

Health Risks Associated With Workers in Cement Factories

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Abstract- The aim of this study was to investigate the health risks associated with the man power working in the cement factories at Kashmir, India. In order to study the health hazards of cement factory on workers, three cement factories were considered for the studies which includes; JK Cements Ltd. Khrew, Saifco Cements Ltd. Khonmoh and Khyber cements Ltd. Khonmoh Kashmir, India. Total of 10% of employees in three cement factories were considered for the studies. The workers were administered with the standard format questionnaire which was followed by personal interviews. The results indicate a visible impact on health of workers and during summers the health related problems increases.

Index Terms- Cement factory; health risk; Questionnaire; workers

I. INTRODUCTION

Cement manufacture has caused environmental impacts at all stages of the process in the area. These include emissions of airborne pollution in the form of dust, gases, noise and vibration when operating machinery and during blasting in quarries, and damage to countryside from quarrying. Generally cement plants are known to be associated with exposure to quartz, cement, and dust, which can potentially contribute to Chronic Bronchitis, Silicosis and Interstitial lung diseases.

The impacts of cement industry are countless and it even did not spare humans from its deteriorating impacts and have adversely impacted health of workers. Exposure to cement pollution has been linked to a number of different health outcomes, starting from modest transient changes in the respiratory tract and impaired pulmonary function, continuing to restricted activity/reduced performance, emergency room visits and hospital admissions and to mortality (Schuhmacher *et al.*, 2004; Aydin *et al.*, 2010; Zeleke *et al.*, 2010; Vestbo *et al.*, 1900). There is also increasing evidence for adverse effects of cement pollution not only on the respiratory system, but also on the cardiovascular system (Dockery and pope, 1993). The most severe effects in terms of the overall health burden include a significant reduction in life expectancy of the average population of workers by a month or more (Samet *et al.*, 2000), which is linked to the long-term exposure to high levels of air pollution with PM from these cement industries (Sheppard, 1990; Pope and Dockery, 2006; Grau, 2009)).

II. STUDY SITES

Three factories were taken in consideration namely JK Cements Ltd. at Khrew (Administrative district Pulwama) Kashmir, India and Saifco and Khyber cements Ltd. at Khonmoh (administrative district Srinagar) Kashmir, India lying in the same geographical area. The sites are located in the satellite image.



III. METHODOLOGY

All subjects were served with a questionnaire and posed with interviews based on work of various organizations mostly University of Virginia questionnaires, American Thoracic Society - Division of Lung Diseases, California institute of technology, medical questionnaires, Environmental questions (ACE), department of health and ageing and enHealth council, health and safety services and health questionnaires, WHO, traditional herbal medicine which were edited after going through literature (Maureen *et al.*, 1860; Hofmeister *et al.*, 1983; Dinah *et al.*, 1990; Lesliam *et al.*, 2005; Winston *et al.*, 2005; Sengupta. S., 2006; UNEP, 2008) according to the need.

The workers working in the cement industry were administered with the questionnaire and total of 10% of

employees in cement factories were studied. Later interviews were conducted. The questionnaire and interview questions posed are given below.

IV. WORKERS HEALTH QUESTIONNAIRE

To be completed by employee

Name (Please print) _____

Employee ID# _____

No. of years since working in the factory -----

Age-----

Marital status-----

1. Do you smoke tobacco?		
2. If yes, how many packs per day? _____ Number of years _____		
<input type="checkbox"/> Yes	<input type="checkbox"/> No	
2. Have you ever had any of the following conditions? (indicate yes or no for each)		Yes
		No
a. Seizures (fits)		
b. Diabetes (sugar disease)		
c. Allergic reactions that interfere with your breathing		
d. Trouble smelling odors		
3. Have you ever had any of the following pulmonary or lung problems?		Yes
		No
a. Asbestosis		
b. Chronic bronchitis more than 3 episodes in the last year		
c. Emphysema		
d. Lung cancer		
e. Silicosis		
f. Chest injuries or surgeries		
g. Asthma as an adult		
h. Pneumonia in the last month		
i. Tuberculosis (active disease)		
j. Any other lung problem that you've been told about:		
4. Do you currently have any of these symptoms of pulmonary or Lung illness?		YES
		NO
a. Shortness of breath		
b. Shortness of breath with light activity		
c. Shortness of breath with strenuous activity		
d. Cough that produces thick sputum or blood		
e. Cough lasting longer than 3 weeks		
f. Wheezing		
g. Wheezing that interferes with work		
h. Any other symptoms that may be related to lung problems:		
5. Have you ever had any of the following cardiovascular or heart problems?		YES
		NO
a. Heart Attack		
b. Stroke		
c. Angina (chest pain)		
d. Heart failure		
e. Irregular heart beat		

