

Original Research Article

A cross sectional study of the morbidity pattern among stone quarry workers and their associated risk factors

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ABSTRACT

Background: Construction sector is a thriving industry which comprises most of the unorganized workers and providing widespread opportunities for employment of most of the poorest and marginalized sections of society in India. The workers are more susceptible to various occupational hazards due to working conditions in dusty environment. This study is proposed to identify the morbidity pattern, availability and usage of safety measures, health care seeking behaviour and health care facilities at the quarry site.

Methods: A cross sectional study was conducted among the stone quarry workers of Maduranthakam area in Kancheepuram district from February 2018 to May 2018. The sample size was calculated as 94 and five quarries were selected randomly. The study tool was interview based semi structured questionnaire and clinical examination. Appropriate descriptive and inferential statistics like Chi square test, Fischer's exact test was done to determine significant association ($p < 0.05$).

Results: The common morbidities among the participants were abdominal conditions (54%), injuries (34%) and musculoskeletal disorders (27%). One in five individuals had respiratory problems and those with breathing difficulty had decreased peak expiratory flow rate. Usage of personal protective equipments is low and about 63.8% of them were using government health care facilities.

Conclusions: Increasing demand for stone and aggregates has led to extensive stone quarrying operations. Awareness and enforcement of personal protective equipment, vaccination against diseases like tetanus, periodic health check-ups should be enforced for people working in quarries.

Keywords: Stone quarry, Morbidity, Risk factors, Health care seeking behavior

INTRODUCTION

Occupational health deals with all aspects of health and safety in the workplace and has a strong focus on primary prevention of hazards; WHO definition. Quarries are open cast excavations from which fairly massive and deep deposits of hard or soft rocks are extracted usually for the production of aggregates.

Occupational exposure to dust particles is known phenomenon all over the world. Although there are many pollutants, stone quarries play an important role in emitting dust particles. Stone quarries are one of the most important industries not only in Tamil Nadu but all over India. It is estimated around 12000 quarry units are present in India and over 5 lakh people are directly employed.¹

Studies done by National institute of occupational health (NIOH) states that prevalence of some lung diseases are 21% in stone quarry units, and 12% in stone crushing units.² It is an industry which produces raw materials such as stones (of various sizes) M-sand etc., for the construction of various buildings like hospitals, bridges, schools, residential areas, industries, commercial and corporate sector buildings, etc. By the introduction of M-sand as an alternate for river sand makes this industry an important sector.

The stone quarries provide employment to many unskilled and uneducated persons mainly from rural areas. Most of them are economically backward where employment opportunities are limited. Usually this sector is located in clusters.

Quarries require easy access to roads for transportation of the stones and M-sand. This appears to be the reason why most quarries are located in peripheries adjacent to major highways. These stone quarries give rise to fine dust particles which can be a major risk factors for respiratory diseases, musculoskeletal problems, injuries, etc. Through this study it is proposed to identify the morbidity pattern, availability of safety measures, health care seeking behaviour and health care facilities of the quarry workers.

Objectives

Objectives of the current study were to assess the morbidity pattern, associated risk factors and health care seeking behaviour among stone quarry workers.

METHODS

A cross sectional study was conducted among the stone quarry workers of Maduranthakam area in Kancheepuram district from February 2018 to May 2018. Based on the study conducted near Bhopal, the prevalence of respiratory morbidity was 29.96%, considering confidence interval level of 95%, absolute precision of 10% and with 10% of non-response, the sample size was calculated and worked out to be 90.³

Multi stage sampling method was used. Five quarries were selected randomly and all the workers were included in the study. The study tool included an interview based semi structured questionnaire followed by clinical examination. The peak expiratory flow rate (PEFR) was also measured using Peak Flow meter. Three readings of PEFR of each participant were taken. The highest reading was noted. PEFR of >400 litres/minute was taken normal. The approval of the Institutional ethics committee of Madras medical college was obtained. Permission was obtained from the quarry owners and informed written consent was taken from all the workers participating in the study.

The data was entered in MS Excel and analysed using SPSS Version 16. Appropriate descriptive and inferential

statistics like Chi square test, Fischer's exact test was done with $p < 0.05$ taken as significant.

Inclusion and exclusion criteria

All the male workers who were working for more than one year at construction sites were included except female workers, their young children, owner of the site and engineers.

RESULTS

The socio-demographic profile of the study participants is described in (Table 1). About fifty percent of them were between 21 to 35 years of age, were married and had completed their high school. About 55% of the participants were living within the quarry site. Among the study participants 29.8% were smokers and 71.3% are alcoholics and the mean duration of work (hours per day) was found to be 8 hours (Table 1).

Table 1: Socio demographic profile (n=94).

