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Original Research Article

An epidemiological study on effect of occupational exposure of cement

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ABSTRACT

Background: Construction industry chiefly depends on the cement. The constituents in the cement have various health effects in the exposed group. The present study focused to realize the health effects of cement exposure and duration of exposure.
Methods: The sample size was 831 male workers. The labourers included were construction workers (masons, helpers and concrete mixers) and cement loading and unloading workers. They were categorized in to five groups which were 5-9, 10-14, 15-19, 20-24 and 25+ years based on the duration of exposure to cement. Health hazards among these labourers were categorized in to lung function impairment symptoms, cutaneous symptoms and other symptoms.
Results: High frequency of respiratory tract ailments (persistent cough 54%, breathlessness 47%) was observed among loading workers as they were handling cement dust. Burning was the most observed one in concrete mixer (70%), hair loss and change in hair colour was observed in 60% of all categories of workers. Skin related ailments were more prevalent among masons, helpers and concrete mixers.
Conclusions: The frequency symptoms had correlation with their nature of work in the construction industry. Prolonged exposure to hazardous substances will decline the efficiency of labourers by malfunctioning their physiological functions. Proper awareness about the hazardous substances and well taken precautions among these labours can enhance their efficacy and wellbeing.

Keywords: Cement exposure, Wet cement, Dry cement, Masons, Loading workers, Health hazards

INTRODUCTION

Cement is an inevitable constituent of construction industry and a key to economic growth. High remuneration and uninterrupted working days attract more skilled and unskilled labourers to this sector. Cement is alkaline in reaction, odourless substance and considered as dust to pose a high risk of respiratory tract damage than any other poorly soluble dusts. Exposure to cement by skin, eye or inhalation results in various health effects.[1-3]

Cement dust are respirable in size due to its micro diameter (0.05-5 µm). The major passage for cement dust is found to be respiratory as well as gastrointestinal tract.[4] Hence, exposure to the cement is considered as a major cause for occupational lung disease. Risk of injury depends on duration and level of exposure and individual sensitivity.

Cement mill workers are the high risk exposed group to cement.[5,6] Construction labourers and cement transporting workers are also exposed to cement during their work. These groups are also exposed to cement for

different concentration and for different time interval. Their health issues are less reported. The aim of the present study is to realize the health hazards among dry (cement transporting labourers) and wet cement (construction workers) exposed group and effect of duration of exposure to cement.

METHODS

The present epidemiological study was conducted between December 2011 and March 2013 in Thrissur district of Kerala state. The sample size was 831. The present study was conducted by including male workers and those who have more than 5 years of exposure to cement and excluding immigrant workers and those having other chronic diseases. The study group comprises construction workers (masons, helpers and concrete mixers) and loading and unloading workers. The loading and unloading workers were from the cement goods- shed of the railway station situated at Ollur and in the nearby depot. Other labourers were working at their respective working places.

It was a questionnaire based study. Questionnaire was prepared by including all probable and frequently reported ailments by the study group. Symptoms related to cement were classified in to three viz. lung function impairment symptoms, cutaneous related symptoms and other health hazards. Lung function impairment symptoms comprise persistent cough, breathlessness, wheezing, irritation in throat and sneezing. Irritation on skin, burning, skin rashes and inflammation and hair loss and change in the hair colour on body were included in cutaneous related symptoms. Irritation on eye, vomiting tendency, dizziness and head ache were included in other health hazards.

All the members of the study group were visited personally and data collected individually by explaining questions and symptoms in regional language. The study population was categorized in to five groups viz. 5-9, 10-14, 15-19, 20-24 and 25+ years based on the duration of exposure to cement. Results were analysed by SPSS software 22.0 package.

RESULTS

In the present study 831 labourers were interviewed from different labour categories of cement workers. There were 10.3% concrete mixers, 9.3% helpers, 48.4% masons and 32% loading and unloading workers. The study population was categorized in to five groups based on the duration of exposure to cement (Table 1).

Symptoms related to lung function impairment comprise persistent cough, breathlessness, wheezing, irritation in throat and sneezing. Loading workers have more frequency of symptoms related to lung function impairment (Table 2).

Table 1: Frequency of cement workers according to year of exposure and category of labour.