f. Swelling in your legs or feet (not caused by walking)		
g. High blood pressure		
h. Any other heart problems:		
6. Have you ever had any of the following cardiovascular or heart symptoms?	YES	NO
a. Frequent pain or tightness in your chest		
b. In the past two years, have you noticed your heart skipping or missing a beat?		
c. Heartburn or indigestion that is not related to eating		
d. Any other symptoms that may be related to heart or circulation problems		
7. Do you currently take medication for any of the following problems?	YES	NO
a. Breathing or lung problems		
b. Heart trouble		
c. Blood pressure		
d. Seizures (fits)		
8. Do you use respirator during work.		
9. If you've used a respirator, have you ever had any kind of problem?	YES	NO
a. Eye irritation		
b. Skin allergies or rashes		
c. Anxiety		
d. General weakness or fatigue		
e. Any other problem that interferes with your use of a respirator		
10. Which health specialist do you visit most frequently? A) What kind of medicine do you use mostly?		
11. How much a day.		

Employee Signature _____ Date: _____ Comments: _____

Thank you for your help!

Interview Questions asked to workers

- Name
- Age
- Working as
- Do you smoke? If yes, how many packs?
- For how many years have you been working in the cement factory?
- Do you think cement industry is causing any health problem?
- Are you suffering from any health problem?
- If, yes what?
- Have you ever consulted a doctor for your problems?
- Which specialist do you visit most frequently?
- Which medicines do you take most frequently?
- Do you use any safety devices such as masks, respirator etc.

- If, yes what?
- If, no why?
- Does the owner provide you with safety devices?
- Do you think cement industry is causing any kind of pollution or problem in area?
- Are there any pollution control devices installed?
- If, yes, are they functional?
- Do you have any family history for any diseases?

