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Respiratory Problems among Workers of Udayapur Cement Factory in Eastern Nepal

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ABSTRACT

Background: There have been very limited studies regarding health of the cement factory workers in Nepal. This study aimed to find out the prevalence of health problems and the factors associated with respiratory symptoms among the workers of Udayapur cement factory.

Methods: This is a cross-sectional study conducted from March to August 2015 in Udayapur cement factory in eastern Nepal. All the workers working in the factory more than a year were included in the study. The data was collected by using a semi-structured questionnaire consisting of socio-demographic characteristics, type of work, reported health problems, use of personal protective measures. Chi-square test was used to determine the association of respiratory symptoms with related variables.

Results: A total of 295 workers were included in this study with mean age of 45.9 years (SD=7.7). Majority 279 (94.6%) were males. The most common health problems were musculoskeletal pain (55.6%) followed by eye problems (33.2%). Among them, 17(21.1%) reported that they had at least one respiratory problem and chest tightness while running/climbing and wheeze were the most common. A total of 233 participants (79%) used at least one form of personal protective equipment. Low education, longer duration of work and smoking were found to be positively associated with respiratory symptoms.

Conclusions: Respiratory problems were high among the workers of the cement factory. Proper use of PPEs and dust control measures should be promoted among the workers.

Keywords: Cement factory; eastern Nepal; occupational health; respiratory problems.

INTRODUCTION

Occupational health is defined as “the promotion and maintenance of the highest degree of physical, mental and social well-being of workers in all occupations”.¹ Workers constitute an important workforce in any country.² Construction industry is an essential contributor to the development of a country.³ Cement factory workers are highly exposed to pollutants in terms of particulate emission. Exposure to these pollutants have acute and chronic health implications.⁴⁻⁶ Chronic exposure to cement particles can affect many organ systems in respiratory. For variety of reasons, like ignorance or the non-availability of personal protective equipment (PPE), the workers do not adequately protect

themselves through PPE.⁷

Despite a large scale of health hazards associated with exposures in a cement factory, sufficient studies have not been done to assess the health risks associated with it in Nepal.⁸ Therefore, this study was carried out to investigate the common health problems and factors associated with respiratory symptoms among cement factory workers in Nepal.

METHODS

This study was conducted in Udayapur Cement Factory situated in Jaljale, Udayapur district, eastern Nepal. It is one of the two cement factories operating under

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Government of Nepal. Its annual production capacity is 277,200 metric ton of cement. The duration of the study was 6 months from March 2015 to August 2015. The workers working in the factory for more than a year were included in the study. During the study period, the total number of workers was 450 and 50 workers were excluded from the study as they were working in the factory less than one year. The data was collected from 295 participants. There were 68 workers not present during the study period and 37 did not participate at all.

The data were collected using a semi-structured questionnaire consisting of socio-demographic characteristics, personal habits such as tobacco and alcohol consumption and health status. For assessment of the respiratory system, Medical Research Council (MRC) questionnaire was used. MRC(UK) Respiratory Questionnaire has extensively been validated as the primary tool to assess the symptoms of the patient. Chronic Cough was defined as cough as much as 4-6 times per day occurring for most days of a week (≥ 5 days) for at least three months of the year and for at least two consecutive years. Chronic Phlegm was classified as sputum expectoration as much as twice a day for most days of the week (≥ 5 days) for at least three months of the year and for at least two consecutive years. Chronic Bronchitis was defined as cough and sputum expectoration occurring for most days of the week (≥ 5 days) for at least three months of the year and for at least two consecutive years. Third year medical students of BPKIHS were trained for data collection and the investigators randomly cross verified the information collected. The data were entered, verified and coded in Microsoft Excel and analysed in Statistical Package for Social Sciences 17. Chi-Square test was used to measure the association of respiratory symptoms with related variables. The ethical approval for the study was obtained from the Institutional Review Board, BPKIHS. A written informed consent was obtained from the participants.

RESULTS

The mean age of the participants was 45.9 years ($SD = \pm 7.7$). Majority of the respondents 239 (81%) were more than forty years. 279 (94.6%) were males and most of the respondents had completed secondary 129 (43.7%) and higher secondary and above 96 (32.5%) level of education (Table 1).

