

# Effects of Cement Dust on Liver Function Parameters of Some Cement Factory Workers

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## Abstract

**Background:** Cement dust is one of the major air pollutants and its exposure causes various problems. It has deleterious effect on vital organs and may affect liver function. This study was done to assess the effects of cement dust on liver function parameters of cement factory workers.

**Materials and methods:** This case control study was conducted in the Department of Physiology, Chittagong Medical College, Chattogram in collaboration with Heidelberg Cement Bangladesh Ltd. Chattogram during January 2018 to December 2018. For these, 30 cement exposed workers of Heidelberg Cement Bangladesh Ltd. aged between 20-45 years were included as case group. Age and sex matched 30 subjects were selected from office workers of Heidelberg Cement Bangladesh Ltd. and Chittagong Medical College as control group. To assess liver function 3 ml of venous blood was collected from each subject under aseptic precaution. Liver enzymes were assessed. After compiling data, statistical analyses were done by using SPSS for windows version-25. Unpaired student's 't' test was done as test of significance.

**Results:** Liver enzymes like serum AST and serum ALT was lower in case group than control group within normal range and it was not statistically significant. Serum ALT was significantly higher in case group than control. It was also within normal range.

**Conclusion:** This study suggests that liver function might not be impaired by cement dust.

**Key words:** Cement workers; Liver enzyme; Liver function.

## INTRODUCTION

Cement is an essential component of construction industry.<sup>1</sup> Cement dust is the major pollution problem in cement factories.<sup>2</sup> Cement is manufactured through a series of process and dust is emitted during these process exposing workers to dust.<sup>3</sup> All stages of its production cause environmental pollution.<sup>4</sup> Construction workers constantly exposed to cement dust and hazardous toxic metals in cements and paints.<sup>5</sup> Workers are usually exposed to cement dust through skin, respiration and via gastrointestinal route.<sup>6</sup> Cement dust via blood reaches different structures of the body and affect their anatomical and physiological function.<sup>7</sup> Occupational exposure to cement dust might cause toxic effect on vital organs such as respiratory, renal and liver.<sup>8</sup> Cement is a dark grey colored powdery substance of aluminis, silica, lime, iron oxide and magnesium oxide with some amount of iron oxide, chromium, potassium, sodium, sulphur and magnesium oxide.<sup>9,2</sup> 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 system.<sup>9</sup>

Occupational exposure to silica, a major constituent of cement dust may lead to silicosis, pneumoconiosis and autoimmune diseases.<sup>10,11</sup> Chromium of cement may also cause allergic reaction, skin ulcer and asthma.<sup>12</sup> Chromium has been reported to be strong oxidizing agent and highly toxic effect in vital organs such as lung, kidney and liver.<sup>2</sup> In developing countries though million of people are working in cement industry, but they are not aware and appropriately trained. They work without high quality facemasks and protective equipment.<sup>13</sup>

Cement dust alter liver function indicated by abnormalities in AST, ALT, Total bilirubin and conjugated bilirubin.<sup>14</sup> Some studies reported significant increase in ALT, AST, ALP, LDH, in cement factory workers, which is indicative of liver cell membrane damage.<sup>2,8</sup> Some author observed decrease liver enzymes in cement factory workers.<sup>9,11</sup> Still there is controversy regarding the effect of cement dust on liver function. So the aim of this study is to assess the effects of occupational exposure of cement dust on liver function in cement workers.

## MATERIALS AND METHODS

This case control study was conducted in the Department of Physiology, Chittagong Medical College, Chattogram in collaboration with Heidelberg Cement Bangladesh Ltd. Chattogram during the period January 2018 to December 2018. Total 60 male subjects, aged between 20-45 years were included in the study by consecutive sampling method who meets the inclusion criteria. All subjects included in the study was informed and explained about the study and written informed consent was taken. 30 subjects were taken in each case and control group from cement exposed and unexposed workers respectively. 20-45 years old male cement factory workers directly exposed to cement dust for more than 2 years, working for 8 hours per day and 6 days per week, working in crushing, milling, packing and loading section and voluntarily willing to participate were included as case. Age matched non exposed worker of same cement factory working in office section and office workers of Chittagong Medical College were included as control.

Age below 20 year and over 45 year, Cigarette smoker, tobacco chewer, hypertension, bronchial asthma, cardiopulmonary disease, tuberculosis, malignancy, recent history of acute or chronic infection and hospitalization, previous history of working in textile, petrol pump, chemical industry were excluded from this study. The protocol of this study was presented and approved by ethical review committee of Chittagong Medical College, Chattogram, Bangladesh.

