Original Article

MORBIDITY PROFILE OF STONE CRUSHER WORKERS WITH SPECIAL REFERENCE TO RESPIRATORY MORBIDITY – A CROSS SECTIONAL STUDY

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ABSTRACT

Background: The occupational environment at the stone crushing sites poses a potential health hazard to the workers. Exposure to heavy dust concentration from stone crushers, may produce several diseases.

Methods: The present study was aimed to assess the morbidity profile of workers working in stone crusher industry. A cross-sectional study was carried out among the workers of the stone crushers located in Ratua at a distance of 23 km to the north of Bhopal city. The total workers working in the crusher are 287.Using interview technique as a tool for data collection demographic and occupational details of the subjects were recorded on the predesigned proforma which included questions regarding age, sex, educational status, socio-economic status, duration of employment and symptoms. The Peak Expiratory Flow Rate (PEFR) of the subject was measured using Peak flow meter/spirometer.

Results: It was observed that in study population 62.72% were suffering from musculoskeletal problems followed by 31.36% subjects were having generalized weakness.29.96% subjects had breathing problem. Respiratory problems were higher among the subjects having duration of occupation more than 5 years than the subjects having duration of occupation less than 5 years ($p<0.003$).

Conclusion: The present study concluded that the workers in the stone crushing industry are exposed to stone dust which leads to various morbidities especially musculoskeletal problems and respiratory problems. The respiratory problems are significantly associated with duration of exposure and decreased PEFR.

Keywords: Morbidity, Stone crusher, PEFR

INTRODUCTION

Stone Crushing Industry is an important industrial sector in the country engaged in producing crushed stone of various sizes depending upon the requirement which acts as raw material for various construction activities such as construction of Roads, Highways, Bridges, Buildings, Canals etc. The sector is estimated to be providing direct employment to

over 500,000 people engaged in various activities such as mining, crushing plant, transportation of mined stones and crushed products etc.[1] Most of these personnel are from rural and economically backward areas where employment opportunities are limited and therefore it carries greater significance in terms of social importance in rural areas. It is a source of earning for uneducated poor unskilled rural people.

The stone crusher is one such industry that exists in the vicinity of almost all major cities/towns throughout the country in all the states because the construction activities go on throughout the country. As transportation of stone over long distances adds to cost of the crushed stone products, the crushers need to be necessarily located nearer to the demand centers such as Cities, Bridges, and Canals etc. Stone Crushers also need electricity supply and large number of man power for its operation. It also needs access roads for the movement of mined stone as well as crushed stone products. It is for this reason that most Stone Crushers are located along the periphery of Cities or in the vicinity of major construction projects. In most cases the Stone Crushers come up in clusters of number of units ranging from five to fifty in one cluster. The crushers are located nearer to the source of raw material such as Stone mines, River Beds etc.

These stone crushers though socio-economically an important sector, gives rise to substantial quantity of fine fugitive dust emissions which create health hazards to the workers as well as surrounding population by way of causing respiratory diseases. The dust also adversely affects visibility, reduces growth of vegetation and hampers aesthetics of the area.[1]

MATERIALS AND METHODS

Study Area

The study area is located in Ratua at a distance of 23 km to the north of Bhopal city. The study area covered 21 crushers, each with a daily crushing capacity of about 18 ton operating very close to each other by the side of a quarry. The extent of the area is 3.5 sq. km for quarrying and 1 sq. km for stone crushing operation. The total workers working in the crusher are 287.

Methodology

Using interview technique as a tool for data collection demographic and occupational details of the subjects were recorded on the predesigned proforma which included questions regarding age, sex, educational status, socio-economic status, duration of employment and symptoms. The Peak Expiratory Flow Rate (PEFR) of the subject was measured using Peak flow meter/ spirometer (Bytech, China). After calibrating the spirometer according to the procedure given in the catalog, three readings of PEFR of each subject were taken. Trained persons supervised the complete procedure of recording the PEFR. The readings showing the highest flow were recorded. PEFR of 400 to 500 litres/minute was taken as normal for males and 300-400 litres/ minute was taken as normal for females.[2]

Statistical Analysis

Data was analyzed on Epi-Info Software 3.4.3 version. Chi square test is used to test the significance.

RESULTS

Table 1 describes the socio-demographic profile of the study population of 287 subjects. It was observed that in study population 73.86% subjects were in the age group of 15-45 years and 26.13% were in age group 45-60 years. 84.67% subjects were married and 89.55% were literate.