Most of the respondents 258 (87.5%) were working for more than ten years. About 15.9% were working in the cement mill and 8.8% were working in the mining department (Table 2).

Table 1. Socio-demographic characteristics of the respondents (n=295).

| Socio-demographic characteristics | Categories | n (%) |
|-----------------------------------|----------------------------|------------|
| Age in years | ≤ 40 | 56 (19.0) |
| | > 40 | 239 (81.0) |
| Gender | Male | 279 (94.6) |
| | Female | 16 (5.4) |
| Education | Illiterate | 35 (11.9) |
| | Primary | 35 (11.9) |
| | Secondary | 129 (43.7) |
| | Higher Secondary and above | 96 (32.5) |
| Religion | Hindu | 284 (96.3) |
| | Others | 11 (3.7) |
| Marital Status | Unmarried | 10 (3.4) |
| | Married | 284 (96.3) |
| | Separated | 1 (0.3) |

Table 2. Occupational characteristics of the respondents (n=295).

| Characteristics | Categories | n (%) |
|------------------|--------------------------------|------------|
| Duration of Work | ≤ 10 years | 37(12.5) |
| | > 10 years | 258 (87.5) |
| Department | Production and Quality Control | 60(20.3) |
| | Cement Mill | 47(15.9) |
| | Maintenance | 47(15.9) |
| | Administration | 42(14.2) |
| | Electrical | 26(8.8) |
| | Mining | 26(8.8) |
| | Security | 26(8.8) |
| | Transportation | 12(4.1) |
| Others | 10(3.4) | |

A total of 71 (24.1%) of the participants had at least one respiratory symptoms. Of which, chronic cough was present in only 10 participants (3.4%) and only nine (3.1%) had chronic bronchitis. Chest tightness while running or climbing stairs were present in 13.6% participants and 9.2% had wheezing. Dyspnea was present in 36.9% grade 1, 15.9% grade 2 and 9.2% grade 3 (Table 3).

Musculoskeletal problem was reported as high as in 164 (55.6%) of the participants. 98 (33.2%) reported of eye symptoms such as itching, redness and burning sensation. Similarly, 54 (18.3 %) had skin lesions of which tinea (ringworm) and eczema were the commonest. (Table 3).

Table 3. Health problems of the respondents.

| Health Problems | n (%) |
|--|------------|
| (A) Respiratory Symptoms | |
| At least one respiratory symptoms | 71 (24.1%) |
| Grade 1 Dyspnea | 109(36.9) |
| Grade 2 Dyspnea | 47 (15.9) |
| Grade 3 Dyspnea | 27 (9.2) |
| Chest tightness while running/climbing | 40(13.6) |
| Wheeze | 27(9.2) |
| Chronic Cough | 10(3.4) |
| Chronic Bronchitis | 9(3.1) |
| (B) Other health problems | |
| Musculoskeletal pain | 164(55.6) |
| Eye symptoms | 98(33.2) |
| Skin lesion | 54(18.3) |
| Diabetes Mellitus | 40(13.6) |
| (C) Past history of respiratory illness | |
| Chest injury | 13(4.4) |
| TB (pulmonary TB) | 8(2.7) |
| Cardiac problems | 6(2.0) |
| Asthma | 6(2.0) |
| Pneumonia | 2(0.7) |
| Bronchitis | 1(0.3) |
| Other chest troubles | 13(4.4) |

About half (46.4%) of the participants were past smokers and 33.2% were currently smoking cigarettes. 45.8% of them drink alcohol (Table 4).

Table 4. Personal characteristics of the respondents (n=295).

| Substance use | n (%) |
|----------------------|-----------|
| Smoking habit | |
| Smoker | 98(33.2) |
| Non-Smoker | 60(20.3) |
| Past Smoker | 137(46.4) |
| Drink Alcohol | |
| Yes | 135(45.8) |
| No | 160(54.2) |

Table 5. Use of Personal Protective Equipment among the participants (n=295).

| Personal Protective Equipment | n (%) |
|-------------------------------|-----------|
| Yes | 233(79.0) |
| No | 62(21.0) |
| Types of PPE | |
| Cloth mask | 237(80.3) |
| Boot | 89(30.2) |
| Hand Protectors | 79(26.8) |
| Apron | 55(18.6) |
| Goggles | 36(12.2) |
| Others | 4(1.4) |

