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Assessment of Occupational Health Hazards and Pulmonary Function Impairment among Cement-Exposed Construction Workers

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Abstract: *The construction sector is the world's largest industrial employer, yet the occupational health hazards faced by unorganized laborers exposed to wet and dry cement remain under-researched. This study evaluates the health and hygiene status, alongside lung function impairment, among 876 construction workers and 450 spirometry subjects (150 masons, 150 loading workers, and 150 controls). Epidemiological findings reveal a high prevalence of occupational cutaneous symptoms, such as severe burning and skin irritation, across all worker categories. Furthermore, pulmonary function tests indicate significant respiratory deterioration, particularly among loading workers exposed to dry cement dust, with only 38.7% of loaders and 50% of masons exhibiting normal spirometry compared to controls. Declines in FVC%, FEV1%, and PEF highlight obstructive, restrictive, and mixed lung disease patterns. The study concludes that currently used personal protective equipment (PPE), such as cloth masks and basic gloves, are statistically ineffective against micro-sized (0.05 µm) cement particles. To mitigate these progressive occupational hazards, the mandatory implementation of industrial-grade PPE, regular medical surveillance, enhanced safety awareness, and strict legislative enforcement by stakeholders are urgently recommended.*

Keywords: Occupational Health Hazards; Cement Dust Exposure; Construction Workers; Spirometry (Lung Function); Dermatitis; Personal Protective Equipment (PPE); Industrial Safety etc.

I. INTRODUCTION

Occupational health and hygiene have become critical components of public health, particularly in developing economies where small-scale industries constitute a significant share of the labor force. Among these, the welding sector is notably hazardous due to its intrinsic exposure to thermal, chemical, and particulate risks. Welding operations generate a complex mixture of metal fumes, gases, and radiation, which pose significant threats to the respiratory and physiological well-being of workers. In India, informal and small-scale welding workshops frequently operate under substandard health and safety conditions, exacerbating the vulnerability of workers to occupational diseases and hygiene-related complications.

The city of Indore, a major industrial hub in Central India, hosts a dense concentration of small-scale welding workshops. Despite their economic contribution, these establishments are often characterized by inadequate ventilation, insufficient use of personal protective equipment (PPE), and limited awareness regarding occupational health protocols. The cumulative exposure to welding fumes—containing hazardous substances such as manganese, chromium, and ozone—can lead to chronic respiratory conditions, including bronchitis, metal fume fever, and even pulmonary fibrosis. Moreover, poor hygienic practices and lack of periodic health evaluations further elevate the risk of physiological deterioration among workers.

This study seeks to bridge the knowledge gap by systematically assessing the occupational health and hygiene standards among small-scale welding workers in the Indore industrial region. The research adopts a multi-dimensional

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approach, incorporating lung function analysis (spirometry), physiological assessments (such as heart rate, blood pressure, and oxygen saturation), and workplace hygiene inspections to comprehensively evaluate exposure risks and overall health status. By integrating medical diagnostics with observational hygiene audits, the study aims to provide empirical evidence on the current state of occupational health in this high-risk population.

The findings are expected to contribute significantly to occupational health policy formulation and intervention design tailored for small-scale industrial settings. Additionally, the research will offer actionable recommendations for enhancing worker safety through improved hygiene practices, health monitoring, and regulatory oversight in the welding industry.

II. LITERATURE REVIEW

2.1 The literature review in the provided document highlights the health and respiratory hazards associated with cement exposure, supported by various previous studies:

1-Health, Hygiene, and Skin Hazards:

Chromium and aluminium are the main toxic constituents in cement that cause skin damage, and chronic exposure can lead to neurotoxicity, renal failure, and anaemia.

Occupational contact dermatitis, particularly hand dermatitis caused by chromate allergy, is highly prevalent among construction workers exposed to cement.

Other constituents like cobalt, nickel, and epoxy resin also act as allergens contributing to occupational skin diseases.

Exposure to cement dust generates free radicals and reactive oxygen species (ROS), which cause oxidative stress and damage cell membranes.

Prolonged exposure has genotoxic effects, causing chromosomal aberrations and decreased mitotic index in workers, a condition that is further accelerated by smoking.