	Variables	N (%)
Age (years)	<20	12 (12.8)
	20 to <35	49 (52.1)
	35 to <50	25 (26.6)
	≥ 50	8 (8.5)
Marital status	Single	37 (39.4)
	Married	52 (55.3)
	Separated	5 (5.3)
Education	no formal schooling	6 (6.4)
	primary school	10 (10.6)
	middle school	20 (21.3)
	high school	48 (51.1)
	Graduate	10 (10.6)
Living status	Living alone	39 (41.5)
	With family	55 (58.5)
Mean duration of work (hours per day):		8.0 hours
Place of accommodation	Within the quarry site	52 (55.3)
	Outside the quarry	42 (44.7)
Personal habits	Smoking (Cigarette / beedi)	28 (29.8)
	chewable tobacco / pan/gutkha	34 (36.2)
	Alcohol	67 (71.3)

Type of work, availability and usage of personal protective equipments, vaccination status

It was observed that 42.6% participants were involved in grinding of stones, followed by breaking of stones (21.3%) and loading of stones (14.9%). Information about the availability and usage of safety measures at the quarry site was recorded. Almost 45.7% of the participants use facemask but only 5.3% of the quarry workers use apron.

It is also noted that only 23.4% of the study participants had been vaccinated for tetanus alone (Table 2).

Table 2: Type of work, availability and usage of Personal Protective Equipments, Vaccination status (n=94).

Variables	N (%)	
Job nature	Grinding of stones	40 (42.6)
	Breaking of stones	20 (21.3)
	Loading of stones	14 (14.9)
	Others	20 (21.3)
Vaccination status	TT	22 (23.4)
Personal protective equipments	Available	Usage
	N (%)	N (%)
Face mask	58 (61.7)	43 (45.7)
Goggles	37 (39.4)	13 (13.8)
Gloves	54 (57.4)	32 (34.0)
Apron	27 (28.7)	5 (5.3)
Shoes	47 (50)	10 (10.6)
Helmet	42 (44.7)	29 (30.9)

Morbidity profile of the study participants in past 3 months (n=94)

It was observed that 54.3% of the participants were suffering from abdominal conditions like acidity and heartburn, 41.5% were suffering from skin problems, 34% had various injuries followed by 27.7% participants were suffering from musculoskeletal disorders, 24.5% of the participants had headache and 18.1% of the participants had respiratory problems. All the participants had one or more morbidity condition (Figure 1).

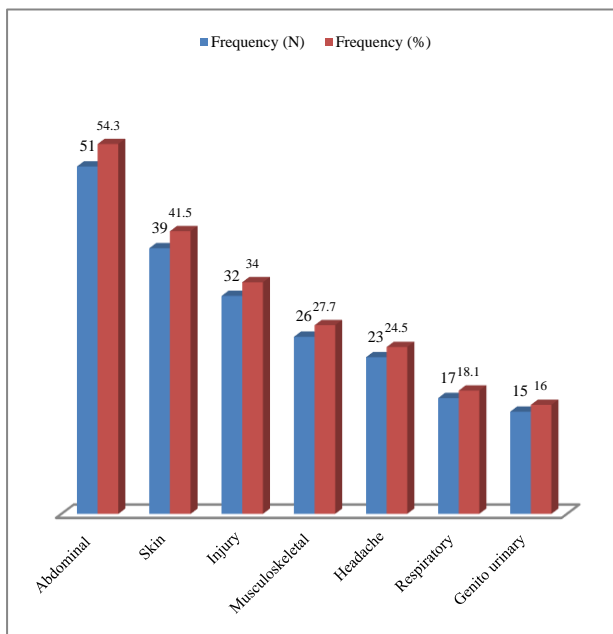


Figure 1: Morbidity profile of the study participants in past 3 months (n=94).

Co-morbidities

It was observed that 8% of the participants have diabetes, 14% have hypertension and 5% have both diabetes and hypertension. About two third of the study participants did not have any co-morbidities (Figure 2).

First point of health care sought in the last 3 months

It was found that in this study the first point of health care sought by the participants were government facilities (63.8%). Workers also made use of mobile medical camps conducted by the Tamil Nadu public health care delivery system (Table 3).

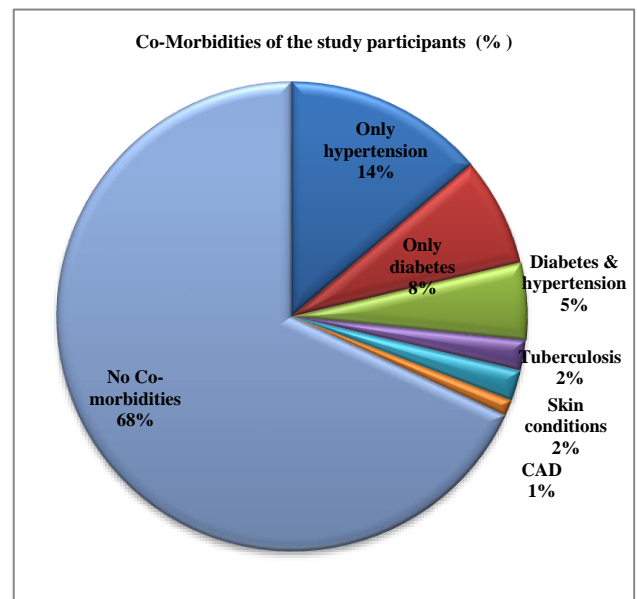


Figure 2: Co-Morbidities of the study participants (n=94).