Table 6. Bivariate analysis showing association of various variables with respiratory symptoms.

| Variables | Category | Respiratory Symptoms | | p- value |
|--------------------------|----------------------------|----------------------|-------------|----------|
| | | Yes n(%) | No (%) | |
| Age (years) | ≤40 | 14 (25%) | 42 (75%) | 0.856 |
| | >40 | 57 (23.8%) | 182 (76.2%) | |
| Gender | Male | 67 (24%) | 212 (76%) | 0.929 |
| | Female | 4 (25%) | 12 (75%) | |
| Education | Illiterate | 12 (34.3%) | 23 (65.7%) | 0.009 |
| | Primary | 14 (40%) | 21 (60%) | |
| | Secondary | 31 (24%) | 98 (76%) | |
| | Higher Secondary and above | 14 (14.6%) | 82 (85.4%) | |
| Duration of Work (years) | ≤10 | 18 (48.6%) | 19 (51.4%) | <0.001 |
| | >10 | 53 (20.5%) | 205 (79.5%) | |
| Shift of work | General | 35 (27.8%) | 91 (72.2%) | 0.19 |
| | Night | 36 (21.3) | 133 (78.7%) | |
| Smoking Status | Current | 23 (30.3%) | 53 (69.7%) | <0.001 |
| | Past | 26 (43.3%) | 34 (56.7%) | |
| | Never | 22 (13.8%) | 137 (86.2%) | |
| Use of PPE | Yes | 58 (24.9%) | 175 (75.1%) | 0.521 |
| | No | 13 (21%) | 49 (79%) | |

233 (79%) reported of using PPE. The most common PPE in use was simple cloth mask (80.3%) followed by boots (30.2%) (Table 5).

Participants with no and primary education were found to have respiratory symptoms more than those having higher education and this difference was found to be statistically significant ($p=0.009$). Similarly, participants with direct exposure to dust had respiratory symptoms more than those who did not have direct exposure to dust ($p<0.001$). Past and current smokers reported of respiratory symptoms more than those who did not smoke and this associations was found to be significant ($p<0.001$). Those who worked for less than 10 years were found to have respiratory symptoms more than those who worked more than 10 years ($p<0.001$). Age, gender, work shift and use of PPE were not found to be associated with respiratory symptoms (Table 6).

DISCUSSION

Cement industry involves occupational exposure to dust particles along with various other hazards. A high proportion of workers reported of respiratory problems similar to the findings conducted by Saji et al.⁹ However, a study conducted in India showed high prevalence of respiratory symptoms: wheezing problems (93%), cough (87% to 90%).¹⁰ While a study done in UAE found out chronic cough and chronic bronchitis to be 19% and 13% respectively.⁷ This difference may have been due to the engineering measures of dust control by the factory like back filter, gravel bed filter which filters about (70%) of dust and electrostatic precipitator which filters about (99%) of dust. Hydrants also help settle dust and reduce the amount of dust in the factory area.

Our study showed that 79% of the participants use PPEs similar to the study done by Acharya SR. However, use of PPEs was not found to be associated with respiratory symptoms. The reason may be we sampled all the workers including the administrative workers (usually do not use PPE). Use of simple cotton mask which is found to be less effective to prevent cement exposure may be the other reason. This study showed an association of respiratory symptoms with education level, a finding analogous with the study done by Ahmed H et al.¹¹ The reason may be educated people are more conscious and concerned about their health and may use PPEs.

This study showed workers working for more than 10 years less likely had respiratory problems. In our study, major (86.5%) were working for more than 10 years. Furthermore, the workers who worked for more than 10 years could have modified their life style including being

away from risky behavior such as engage in administrative works because of some reasons or without any reasons which could be responsible for respiratory diseases.