2-Lung Function and Respiratory Hazards:

Cement dust particles are respirable (0.05-5 micrometer in diameter) and easily lodge in the tracheobronchial tree and alveoli, impairing pulmonary function.

Inhalation of cement dust causes mucous hypersecretion, lung fibrosis, chronic obstructive pulmonary disease (COPD), restrictive lung disease, and pneumoconiosis.

Various epidemiological studies show that prolonged exposure to cement dust leads to a significant decrease in lung function parameters, such as Forced Vital Capacity (FVC), Forced Expiratory Volume (FEV1), and Peak Expiratory Flow (PEF).

Workers exposed to cement dust are at a higher risk of developing chronic respiratory symptoms (cough, sputum build-up, dyspnoea) and have an increased risk of lung and laryngeal cancer.

2.1 Literature Gap Analysis Table

Key Research Area	Focus of Previous Studies (Author & Year)	Identified Literature Gap	Contribution of Current Study
1. Target Population (Factory vs. Construction Workers)	Pichhlizyada tar studies ka focus cement mill/factory workers par rahahai (Jenny et al., 1960; El-Sewefy et al., 1970; Oleru, 1984; Alakija et al., 1990; Yang et al., 1996; Meo et al., 2004; Merenu et al., 2007).	Unorganized construction sector (jaise masons, helpers, tile setters) meinkaamkarne wale labourers par health aur dust exposure ke reports bohotkamhain.	Yeh study specifically construction workers aur loading/unloading labourerske lung function aur health hygiene ko target kartihai.

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2. Lung Function Parameters (MMEF Analysis)	Purani studies ne mainly standard spirometry parameters jaise FEV1, FVC, FEV1/FVC ratio, aur PEF par dhyandiyahai (Mahmood et al., 2010; Meo et al., 2013; Al-Neaimi et al., 2001; Ali et al., 1985; Badari and Saeed, 2008).	Maximal Mid Expiratory Flow (MMEF25-75), joki alveoli mein dust jama hone aur 'small airways disease' ka main indicator hai, usko cement-exposed groups meinpehle examine nahikiyagayatha.	Yehpehli study report haijisne cement exposed group (loading workers aur masons) mein MMEF parameter ko examine kiyahai.
3. Nature of Exposure (Dry vs. Wet Cement)	Purani studies ne cement dust inhalation yasirf skin allergies/dermatitis par general studies kihain (Tjoe et al., 2003; Bock et al., 2003; Putten et al., 1995).	Is baat par comparative analysis ki kami thiki cement kealag-alag texture (Sookha vs. Geela) kalabourers par alag-alagkyaasarhotahai.	Is study ne comparative analysis kiyahai: Dry cement exposure (loading workers, jinhe lung impairment zyadahai) vs. Wet cement exposure (masons, jinhe skin burning zyadahai).
4. Efficacy of Preventive Measures (Masks & PPE)	Pichhli studies ne sirfyeh document kiyakikitne % workers protective gear use kartehain (Ahmed and Smith, 2010; Ashish et al., 2011; Ahamed and Abdulla, 2012; Sundarraj, 2013). Ahamed and Abdulla (2012) ne cloth masks ke use ko report kiya.	Is baatka in-depth assessment nahithaki ordinary cotton cloths (gamcha/towel) ya conventional PPEs asalmein 0.05-5 µm size ke cement dust koroknemeinkitne ineffective hain.	Study statistically prove kartihaiki 87.2% loading workers mask (cotton cloth) use karnekebawajood respiratory ailments face karrahehain, yani current practices inadequate hain.

Table 1 Literature Gap

III. ARIA OF STUDY

Geographical Location:

The study is primarily focused on the local place where study is carried out, specifically around cement goods-sheds and temporary storage centers located in the vicinity of the railway station. While the document notes the flourishing construction sector in India and the heavy transport of cement to states like MP, the specific data collection centers for loading and unloading workers are situated in the Indore district.

Specific Work Sites:

Data was collected randomly from different localities within the district, focusing on two distinct work environments to assess exposure to different forms of cement:

Construction Sites: Small construction sites located within residential areas of the district. The workforce here comprises masons, helpers, concrete mixers, and tile setters who are primarily exposed to wet cement.