Table 3: First point of health care sought in the last 3 months (n=94).

Variables	N (%)
Government	60 (63.8)
Private	23 (24.5)
Over the counter	10 (10.6)
None	1 (1.1)

Table 4: Association of breathing problems and PEFR (n=94).

Breathing difficulty	N (%)
Normal	1 (3.7)
Present	Absent
Over the counter	10 (10.6)
None	1 (1.1)

p value=0.02,df=1, Odds Ratio=8.157

Table 5: Association between smoking and PEFR (n=94).

PEFR	Smoker (N=28)	Non smoker (N=66)
Normal	1 (3.6)	26 (39.4)
Decreased	27 (96.4)	40 (60.6)

($\chi^2=12.323$, df=1, p value<0.001, Odds Ratio=8)

Table 6: Association between duration of occupation and breathing difficulty (n=94).

Duration of occupation (years)	Breathing difficulty		Total N (%)
	Present N (%)	Absent	
<3	11 (13.9)	68 (86.1)	79 (100.0)
≥ 3	7 (46.7)	8 (53.3)	15 (100.0)
Total	18 (19.1)	76 (80.9)	94 (100.0)

($\chi^2=8.729$, df=1, p=0.008)

Association between type of work and common health problems (n=94)

Among the participants whose job is breaking of stones had musculoskeletal disorders (40%) and injuries (35%). Participants doing grinding work had skin problems (47.5%) like allergy, itching and 40% of them had injuries. Conditions like abdominal problems (85.7%), Genitourinary disorders (35.7%) and injuries (64%) were significantly associated with loading of stones in the quarry (p value 0.01, 0.04 and 0.03 respectively).

The association of breathing difficulty and PEFR is depicted in (Table 4). It was observed that 23.9% of the participants with breathing difficulty had decreased PEFR (<0.05). It was found through this study that participants with decreased PEFR have 8 times the odds of having breathing difficulty (Table 4). In the above table it was also found that 96.4% of the participants who smoke had decreased PEFR with $\chi^2=12.323$, df=1, p<0.001 (Table 5). The above table describes the association of duration of occupation and breathing difficulty. It was observed that breathing difficulty were higher among the participants who work ≥3 years than the participants having duration of occupation <3 years. ($\chi^2=8.729$, df=1, p=0.008) (Table 6).

DISCUSSION

In the present study it has been observed that most of the workers had health related problems like musculoskeletal problems, respiratory problems, various injuries which was similar to the results shown in the study done by Narkhede et al and Smruthuranjan et al.^{3,4} It was also observed that decrease in PEFR was significantly associated with breathing difficulty, similar results was shown in the study done by Narkhede et al.³ It was also observed in this study that there is a significant association between duration of occupation and breathing difficulty similar results was shown in the study done by

Narkhede et al.³ The respiratory problems were due to the exposure to dust particles in the work place. Excessive dust, more than the respirable dust limit of 5 microns per square meter as given by occupational safety and health administration.²

It is found in this study that participants who are smokers had decreased PEFR. Study done by Ghotkar et al also observed the same results.⁵ However contrasted finding was observed in Smruthuranjan et al in which there was no significant difference was observed between pulmonary function results of smokers and non-smokers.⁴ Complaints related to musculoskeletal diseases can be attributed by carrying heavy loads, stress and strain, consumption of alcohol, bad postures might also be the reason.¹ When compared with the study done by Nwibo et al it was found to be the use of face mask (0.7%), apron (0.5%) and other devices was high in this study.⁶ It also been noted in this study that 72% of the participants have not been vaccinated for tetanus. Among the study population 63.8% of them were using government facilities and 90.4% of the participants make use of medical camps conducted by the mobile medical units of the Tamil Nadu health care delivery system. Interesting to note in the study done by Nwibo et al is that none of the participants received any medical care.⁶

CONCLUSION

Increasing demand for stone and aggregates has led to extensive stone quarrying operations. The exposure to dust particles from the quarry may increase the susceptibility to respiratory diseases and smoking and alcohol consumption may also be an additional predisposing factor. Discouraging workers from smoking and alcohol usage through health education is important. Awareness about the usage of personal protective equipment, vaccination against diseases like tetanus, periodic health check-ups should be enforced for people working in quarries.

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