Similarly, those who were smokers had greater chances of having respiratory symptoms compared to the non-smokers. This is similar to the study findings done by Ahmed H et al.¹¹ There is direct causal relationship between smoking habit and respiratory symptoms. There was no association of age with respiratory symptoms in contrast to the finding of a study conducted by Abou-Taleb where chronic bronchitis was associated with age more than 40 years.⁷ The reason may be that this study did not analyse the data in disaggregated form and also there is preponderance of participants aged more than 40 years in our study. This study found 33% having eye symptoms, which is in quite contrast to study done in Kashmir, India where eye symptoms were reported as high as 97%.¹⁰ Similarly, skin problems were also seen high in studies done in India (47.8%).¹² A much higher prevalence (84%) was reported in study done in Bangladesh compared to our study.¹³ This difference could have been due to use of quality personal protection in different settings and secondly ours is an automatic working machines so direct exposure to the cement is less.

There are some limitations to our study. First, being a cross-sectional study, causal association cannot be ascertained. Environmental measurements (exposure measurement) for dust and noise were not carried out at workplaces. Confounding effect or effect modifier because of smoking could have affected our result, but we did not control it during data analysis. We do accept that we did not follow the workers who were absent or did not participate for any reasons in our study and we could not ignore the non-response bias. However, the strength of the study could be defined by the assessment of the employees by interviewing with help of questionnaires with pre-determined criteria of respiratory disorders, completed data collection at a time within a short duration and more than one source of information regarding respiratory problems were taken, such as self-reported as well as assessment of signs of respiratory disorders. Also, detailed health examination was carried out by medical professionals.

CONCLUSIONS

The health problems were prevalent among the workers of the cement factory. Proper use of PPEs and dust control measures should be promoted among the cement factories to improve the health status of the workers. Routine health examination should be conducted among factory and industrial workers.

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REFERENCES

1. Park K. Park's Textbook of Preventive and Social Medicine: Banarsidas Bhanot Publisher; 23rd ed. 2015.
2. R. Detels, R. Beaglehole, M.A. Lansang, M. Gulliford. Oxford Textbook of Public Health: Oxford University Press; 5th ed. 2011.
3. Saji KG, Varghese PR. An epidemiological study on health status of cement workers. *Int J Sci Res*. 2014;3:318-20. [\[Full Text Link\]](#)
4. Koh DH, Kim TW, Jang S, Ryu HW. Dust exposure and the risk of cancer in cement industry workers in Korea. *Am J Ind Med*. 2013;56(3):276-81. [\[PubMed\]](#)
5. U.S Department of Health and Human services, U.S Department of Labour. Occupational Health guideline for portland cement. 1978. [cited 2016 Apr 29]. [\[Full Text Link\]](#)
6. Pournourmohammadi S, Khazaeli P, Eslamizad S, Tajvar A, Mohammadirad A, Abdollahi M. Study on the oxidative stress status among cement plant workers. *Hum Exp Toxicol*. 2008;27(6):463-9. [\[Full Text Link\]](#)
7. Abou-Taleb AN, Musaiger AO, Abdelmoneim RB. Health status of cement workers in the United Arab Emirates. *J R Soc Health*. 1995;115(6):378-81. [\[PubMed\]](#)
8. Gautam RP, Prasain JN. Current Situation of Occupational Safety and Health in Nepal. General Federation of Nepalese Trade Unions (GEFONT) Man Mohan Labour Building, GEFONT Plaza, Putalisadak, Kathmandu, Nepal. 2011. [\[Full Text\]](#)
9. Saji KG, Sreelatha BN, Zubair M, Varghese PR. An epidemiological study in construction workers. *Millennium Zool*. 2012;13(1):46-9. [\[Link\]](#)
10. Sana S, Bhat GA, Balkhi HM. Health risks associated with workers in cement factories. *Int J Sci Res Publ*. 2013;3(5):1-5. [\[Full Text\]](#)
11. Ahmed HO, Abdullah AA. Dust exposure and respiratory symptoms among cement factory workers in the United Arab Emirates. *Ind Health*. 2012;50(3):214-22. [\[PubMed\]](#)
12. Shah KR, Tiwari RR. Occupational skin problems in construction workers. *Indian J Dermatol*. 2010;55(4):348. [\[PubMed\]](#)
13. Sultana N, Ferdousi J, Shahidullah M. Health Problems among Women Building Construction Workers. *J Bangladesh Soc Physiol*. 2014;9(1):31-6. [\[DOI\]](#)