V. RESULTS

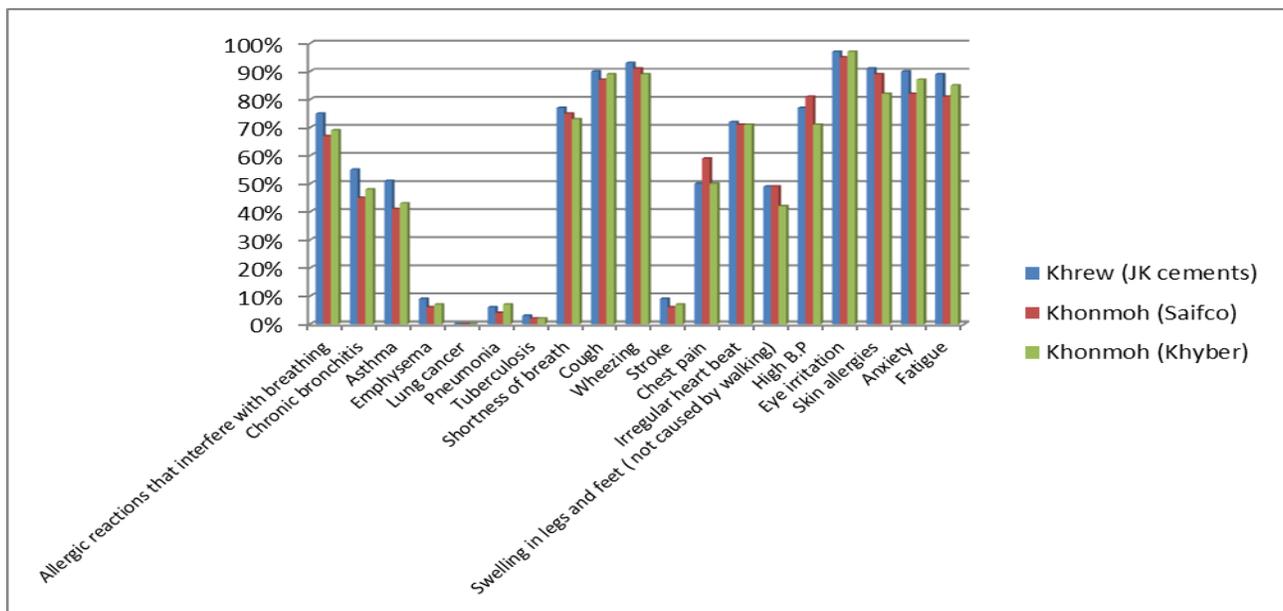
Response to questionnaire

Nineteen kinds of ailments (Fig.1) were recorded from the manpower serving as workers in the cement factories of the study area. These included: Allergic reactions that interfered with breathing, chronic bronchitis, asthma, emphysema, Lung cancer, pneumonia, tuberculosis, shortness of breath, cough, wheezing, stroke, Chest pain, irregular heartbeat, swelling in legs and feet (not caused by walking), High B.P, eye irritation, skin allergies, anxiety and fatigue.

93% of the workers in Khrew, JK Cements Ltd. complained of wheezing problems while 91% and 89% were found to be suffering from skin allergies in the Saifco cements of Khonmoh and Khyber cements Khonmoh respectively.

Irregular heart beating in the workers of the three factories ranged between 71% and 72%. 87% to 90% were found to be suffering from cough. Chest pains were complained by 50% to 59% with high among Khyber cement workers and low in JK cement workers. Asthma problems was between 41% and 51% with high in JK cements Ltd, Khrew workers and low in workers of Saifco cements, Khonmoh.97% workers were suffering from eye irritation. The prevalence of various other diseases was also found high in cement factory workers.

Figure 1: Representation of incidence / occurrence of nineteen types of diseases as identified in workers in cement factories of Khrew and Khonmoh.



Response to interviews

The workers responded very well to the interview and replied that they were mostly suffering from skin, respiratory and eye irritations. They were not given any safety devices during work. The workers generally received treatment by the health care center of the factories. During summers the health related problems increased.

VI. DISCUSSION AND CONCLUSIONS

The diameter of cement particles makes it a potential health hazard as these are respirable in size and reaches in internal organs particularly lungs leading to occupational lung diseases. This size distribution would make the trachea-bronchial respiratory zone, the primary target of cement deposition. The main route of entry of cement dust particles in the body is the respiratory tract and/ or the gastrointestinal tract by inhalation or

swallowing respectively (Green, 1970). Both routes, especially the respiratory tract are exposed numerous to potentially harmful substances in the cement mill environment. Besides cement dust various gaseous pollutants are also contributed by cement factories which cause pollution and ultimately affect human health. The various organ systems which get affected because of cement factories include: Allergic reactions that interfere with breathing, Chronic bronchitis, Asthma, Emphysema, Lung cancer, Pneumonia, Tuberculosis, Shortness of breath, Cough, Wheezing, Stroke, Chest pain, Irregular heartbeat, Irregular heart beat and Chest pain usually occurs when cardio vascular system gets affected.

89%-93% of the workers in cement factories complained of wheezing problems while 89%-91% were found to be suffering from skin allergies. Irregular heart beating in the workers of the three factories ranged between 91% and 92%. 87% - 90% were found to be suffering from cough. Chest pains were complained by 50% to 59% with highest among Khyber cement workers and lowest in JK cement. Workers were suffering from asthma between 41% and 51% with high in JK cements Ltd, Khrew factories and lowest in Saifco cements, Khonmoh. 97% were suffering from eye irritation. The prevalence of various other diseases among workers was also found high in the JK cements Ltd. when compared with Saifco and Khyber cements this may be because JK cements Ltd. is not using pollution control equipments or they are mostly not in a workable condition and Saifco and Khyber cements were using pollution control equipments to some extent. Most of the workers in the factory were given medical facilities inside the factory health care centers.

