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## General biological monitoring of building construction workers: An environmental health survey

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### ABSTRACT

The aim of the present study was to investigate the health impact of South Indian building construction workers using different hematological and biochemical parameters. Blood samples were collected from 50 building construction workers. They were compared with 45 voluntary healthy subjects (control). Mean age of workers was  $39.50 \pm 1.00$ , age ranged from 23 to 64 years. A significant ( $p < 0.05$ ) decrease in the level of haemoglobin ( $10.52 \pm 0.14$ ) and increased level of ESR ( $13.96 \pm 1.45$ ) and TLC ( $9634.16 \pm 1345.03$ ) were obtained in cement industry workers. There were no significant difference between the cholesterol level among control and experimental groups. The level of serum enzymes Alanine Amino Transferase (ALT), Aspartate Amino Transferase (AST) were found to be increased in cement industry workers when compared to control groups.

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### KEYWORDS

Building construction workers;  
ESR;  
TLC;  
ALT;  
AST.

### INTRODUCTION

The construction industry is the most dangerous land based civilian work sector. Building construction workers are also exposed to high concentration of cement dust and fumes, prolonged inhalation of these dusts can provoke clinical symptoms and inflammatory response that may result in functional, structural, as well as other abnormalities<sup>[1]</sup>.

Hazardous materials in wet concrete cements that include alkaline compounds such as lime (calcium oxide) that are corrosive to human tissue, trace amounts of crystalline silica which is abrasive to the skin as well as harmful to lungs. Similarly trace amounts of chro-

mium can cause allergic reactions. Cement dust is suspected to be one of the main factors causing increased mortality among workers in the construction industry worldwide. Cement dust contains mixture of calcium oxide, silicon oxide, aluminium tri-oxide, ferric oxide, magnesium oxide, clay, shale, sand and other impurities<sup>[2]</sup>. The cement dust particles mainly entered into the body through respiratory and gastrointestinal tracts<sup>[3,4]</sup>. Inhaled cement dust mainly causes bronchial asthma and lungs and the stomach cancer<sup>[5-7]</sup>. It has also been reported that cement traces were found in various body organs including liver, spleen, bone, and blood and they produce different type of lesions.

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**TABLE 1: General characteristics of study population**

| Parameters                   | n=45 Control group<br>(Mean $\pm$ SEM) | n=50 Experimental<br>group (Mean $\pm$ SEM) |
|------------------------------|----------------------------------------|---------------------------------------------|
| Age (Years) *                | 36.00 $\pm$ 1.10                       | 39.50 $\pm$ 1.00                            |
| Average work exposure(years) | -                                      | 10.55 $\pm$ 1.15                            |

\*Significant level -Non significant

**TABLE 2 : Blood hematological parameters of cement industry workers**

| Parameters                            | Control group<br>(n=45)<br>(Mean $\pm$ SE ) | Experimental<br>group(n=50)<br>(Mean $\pm$ SE ) |
|---------------------------------------|---------------------------------------------|-------------------------------------------------|
| Haemoglobin Hb (g/dl)                 | 13.32 $\pm$ 0.47                            | 10.52 $\pm$ 01.40                               |
| Erythrocyte Sedimentation Rate(mm/hr) | 10.01 $\pm$ 0.09                            | 13.96 $\pm$ 1.45                                |
| TLC (10 <sup>6</sup> /L)              | 9432.63 $\pm$ 1015.60                       | 9634.16 $\pm$ 1345.03                           |
| Neutrophils (%)                       | 60.94 $\pm$ 3.00                            | 64.16 $\pm$ 2.77                                |
| Lymphocytes (%)                       | 36.45 $\pm$ 1.53                            | 31.58 $\pm$ 1.37                                |
| Eosinophils (%)                       | 1.98 $\pm$ 0.12                             | 3.26 $\pm$ 0.16                                 |
| Monocytes (%)                         | 1.16 $\pm$ 0.04                             | 1.52 $\pm$ 0.06                                 |

All values are given as mean  $\pm$  SE. \*Significant level -  $p < 0.05$ **TABLE 3 : Mean levels of biochemical parameters of cement industry workers**

| Parameters<br>(mg/dl) | Control group<br>(n=30)<br>(Mean $\pm$ SE ) | Experimental group (n=30)<br>(Mean $\pm$ SE ) |
|-----------------------|---------------------------------------------|-----------------------------------------------|
| Triglycerides         | 126.50 $\pm$ 17.30                          | 134.40 $\pm$ 16.00                            |
| total cholesterol     | 185 $\pm$ 22.00                             | 191 $\pm$ 23.10                               |
| HDL – C               | 50.1 $\pm$ 7.40                             | 52.15 $\pm$ 7.65                              |
| LDL – C               | 98.14 $\pm$ 10.40                           | 100.5 $\pm$ 10.20                             |
| VLDL- C               | 23.30 $\pm$ 1.20                            | 25.50 $\pm$ 1.10                              |
| ALT (IU/L)            | 22.50 $\pm$ 1.10                            | 30.01 $\pm$ 1.09                              |
| AST(IU/L)             | 30.60 $\pm$ 1.30                            | 36.25 $\pm$ 4.20                              |