Years of exposure	Category of workers				Total
	Concrete mixers	Helpers	Masons	Loading workers	
5-9	24	34	96	84	238
10-14	33	12	79	59	183
15-19	8	25	134	66	233
20-24	13	5	46	35	99
25+	8	1	47	22	78
Total	86	77	402	266	831
Percentage	10.3	9.3	48.4	32	100

Table 2: Percentage of symptoms related to lung function impairment in each category.

Category of workers	Persistent cough	Breathlessness	Wheezing	Irritation in throat	Sneezing
Concrete mixer	27.9	26.74	10.46	2.32	1.16
Helper	20.77	31.16	9.09	7.79	2.59
Loading worker	54.88	47.36	26.31	13.15	8.27
Mason	24.87	15.92	7.21	2.73	6.21

Table 3: Percentage of cutaneous effects in each category.

Category of workers	Irritation on skin	Burning	Skin rashes/ inflammation	Hair loss and change in the hair colour on body
Concrete mixer	11.6	70.9	33.7	70.9
Helper	37.7	53.2	32.5	70.0
Loading worker	28.9	36.5	35.3	66.5
Mason	26.1	55	17.4	63.4

Table 4: Percentage of other health hazards in each category.

Category of workers	Irritation on eye	Vomiting tendency	Dizziness	Head ache
Concrete mixer	7	12.8	2.3	5.8
Helper	5.2	11.7	6.5	15.6
Loading worker	12.4	3.4	4.5	16.2
Mason	7.5	16.9	7.0	14.4

Table 5: Percentage of cutaneous symptoms based on duration of exposure.

Symptoms	5-9	10-14	15-19	20-24	25+
Irritation on skin	31.08	23.52	25.41	12.87	30
Burning	56.17	47.05	44.16	53.92	60
Skin rashes/inflammation	25.84	24.59	28.33	35.29	25
Hair loss and change in colour on body	73.78	63.63	58.33	63.72	73.75

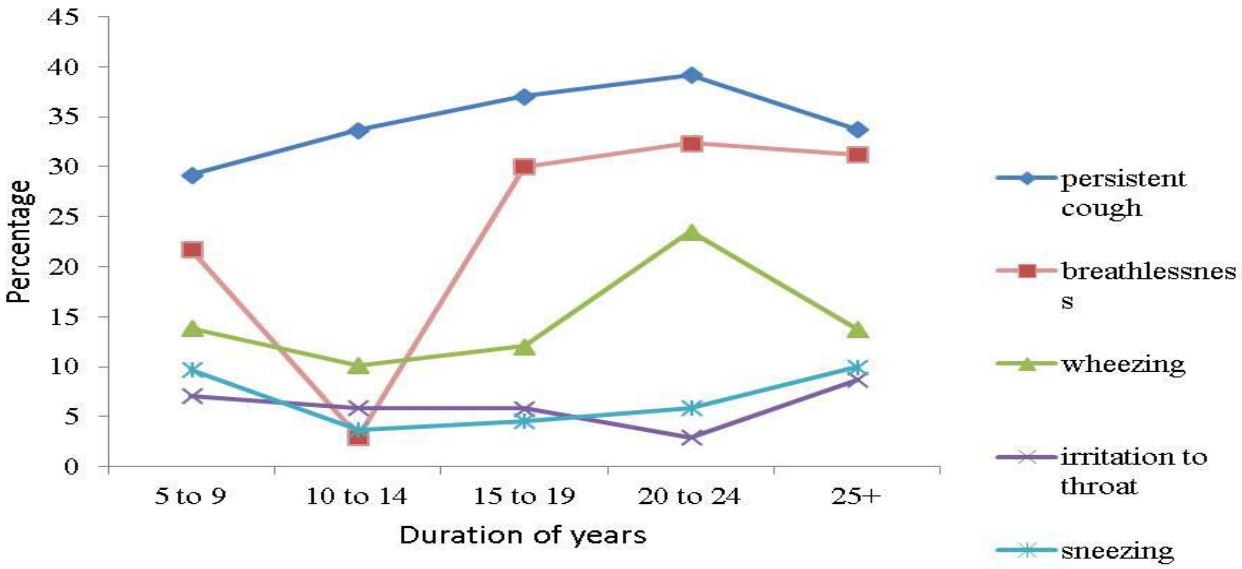

Figure 1: Percentage of lung function impairment in all study groups based on duration of exposure.