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REFERENCES

- [1] ACE, "Environmental questions for area candidates". 2002.
- [2] American Thoracic Society - Division of Lung Diseases.
- [3] Aydin, S. Aydin, S. Croteau, G. Sahin, I. and C. Citil, "Ghrelin, Nitrite and Paraoxonase/Arylesterase. Concentrations in Cement Plant Workers." *Journal of Medical Biochemistry*. 2010. 29-2: 78-83.
- [4] California institute of technology, medical questionnaires
- [5] Department of health and ageing and enHealth council, "Environmental health risk assessment- guidelines for assessing human health risks from environmental hazards".2002.
- [6] Dinah, A. K. Besnell, S. Deborah, H.B. Gregory, N. and D.S. John, "The effect of air pollution related human health risks on firm financial performance".1990.

- [7] Dockery, D.W. and C.A. Pope, "Acute respiratory effects of particulate air pollution". *Animal Review of Public Health* 1993.1-5: 107 -132.
- [8] Environmental questions (ACE), department of health and ageing and enHealth council.
- [9] Grau,L.P. "The urban health effects and impact of anthropogenic and natural air pollution".2009.
- [10] Green, G.M. "The J. Burns Amberson lecture. In defense of lung". *Am. Rev. Rep. Dis.* 1970.102: 691-703.
- [11] Health Questionnaire, American Thoracic Society - Division of Lung Diseases, California institute of technology.
- [12] Health Questionnaire, traditional herbal medicine, 7 Northumber land place, Bath.
- [13] Hofmeister, B. Fischer, F.M. Nogueira, P. and I. Romieu, "Effects of air pollution on the health of children living in the city of Cubateo, Brazil".1986.
- [14] Lesliam, Q.M.S. and G.W. Awelka, "Assessment of cement dust concentrations and noise levels in a cement plant in Nicaragua".2005.
- [15] Maureen, L.C. Nathalie, B.S. Anna, A. and P. K. Sharma, "The health effects of air pollution in Delhi, India".1860.
- [16] Pope,C.A. and W. D. Dockery, "Health effects of fine particulate air pollution". *Air and waste manage assoc.* 2006. 56 :709-742.
- [17] Respiratory health questionnaire, University of Virginia health system
- [18] Samet, J.M. Dominici, F. Zeger, S.L. Schwartz, J. and D. W. Dockery, "The National Morbidity, Mortality, and Air Pollution Study". Health Effects Institute Research Report. 2000. 94.
- [19] Schuhmacher, M. Domingo, J. L. and J. Garreta, "Pollutants emitted by a cement plant: health risks for the population living in the neighborhood." *Environmental Research* 2004. 9- 52: 198-206.
- [20] Sengupta, B. "Design of air quality monitoring systems to enable health impact studies", Central Pollution Control Board Ministry of Environment & Forests New Delhi.2006.
- [21] Sheppard, D. Hughson, W.G. and J. Shellito, "Occupational lung diseases. In: Joseph La Dou", *Occupational Medicine*, USA, Appleton and Lange,1990. 221-236
- [22] UNEP "Environmental pollution and impacts on public health by United Nations environment programme".2008.
- [23] Vestbo, J. and F. V. Rasmussen, "Long-term exposure to cement dust and later hospitalization due to respiratory disease". *International Archives of Occupational and Environmental Health*. 1990. 62-3: 217-220.
- [24] Winston, H. H and D. Joan, "A guide to health risk assessment California Environmental protection agency office of environmental health hazard assessment".2005.
- [25] WHO "Monitoring ambient air quality for health impact assessment". WHO Regional Publications, European Series, No. 85 World Health Organization Regional Office for Europe Copenhagen. 1999.
- [26] Zeleke, Z., Moen, B. and M. Bratveit, M."Cement dust exposure and acute lung function: A cross shift study." *BMC Pulmonary Medicine* 2010.10-1: 19.

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