All values are given as mean  $\pm$  SE. \*Significant level -  $p < 0.01$ 

toring of building construction workers. Most of the building construction workers do have smoking/smokeless tobacco habits. The present study is to assess the hematological and biochemical characteristics of building construction workers. Blood is a part of the circulatory system of the body and has several functions. Much valuable information can be readily obtained from blood tests. A wide variety of diseases and other dysfunctions may show signs or symptoms of a haematologic disease like anemia, eosinophilia and are highly associated with occupational hazards<sup>[8]</sup>. The basic hematological parameters (ESR and TLC) are increased in pneumoconiosis, hypersensitivity pneumonitis, bacterial pneumonia, pulmonary tuberculosis, bronchiectasis, chronic bronchitis, lung abscess, bronchiogenic carcinoma and various occupational diseases.

The purpose of the study was to estimate the hematological and biochemical parameters of building construction workers. These studies can help further, in the evaluation of the health effects of building construction workers.

## MATERIALS AND METHODS

The present study is to comparatively evaluate the hematological and biochemical changes in building construction workers from rural areas of Coimbatore city, South India. The study subjects comprised 95 healthy age matched individuals, which include 50 building construction workers and 45 controls. Participants were informed about the study and asked to sign an informed consent form and to complete a standardized questionnaire to obtain necessary data on lifestyles and personal factors (age, working period, health, etc.). None of these study groups showed significant differences with regard to lifestyle and personal factors. 5 ml of venous blood was collected from each participant after overnight fasting and transferred into EDTA coated tubes<sup>[9]</sup>. The blood was then centrifuged at 3,500rpm for half an hour to obtain serum. The EDTA blood samples were used for analyzing Hb, ESR, DC and TLC<sup>[10-12]</sup>.

The fasting blood sample was collected and allowed to stand for 30minutes and serum was separated. The serum was kept at 4°C for analysis. Serum TC, HDL, LDL and VLDL -cholesterol were determined by enzymatic method<sup>[13]</sup>.

## Statistical analysis

All statistical analysis was performed using SPSS 11.0. P values  $< 0.05$  were considered significant. Values are expressed in mean  $\pm$  S.E.

## RESULT

General Characteristics of study population are given in TABLE 1 that includes mean age and duration of employment. The mean age of workers was 39.50  $\pm$  1.00 years, and the mean year of employment was (10.55 $\pm$ 1.15). The mean level of Hg content ESR and TLC of exposed and control groups were represented in TABLE 2. There was a statistically significant decrease ( $p < 0.05$ ) in the values of haemoglobin and in-

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crease in the mean values ESR and TLC which were obtained in cement industry workers.

The mean level of Triglyceride, TC, HDL-C, LDL-C, and VLDL-C in control groups and building construction workers were represented in TABLE 3. There was no significant difference between these two groups in any one of the cholesterol parameter studied. The level of serum enzymes ALT, AST were found to be significantly ( $p < 0.05$ ) increased in building construction workers than control groups.

## DISCUSSION

In this study, we found a significant increase in the mean level of ESR and TLC. Inflammatory changes in the lungs of cement industry workers described by Kumar et al.<sup>[2,14-16]</sup>, and ESR has been found to be higher in patients with respiratory diseases<sup>[17]</sup>. High TLC count represents a primary disorder of leukocyte production or may reflect a secondary response to some disease process or toxins<sup>[17]</sup>. The peripheral blood leukocyte count is a marker of inflammatory activity and ongoing tissue inflammation from whatever underlying cause. It 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<sup>[18]</sup>, ischemic heart disease<sup>[19]</sup> and cancer<sup>[20]</sup>.

Redlich, 1996<sup>[21]</sup> 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. According to Hauser et al., 1995<sup>[22]</sup>, the similar adaptation to a may be responsible for non-significant rise in TLC with increased period of exposure in this study.

High levels of two key liver enzymes ALT and AST may be sign of liver damage<sup>[23]</sup>. Extensive studies and standardized tests to evaluate biological damage at different levels are recommended to public agencies concerned with environmental quality and public health. We recommended that building construction workers should regularly use appropriate personal protective measures at their work site and they need regular medical checkup.

These measures would help to decrease the occupational hazards and detect the disease in initial stage when treatment is achievable in building construction cement workers.

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