Cement Goods-Sheds and Depots: Railway station goods-sheds and nearby depots where fully loaded goods trains arrive. Loading and unloading workers at these sites are constantly exposed to dry cement dust while clearing wagons and filling trucks.

Demographic and Residential Distribution:

The study sample comprises 876 male laborers, categorized by their residential backgrounds to reflect their socio-geographic distribution:

Panchayat Area (Rural): The majority of the workforce, comprising 63.81% of the laborers, resides in different Panchayat areas.

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District Corporation Area (Urban): 34.59% of the laborers reside in the district Corporation area.
Municipality Area: The remaining 1.60% of the laborers reside in the municipality area.

IV. PROBLEM IDENTIFICATION

Key Research Area	Focus of Previous Studies (Author & Year)	Identified Literature Gap	Contribution of Current Study
1. Target Population (Factory vs. Construction Workers)	Pichhlizyada tar studies ka focus cement mill/factory workers par rahahai (Jenny et al., 1960; El-Sewefy et al., 1970; Oleru, 1984; Alakija et al., 1990; Yang et al., 1996; Meo et al., 2004; Merenu et al., 2007).	Unorganized construction sector (jaise masons, helpers, tile setters) meinkaamkarne wale labourers par health aur dust exposure ke reports bohotkamhain.	Yeh study specifically construction workers aur loading/unloading labourerske lung function aur health hygiene ko target kartihai.
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3. Nature of Exposure (Dry vs. Wet Cement)	Purani studies ne cement dust inhalation yasirf skin allergies/dermatitis par general studies kihain (Tjoe et al., 2003; Bock et al., 2003; Putten et al., 1995).	Is baat par comparative analysis ki kami thiki cement kealag-alag texture (Sookha vs. Geela) kalabourers par alag-alagkyaasarhotahai.	Is study ne comparative analysis kiyahai: Dry cement exposure (loading workers, jinhe lung impairment zyadahai) vs. Wet cement exposure (masons, jinhe skin burning zyadahai).
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Table 2 Problem, Cause and Effects

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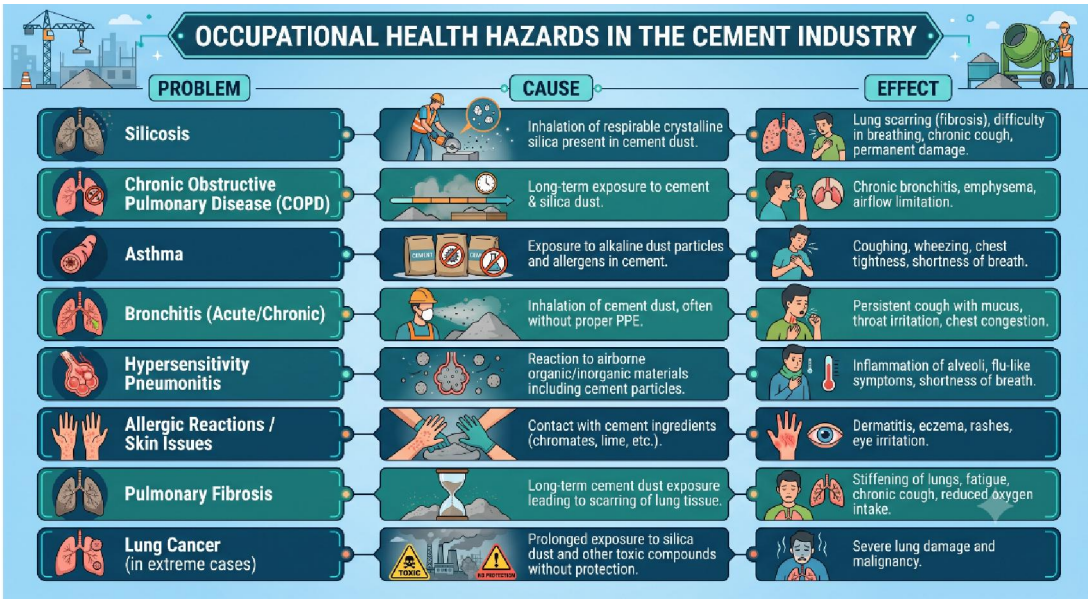

Figure 1 Occupational hazards in Cement Industries

V. MATERIAL AND V.METHODOLOGY

The research methodology was divided into two main phases: an epidemiological Health and Hygiene study, and a clinical Lung Function study.