Table 1: Socio-demographic profile of study population (n=287)

Variable	Frequency	No. (%)
Age Range (Years)	15-45	212 (73.86)
	45-60	75 (26.13)
Marital Status	Married	243 (84.67)
	Unamrried	44 (15.33
Educational status	Literate	257 (89.55)
	Illiterate	30 (10.45)
Family income (Rs.)	>6000	52 (18.12)
	4000-5999	134 (46.68)
	2000-3999	65 (22.65)
	<1999	26 (9.05)
Duration of work (Years)	<5	81 (28.22)
	5-10	97 (33.78)
	>10	109 (38.00)
Smoking		130 (45.3)

Most (46.68%) of the subjects having family income in the range of Rs 4000-5999, 18.12%

were having family income more than Rs 6000, 22.65% were having Rs 2000-3999 and 9.05 were having less than Rs 1999 as family income per month. Duration of work for the subjects was 38% were working since more than 10 years, 33.78% were working since 5-10 years and 22.82% were working for less than 5 years. Among study subjects 45.3% subjects were smokers.

Table 2: Health problems of the study population (n = 287) multiple response

Health problems	No. (%)
Musculoskeletal problems	180 (62.72)
Generalized weakness	90 (31.36)
Breathing problem	86 (29.96)
Acidity and heartburn	45 (15.68)
Headache	34 (11.85)
Eye problem	31 (10.80)
Burning sensation during micturation	07 (2.44)
Swelling of feet	04 (1.39)
Injury	03 (1.04)
Vertigo	02 (0.7)

Table no. 2 describes the health problems of the study population with multiple responses. It was observed that in study population 62.72% were suffering from musculoskeletal problems followed by 31.36% subjects were having generalized weakness. 29.96% subjects had breathing problem, 15.68% had acidity and heartburn, 11.85% subjects had headache and 10.80% had eye problem. 2.44% subjects had burning micturation, 1.39% had swelling on feet, 1.04 had injury and 0.7% had vertigo.

Table no. 3 describes the association of duration of occupation and respiratory problems. It was observed that respiratory problems were higher among the subjects having duration of occupation more than 5 years than the subjects having duration of occupation less than 5 years ($p<0.003$).

Table 3: Association of duration of occupation and respiratory problems (n = 287)

Duration of occupation	Respiratory problem		Total
	Present	Absent	
< 5yrs	14	67	**81**
> 5yrs	72	134	**206**
Total	**86**	**201**	**287**

($\chi2 = 8.65$, df = 1, $p< 0.001$)

Table no. 4 describes the association of breathing problem and PEFR. It was observed that higher number of subjects having breathing problems had decreased PEFR then the subject not having breathing problems ($p< 0.001$).

Table 4: Association of breathing problem and PEFR (n=287)

Breathing problem	PEFR		Total
	Decreased	Normal	
Present	64	22	**86**
Absent	36	165	**201**
Total	**70**	**217**	**287**

($\chi2 = 84.71$, df = 1, $p< 0.0001$)

DISCUSSION

In the present study it has been observed that large numbers of study subject were suffering from the musculoskeletal and breathing problems. It was also evident that the decrease in PEFR was significantly associated with breathing problems. Though most of the dust related respiratory morbidities among the subjects are restrictive in nature, it has resulted in reduced PEF. This can be attributed to the irritation of upper respiratory mucosa causing hypertrophy of mucosal cells and formation of mucosal plugs resulting in obstruction of exhaled air partly by dust exposure and partly by smoking. Similar association of respiratory morbidity has also been reported in earlier studies. [3]

Majority of the subject have been working regularly in the industry for more than 10 years. And large numbers of them were suffering from breathing problems. Other studies have showed that the presence of underlying respiratory diseases unrelated to occupational exposures cannot be excluded but the results of the respirable dust measurements and the long history of high level exposures (5–15 years) indicate that observed lung function impairments are most likely directly related to occupational exposures. There was a significant association between pulmonary function and increasing dust concentration and years of working (exposure to dust) adding strength to the evidence that contribution from the work environment to the observed respiratory impairments may be substantial.[4]

The complaints related to musculo-skeletal system i.e. headache, backache, weakness, joint pain and muscular pain can be attributed to repeated movements, stress and strain and carrying heavy loads might lead to osteoarthritis of the joints. Bad postures might also be responsible for the aches and pains.[5]

However, there is scarcity of research on the stone crusher worker as this being an small scale industries in the un-organized sector .This call for the need to plan out better designed studies like cohort studies for better understanding of the association between the cause and the effect.

CONCLUSION

The present study concluded that the workers in the stone crushing industry are exposed to stone dust which leads to various morbidities especially muculo-skeletal problems and respiratory problems. The respiratory problems are significantly associated with duration of exposure and decreased PEFR.

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