Prior to conduct the study, permission was taken from Chittagong Medical College and Heidelberg cement factory authority to perform the procedure on cement factory workers. Subjects were selected as exposed workers (Case) and unexposed workers (Control) on the basis of exposure to cement dust and also on the basis of inclusion and exclusion

criteria. Sampling was done in medical centre of cement factory and workers were gathered on that room which was well lighted and well ventilated in each day. They were explained about the aims, objectives and detail procedure of the study. They were encouraged for voluntary participation and allowed to withdraw from the study if they wish. Informed written consent was taken from each worker. Detailed medical and family history was taken and thorough clinical examination was done. All information was recorded in a preformed questionnaire. Height and weight of the subjects were recorded and BMI was calculated. Then general examinations were done and recorded. 3 ml of venous blood was collected from the subjects of both case and control group in two test tubes. Skin was cleaned with spirit and gauze and tourniquet was applied 2-3 cm above the elbow. Then vacu needle was used to draw blood and 3 ml were collected in red tube for analysis of liver enzyme for detecting any liver pathology. Tube, containing blood was kept in a cold box (4 °C) immediately. In each day, samples were collectively transported to the laboratory within 4 hours of collection in a cold box with minimum vibration. All data were recorded in a predesigned data collection sheet. Data was entered and analyzed in computerized SPSS program for windows version-25.

All the data were continuous and were expressed as mean ( $\pm$ standard deviation). Between groups comparison of these variables were done by Independent sample t test. P value < 0.05 was taken as statistically significant.

## RESULTS

Both the Case and control groups were similar in terms of their age, height, weight, BMI, systolic blood pressure and diastolic blood pressure (Table I).

**Table I** Age, height, weight, BMI and blood pressure of the 60 cement factory workers

Variables (unit)	Study groups		p value
	Case (n=30)	Control (n=30)	
Age (Years)			
Mean $\pm$ SD	36.83 $\pm$ 6.73	35.57 $\pm$ 7.02	0.479 <sup>ns</sup>
Range	22-45	22-45	
Height (cm)			
Mean $\pm$ SD	163.70 $\pm$ 6.57	165.93 $\pm$ 5.42	0.157 <sup>ns</sup>
Range	149-177	152-177	
Weight (Kg)			
Mean $\pm$ SD	59.33 $\pm$ 4.73	61.63 $\pm$ 5.71	0.095 <sup>ns</sup>
Range	52-68	50-72	
BMI (Kg/m <sup>2</sup> )			
Mean $\pm$ SD	22.21 $\pm$ 0.85	22.09 $\pm$ 0.87	0.795 <sup>ns</sup>
Range	19.00-22.80	19.50-22.80	
SBP (mmHg)			
Mean $\pm$ SD	121 $\pm$ 10	121 $\pm$ 9	0.795 <sup>ns</sup>
Range	100-130	100-130	
DBP (mmHg)			
Mean $\pm$ SD	76 $\pm$ 5	77 $\pm$ 4	0.434 <sup>ns</sup>
Range	60-80	70-80	

p value reached from Independent sample t test. ns: Statistically not significant; SD: Standard Deviation.

**Table II** Liver enzymes of cement factory workers

Liver enzymes	Unexposed workers (Control) (Mean±SD) (range) (n=30)	Exposed workers (Case) (Mean ±SD) (range) (n=30)	p value
AST (IU/L)	45.97±22.49 (21-113)	40.57±15.92 (16-70)	0.288 <sup>ns</sup>
ALT	27.10±10.47 (46-124)	24.83±7.38 (46-123)	0.336 <sup>ns</sup>
ALP	75.93±16.59 (46-124)	85.53±18.94 (46-123)	0.0041*

Independent sample 't'-test was done, values are expressed as Mean ± SD (Standard Deviation), n = number of subject, ns = Statistically not significant (p<0,05)\* = Statistically significant (p<0.05) values in parenthesis indicate range, AST = Aspartate amino Transferase, ALT = Alanine amino Transferase, ALP = Alkaline Phosphatase.

## DISCUSSION

In this study age, height, weight, BMI and blood pressure of subjects were measured. No significant difference was observed between exposed (Case) and unexposed (Control) workers regarding these parameters (p>0.05). It indicates both the groups were of similar characteristics. The results in the present study have shown that there is no significant difference regarding AST and ALT level between exposed and non exposed workers which is similar to some other investigators but dissimilar to others, ALP level of this study is significantly increased in exposed group than non exposed group but within normal range, which is also similar to some researchers but dissimilar to others.<sup>2,8-11</sup> The limitation of this study is that the sample size is relatively small. Large sample size may give us a more conclusive one.

## CONCLUSION

The findings of the present study showed that the liver function may not be adversely affected by cement dust exposure.

## DISCLOSURE

All the authors declared no competing interest.

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