1. Health and Hygiene (Epidemiological) Study

Data Collection and Tool:

Data was collected through personal interviews using a pre-designed and pre-tested questionnaire.

A pilot study involving 96 laborers was initially conducted to interact with workers and understand their difficulties, after which the questionnaire was restructured.

Interviews were conducted during leisure time, taking 15-20 minutes per individual, with questions explained in the regional language.

The questionnaire recorded data on age, education, socioeconomic status, years of exposure, personal habits (smoking, alcoholism, chewing), and the use of safety gadgets (masks, gloves, boots, etc.).

Sample Size and Study Population:

The sample size was calculated using WHO Guidelines (1983) based on a 95% Confidence Interval, 80% power of the test, and 5% Type-1 error.

While the minimum required sample size was determined to be 860, the actual epidemiological study included 876 laborers.

The study group comprised masons, helpers, concrete mixers, tile setters, and loading/unloading workers.

Inclusion and Exclusion Criteria:

Inclusion: Only male workers who gave consent and had more than 5 years of exposure to cement work.

Exclusion: Female workers (who primarily worked as helpers), workers with less than 5 years of service, immigrant workers, and individuals with existing chronic diseases (as advised by a medical officer).

2. Lung Function Study (Pulmonary Function Test - PFT)

Equipment and Parameters:

Lung function was assessed using a flow-sensing portable spirometer (Spiro tube from Thor soft medical system) connected to a laptop running specific software to calculate predicted values based on Indian population adjustments.

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The main parameters measured included Forced Vital Capacity (FVC), Forced Expiratory Volume in the first second (FEV1), FEV1/FVC ratio, Peak Expiratory Flow (PEF), and Maximal Mid Expiratory Flow (MMEF25-75).

Study Population for PFT:

The study included 300 cases (150 masons exposed to wet cement and 150 loading workers exposed to dry cement dust).

A control group of 150 matched subjects (75 electricians/plumbers and 75 loading workers from rice bazaars not exposed to cement) was used for comparison.

Inclusion and Exclusion Criteria for PFT:

Inclusion: Males willing to perform the test with more than 5 years of cement exposure.

Exclusion: Laborers with less than 5 years of exposure, immigrants, those with chronic respiratory distress (like asthma or COPD), and individuals with habits of alcoholism, smoking, or tobacco chewing.

Procedure:

After recording anthropometric data (height and weight without shoes) and excluding known pulmonary diseases with the help of a pulmonologist, subjects were given a practice test.

The test was conducted in a standing position; subjects were asked to inhale fully, seal their lips around the mouthpiece, and forcefully exhale for at least 6 seconds.

At least three attempts were recorded per subject, and the highest FVC and FEV1 values were retained for analysis.

3. Statistical Analysis

The collected data was analyzed using the SPSS software package (version 22.0).

Descriptive analysis and Student's t-tests were performed for continuous variables.

A 'z' score test for two population proportions was used to determine significant differences between groups (e.g., users vs. non-users of protective equipment).

For all statistical tests, a p-value of <0.05 was considered statistically significant.

VI. RESULT

1-The study includes a total of 633 cases (refer to Table 3). Among the helpers, 33 participants were female; however, their data were not analyzed separately. Seventy percent of the participants had more than 10 years of exposure to cement-related work, while 16% had over 20 years of exposure. Of the 633 individuals interviewed, 43% were masons, 15% helpers, 9% concrete mixers, 27% loading and unloading workers, and 6% tile workers. Each occupational group was further subdivided into three categories based on the duration of their exposure to cement: less than 10 years, 10–20 years, and more than 20 years.

