human include damage of eyes, respiratory and nervous systems and a number of teratogenic, carcinogenic and mutagenic effects [3]. These pollutants have been implicated in many diseases including respiratory abnormalities, genetic disorders, haematological complications, organs and systems failure, vision problems, brain damage and teratogenic effect [7]. The main ingredients of cement are clay, silica and lime with added gypsum, oxides of aluminium, magnesium, iron etc. It is this silica in the cement that has been mostly implicated in causing the human hazards in the form of lung disorders like silicosis, bronchitis etc.

The manufacturing of cement in the factories requires grinding to powder form which makes the working environment very dusty, thus producing the inhalational hazards. Moreover, most of the cement factories in India have ill equipped set up to check and control its biohazards. Exposure to cement also causes a significant reduction in life expectancy of the average population of workers by a month or more [8].

The present study was undertaken to explore the effects of cement dust on haematological parameters of cement factory workers of Guwahati city region. Several studies have shown that some of the haematological parameters exhibit considerable variations at different periods of life to cement dust exposure. The increasing demand for cement and associated products has warranted the investigation for the health risk of cement dust exposure on the workers.

MATERIALS AND METHODS:

The study was conducted in the Department of Physiology, Gauhati Medical College, Guwahati, Assam, India.

Materials used – Haemocytometer slide, WBC pipette, Turk's fluid, thick coverslip, microscope, colorimeter, Drabkin's solution, Westergren's pipette with stand.

EXCLUSION CRITERIA:

1. All female individuals
2. Male individuals below 18 and above 60 years
3. Individuals suffering from Obstructive lung diseases like bronchial asthma, emphysema;
4. Restrictive lung diseases like pneumoconiosis, tuberculosis;
5. Hypertensive and diabetes
6. All smokers
7. Individuals working in the cement factories for less than 1 year.

Method:

The cross sectional comparative study was undertaken amongst the cement factory workers of Guwahati city region, Assam, India. The study group consisted of 100 male cement factory workers and 100 unexposed male control groups of equivalent socio-economic strata. The minimum age requirement was 18 years and the maximum age limit was 60 years. A detailed clinical history and informed consent were taken before the study. The subjects with no history of respiratory disorders, signs of liver, heart, hematologic and bone diseases, non smokers were only considered for the subjects. However, the symptoms of cough and sneezing were taken into account for both the exposed and unexposed groups.

5 ml of blood was collected from each subject via venipuncture using 5 ml disposable syringe. 3 ml of blood was transferred to a bottle containing ethylene diamine tetra acetic acid (EDTA) and thereafter used for estimating TLC by Haemocytometry using Turk's fluid and Hb% by colorimetry method using Drabkin's solution. The remaining blood sample was used for estimating ESR by Westergren's method.

The data were then expressed as mean ± SD and unpaired 't' test was employed using Microsoft Excel 2007 version. The p value of <0.5 is considered significant.

RESULTS:

Table 1 Haematological Parameters On Cement Factory Workers (exposed) And Unexposed Control Group

	Hb (g/dl) (mean± Standard deviation)	TLC/mm3 (mean ±Standard deviation)	ESR mm AEFH (mean ±Standard deviation)
Exposed n = 100	13.298 ± 0.76	7727 ± 1312.323	11.51 ± 2.39
Control n = 100	14.26 ± 0.71	6553 ± 1487.69	8.42 ± 1.84
p value	<0.5	<0.5	<0.5

Table 1 shows that there is a significant decrease in the mean value for haemoglobin and increase in the mean values for TLC and ESR for the exposed cement factory worker as compared to unexposed control group of equivalent socio-economic strata as demonstrated by p value of <0.5 in all three respectively.

TABLE 2 Comparisons Of Haematological Parameters On Cement Factory Workers According To Years Of Exposure

Years of exposure	Hb (g/dl) (mean ±Standard deviation)	TLC/mm3 (mean ±Standard deviation)	ESR mm AEFH (mean ±Standard deviation)
1-5 (n = 51)	13.63 ± 0.69	7170.59 ± 1291.556	10.08 ± 1.83
>5 (n = 49)	12.96 ± 0.68	8308.163 ± 1066.7	13 ± 1.979

Table 2 shows that the years of exposure on the individual seem to have a profound effect on the mean values of Hb, TLC and ESR respectively. Thus it can be seen from table 2 that individuals exposed to cement dust for more than five years tend to have a lower haemoglobin count and an increase in TLC and ESR respectively.

DISCUSSION:

It is widely known that exposure to cement dust for periods in short or longer affects the respiratory system causing variety of symptoms. Blood parameters play an important role in understanding the depth of derangement of the body tissues to any stress which may be biological, physical or chemical that may be inhaled or ingested etc. The human hematopoietic system is extremely sensitive to some environmental influences because of rapid synthesis and destruction of cells with consequent heavy metabolic demand [6].

In the present study it can be seen that there is a significant decrease in the haemoglobin levels in the exposed groups as compared to the unexposed groups; and also a significant increase TLC and ESR in the exposed groups respectively. This is evident by p value statistically being <0.5 for all three parameters. The above condition of decrease haemoglobin and increase TLC may be attributed to the deleterious effects on the bone marrow by components of cement dust especially silica. ESR may be raised in the exposed groups as a result of decrease in the haemoglobin count and a prepondence to infection. A significant decrease in haemoglobin concentration might be due to decrease in synthesis haemoglobin in bone marrow or decrease concentration of haemoglobin within the cell [9].

This decrease may be attributed to the effects of cement dust on the bone marrow combined with nutritional deficiency leading to anaemia. The increase in TLC may be attributed to the increase in number of agranulocytes especially lymphocytes. The agranulocyte percentage (lymphocyte and monocyte) increased significantly after the shift [5]. High TLC count represents a primary disorder of leukocyte production or may reflect a secondary response to some disease process or toxins [2].Chronic exposure to cement dust leads to further decrease in haemoglobin count because of its deleterious effects on the bone marrow. Also, an increase in TLC is seen with prolong years of exposure which may be due to some inflammatory reactions. Various occupational exposures cause lung injury and initiate a chronic inflammatory process that may either progress to initiate fibrosis or result in repair [10]. Similarly an adaptation mechanism may come into play after prolong exposure leading to leucocytosis. 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 [4].

CONCLUSION & FUTURE SCOPE:

The parameters undertaken in this study can only highlight about a portion of the effects that the cement dust exposure can have on blood and thus the body as a whole. An elaborate study of the effects of cement dust on other systems especially respiratory system and its association with the various haematological parameters is the need of the hour. Further studies among known respiratory illness patients, among different genders and ethnic comparison should be conducted to get more insights.

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