Irritations on skin, burning, skin rashes/inflammation and hair loss or change in hair colour on body were considered in the group of symptoms related to cutaneous effects. All categories of labourers reported hair loss and change in hair colour on body with high percentage. Burning sensation was more observed (70.9%) in concrete mixers (Table 3).

Other symptoms reported were irritation to eye, vomiting tendency, dizziness and headache. Different categories have different levels of these symptoms (Table 4).

The symptoms related to lung function impairment in all labourers were compared with the duration of exposure (Figure 1). Symptoms like persistent cough, breathless-ness and wheezing gradually increases from beginners to 20-24 years of exposure. Whereas irritation in throat and sneezing were high in the beginning group then it decreases, again rise in the percentage in prolonged exposed group.

Cutaneous symptoms were also compared in all categories of labourers with duration of exposure (Table 5). Every symptom related to skin was high in beginners, and then it gradually decreased, and then again rose in percentage with prolonged exposure.

DISCUSSION

The epidemiological data presented in this study is based on the personal observations and by the use of questionnaire. The sample size was 831.The grouping of workers into concrete mixers, helpers loading workers and masons are based on the 'job types'.[7]

In this study, years of service were taken for consideration instead of age. Here more frequency was observed among the two classes that are 5-9 years (29%) and 15-19 years (28%). Then number was decreased. Less frequency observed in last two classes (20-24 years and 25+ years). They have 12% and 9% respectively. It

may be due to movement of these labourers to higher category as contractors or supervisors. Various authors have reported 8% in their study group of above 20 years of service while others had only 2% of this category in their study as cement workers.[8,9] This is in support of the present observation that they have moved to higher levels in that industry. The professional association of cement workers itself is named as 'Cement Workers and Supervisors Association'. Many workers originally started their work in some other industry and later moved to construction industry owing to high remuneration, steady employment, more opportunities and chances of up-gradation of category on skill acquisition.

The health condition of the study group was assessed based on signs and symptoms presented by them. Studies have reported 45.3% of clinical symptoms of upper respiratory tract ailments among the cement dust exposed workers.[10] They also reported 37.5% of lower respiratory tract symptoms like cough with or without expectoration wheeze etc. In the present study persistent cough, breathlessness and wheezing were the more observed symptoms associated with respiratory tract. Other studies have reported 12.6% with respiratory symptoms.[11] Another study reported 21.3% of chronic cough and 36.9% of breathlessness in that study.[12] There are reports that 70.6% workers have respiratory symptoms.[13]

Highest frequencies of respiratory tract ailments were more observed among loading workers as they were dealing with dry cement, handling as cement dust. They have to shift cement bags from wagons directly to the trucks for shifting to the neighbouring depots. Considering the nature of their work, they were more exposed to cement as dry form. The security measures used by them like face masks (locally available), cotton clothes were not enough to prevent the deposition of micro diametric cement powder. Similar reports on inhale cement dust and consequent health hazard were also reported by different workers.[7,14]

In this study, lung function impairment symptoms and cutaneous symptoms were further analyzed on the basis of duration of exposure. Persistent cough and wheezing showed gradual increasing pattern from 5-9 years age group to 20-24 years age group. Then the percentage is lowering in the last class may be due to low number of workers. Other important symptom, the breathlessness showed highest frequency in the first class (5-9 years) then lowering in the next class and again increases upwards the last class (25+years). These observations revealed that prolonged exposure to cement resulted in lower respiratory functions. Whereas irritation to throat and sneezing were manifested by acute exposure itself.

Cutaneous symptoms like irritation on skin, burning, skin rashes were observed in higher percentage in all categories of 'job types'. Burning was the most observed one in concrete mixer (70%), hair loss and change in hair colour was observed in 60% of all categories of workers. Cutaneous problems were more prevalent than pulmonary function impairment among masons, helpers and concrete mixers since they handle wet preparations of cement rather than in dust form. Water alters the pH of cement and form calcium hydroxide resulting various manifestations. These symptoms were present by the acute exposure itself. So prolonged exposure lead to the severity of these symptoms. In another study there were 89-91% of cement workers had skin allergies.[15]

The prevalence of symptoms had direct correlation with their nature of work. Prolonged exposure to hazardous substances will decline the efficiency of labourers by malfunctioning their physiological functions. Proper awareness about the hazardous substances and well precautions among these labours can enhance their efficacy and wellbeing of them.

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