Table 3: Category and duration wise distribution of the study group

Category	Duration as cement workers			Total
	<10 years	10-20 tears	>20 years	
Masons	53	175	47	275
Helpers	37	49	11	97
Concrete Mixers	19	25	10	54
Tile workers	20	11	4	35
Loading & unloading Workers	45	97	30	172
Total	174	357	102	633

Health hazards of construction workers such as masons, helpers, concrete mixers and tile workers and transporters like loading & unloading workers are focused in this study. Frequency of lung function impairment and cutaneous problems

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are more observed in these workers. Persistent cough, breathlessness and wheezing are taken to be indicators of lung function impairment. Frequency of cement workers with lung function impairment is shown in table -4

Table 4: Frequency of lung function impairment in different classes of workers

symptoms	Masons	helper	Concrete Mixers	Tile workers	Loading & unloading Workers
Persistent cough	32	27	26	7	56
Breathlessness	28	34	30	8	68
Wheezing	10	18	12	4	35
sneezing	12	15	5	12	30

Workers who were exposed to wet cement have more cutaneous problems than dry cement workers. Cutaneous effects include burning effect, skin rashes/ inflammations and irritation to skin. Frequency of cutaneous symptoms are shown in table -5.

Table 5: Frequency of Cutaneous symptoms in different classes of workers

Symptoms	Masons	Helper	Concrete mixers	Tile workers	Loading & unloading worker
Burning effect	66	60	70	70	30
Skin rashes/inflammation ion	26	40	30	38	12
Irritation to skin	36	46	32	25	16
Hair loss and colour change on body	80	75	65	85	78

Masons have reported more cutaneous symptoms. Altogether 90% have skin related symptoms. Sixty six percentage have skin burns, 26 % have skin irritation and 36 % have skin rashes and 80% have hair loss or change in hair colour on body. Persistent cough is reported by 32% and breathlessness is reported by 28% of masons. Cutaneous problems are more frequent in helper category compared to lung function parameters. Above 80 % have cutaneous problems in this group. Forty percentage have skin rashes and skin irritation is also reported in 46 % of helpers. Thirty four percentage of helper group also complained by breathlessness. Tile workers and concrete mixers also have skin related problems. Out of 54 concrete mixers, 70 % have skin burning, 30 % have skin rashes and 65 % of workers have reported hair loss & colour change on body. Twenty six percentages of workers have persistent cough and breathlessness is also reported in 30% of workers. Seventy percentages of tile workers have cutaneous problems. Sneezing is also reported by 12 % of these workers. All the symptoms under study are more prevalent among loading and unloading workers. Of all symptoms considered respiratory tract and skin diseases are the highest. Fifty six percentages have persistent cough, 68% have breathlessness and 30% have skin burns. Hair loss and change in hair colour on body are reported by 78% of loading and unloading workers.

2-The study comprises 508 cases (Table-7). Of these only 48 cases were females under helper category and not separately analyzed. Seventy two percent cases have more than 10 years of exposure in cement work and 17 % over 20 years. Out of 508 individuals interviewed during the study 60 % individuals belonged to the category of masons, 21 % helpers, 12% concrete mixers and 7% tile workers. Individuals under each category (based on nature of work) were further divided in to three based on their duration of exposure to cement.

Table 7. Category and duration wise distribution of the study group

Category	Duration as cement workers			Total
	<10 years	10-20 tears	>20 years	
Masons	60	186	58	304
Helpers	39	54	13	106
Concrete Mixers	20	29	11	60
Tile setter	21	12	5	38

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Total	140	281	87	508

Impairment and cutaneous effects is shown in table -8. Cutaneous problems have been reported in 90 % of masons. Sixty four percent have skin burns, 38 % have skin irritation, 33 % have skin rashes and 79 % have hair loss or change in hair colour on body. Persistent cough is reported by 30%, breathlessness is reported by 19 % of masons. Wheezing and sneezing is also complained by 9% and 8% of workers respectively. Helper category reported skin related problem as well as pulmonary ailments. Forty two percentages of workers were affected by skin rashes/ inflammations. Altogether ninety percentages of workers have shown skin related problems. This includes burning, irritation to skin, Skin rashes/ inflammations and hair loss/ hair change on body. Twenty eight percentages of workers have breathlessness and 33% have reported persistent cough.

Table: 8 Frequency of lung function impairment & cutaneous effects in different categories of workers.

Symptoms	Masons	Helpers	Concrete mixers	Tile workers
Lung function impairment				
Persistent cough	30	28	23	8
Breathlessness	19	33	29	9
Wheezing	9	19	9	3
Sneezing	8	10	11	15
Cutaneous effects				
Burning effect	64	53	72	69
Skin rashes/inflammation	33	42	28	40
Irritation of skin	38	44	31	23
Hair loss and colour change on body	79	72	66	86

VII. DISCUSSION

1-Construction workers are more exposed to cement than other labours. Wet cement preparations are more handled by construction workers. Construction workers reported more symptoms related with skin than respiratory tract. Actually they are handling with cement preparations of different combinations rather than in dust form. Hence the chances of inhaling are less in comparison to loading and unloading workers. When the cement dust comes in contact with water, hydroxides are formed that impair natural water alkalinity, living tissue leads to burning, skin rashes and inflammation. However, pulmonary problems were also observed in the study group of masons. They have more than fifteen years of exposure. This shows that there is a correlation between and symptoms years of exposure.Burning and skin rashes are important symptoms seen in workers exposed to wet cement. Moist cement burns occur on lower leg, ankle and dorsal regions of hand. In some workers it will leads to scaling of skin, oozing and itching. Exposure to wet cement can also cause inflammation called Irritant Contact Dermatitis due to the presence of hexavalent chromate in cement. This hexavalent form penetrates the skin easily than other.Loading and unloading workers showed maximum frequency of symptoms like persistent cough, breathlessness, wheezing etc. This is caused by the exposure to dry dust particles which is in definite correlation with their nature of work. Portland cement contains some insoluble residues. A fraction of the insoluble residue may be free respirable silicates, which can cause silicosis, fibrosis of lungs and possibly cancer. Hence Portland cement can be considered as potential cause of occupational lung disease. Inhaling high levels of dust may occur during emptying cement bags. Short term exposure to cement dust irritates the nose and throat and causes choking and difficulty in breathing.

2-Health problems of construction workers are highlighted in this study. Construction worker perform a large variety of duties concerned with building, repairing and wrecking building and so on. Their work may include mixing, pouring and spreading concrete, gravel and other materials. Workers are exposed to cement and its potential toxicological effect during pouring and cleaning processes. Cutaneous problems aremore prevalent than pulmonary problem among masons, helpers, concrete mixers and tile workers.Theyhandlewetcementpreparationsof different combinations rather

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than in dust form. Cement is the common cause of dermatitis among construction workers. Skin diseases are more frequent among cement users than manufacturing workers. Because the presence of hexavalent chromate in cement. The hexavalent form penetrates the skin easily than other forms. Chromium dermatitis affects the dorsal region of hands and distal forearms. Other impurities such as nickel and cobaltalsoleadtomorecomplications.Whenthe cement dust comes in contact with water, hydroxides are formed that impair natural water alkalinity, living tissue leads to burning, skin rashes and inflammation Eventhoughcutaneousproblemsare morereportedbyworkersintheconstruction field, respiratory problems are also reported by helpers and concrete mixers. This is due to the pattern of their work.They are also exposed to dry cement during their work.Hence inhalation of dry cement is more in these two groups compared to masons. Cement dust has been implicated as a cause of mucous hyper secretion and obstruction of small airways

VIII. CONLCUSION

1-Construction sector is world's largest industrial employer with 7% of total world employment and 31% of industrial employment. Cement can cause ill health by skin and eye contact or inhalation. Risk of injury depends on duration and level of exposure and individual sensitivity. There are many reports on the health hazards of cement factory workers. But the reports on construction workers are very less. They have to handle cement in different combinations at different time interval. Masons, concrete mixers, tile setters, helpers, loading and unloading workers form the working force in construction industry. Of this masons, concrete mixers, tile setters and helpers were exposed to wet cement and loading workers to the dry cement in the form of dust. The prime aim of the study is to understand the occupational hazards of cement and health status of cement workers in construction industry. It has also attempted to suggest remedial measures to reduce work related hazards.

Health hygiene and lung function parameters in construction workers were studied. There were 876 samples for Health hygiene study and lung function parameters of 150 masons, 150 loading workers and 150 controls were studied.

In the Health hygiene study, most of the workers were in the 25-35 age groups. Major share (79%) of workers were below 20 years of exposure. When the personal habits were considered, 64.27 % were found alcoholics and 39.4% were smokers. Betel, nut, lime and tobacco chewing was not popular among the study group. Instead 24.9% of masons were using pan-parag. In the present study, persistent cough, breathlessness and wheezing were the symptoms of lung function impairment. Respiratory tract symptoms were more observed among loading workers. In this study, 87% of loading workers were using face masks of cotton cloths, bath towels and hand-kerchiefs. There was statically significant association with the use of protective devices and symptoms were reported. The face mask used currently is not enough to prevent the entry of 0.05 µm sized cement particles.

Occupational cutaneous symptoms like irritation on skin, burning, skin rashes etc were reported in higher percentage in all categories of workers. Burning was more (70%) reported by concrete mixers. They were using finger-caps, gloves and boots etc as personal protective devices. On analysing the present data using 'z' test, statistically significant benefit was found in these device users.

2-In lung function study reduced but not significant mean and S. D values of FVC % predicted was observed in both cases than controls. The mean and S D values of FEV1/FVC % predicted were higher in both cases than control. The present observations are contradictory to other reports. These may be due to the difference in occupational style of our study group. Other experimental groups are working in cement factories so their labouring hours and patterns are different from the present study group. Lowered percentage of MMEF reflects the amount of dust accumulated in the alveoli. In the present study both cases showed non-significant reduced mean value of MMEF. Of this, lowest mean value was shown by loading workers. It reflects that the pattern of their work generates more dust during their labour. This is the first study report examining this parameter among cement exposed group.

Normal spirometer was expressed by 38.7% of loading workers and 42.7 % of their controls. While comparing normal spirometer in different age groups, it gradually decreases but last two groups (IV and V) showed variation which may

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be due to difference in the sample size. Eventually the impairment (mixed pattern) showed increasing pattern from first group to fifth group. It shows direct correlation with duration of exposure.

On comparing the two study groups loading workers showed lower normal spirometry and higher impairment. It showed they are having the highest lung function impairment. Deposition of cement dust in different sites of respiratory tract results in accelerated symptoms and decline in lung function capacity. Even though loading workers take some preventive measures and duties on alternate days, they were constantly exposed to cement for longer duration. Clearing the wagon, loading the trucks and other vehicles waiting for the purpose are done by them without taking proper security measure and rest between labours. Hence they are the real victims of the cement exposure.

The present study unveil the working conditions, occupational hazards, protective measures taken and the health status of one of the most vibrant work force in district. Immigrant workers and women helpers are not included in the present study. This provided homogeneity to the data. Workers exposed to wet cement have reported the symptoms like irritation on skin, burning, skin rashes. Irritation on eye, hair loss and change in hair colour are also reported. Loading workers who are exposed to dry cement (dust) have lower normal spirometry and higher lung functionimpairment. The present study showed that exposure of humans to cement dust is capable of inducing marked hazardous alterations in some enzymatic activities, liver functions and some biochemical parameters. The present day practice of face masks, finger caps, gloves boots etc. are not enough to protect them

VIII. RECOMMENDATIONS

1. Cement Workers should be adequately informed about the specific hazards associated with their job and the specific safety measures they should follow to protect themselves.
2. Workers must be provided with health education on occupational hazards and preventive measures.
3. Workers should regularly use high quality protective devices in their work places.
4. Loading workers should use industrial masks.
5. Awareness campaign should be conducted about the occupational health hazards and regular use of high quality personal protective equipment's to contractors, builders and other stake holders.
6. Workers should undergo regular medical checkup which might help to detect the occupational related abnormal parameters in early stage.
7. Campaign among workers to avoid alcohol and the new generation chewing items.
8. Cement workers should avoid smoking as it reduces the lung's ability to clear dust.
9. Legislation to reduce health hazards of the construction workers.
10. Development of recommendations and requirements of engineering and environmental appropriate to safeguard this industry from health hazards.
11. Regulatory agencies should be committed to monitor this industry also.
12. The observation that cement exposure in construction workers cause small airway disease should further be tested in a follow-up study

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