



Research Article

## HEALTH AND SOCIAL WELLBEING OF THE WORKERS IN THE STONE QUARRYING AND CRUSHING INDUSTRY

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### ABSTRACT

**Introduction:** The quarry is an open excavation or a type of open pit mine, from which the stone is obtained by digging, blasting or cutting. The Indian quarries cater to the needs of railways, road construction and maintenance, housing and infrastructure building. The objectives of this were to assess the social wellbeing among quarry workers, to study the health issues peculiar to specific vulnerable population groups in the quarry, specifically under five children of quarry workers, women and the elderly and to enumerate if any health problems among workers, with specific reference to injuries and other work related morbidities.

**Methodology:** This study was a cross sectional study done over a period of one year among people working in three quarries, situated in the peri-urban area of Bangalore. Predesigned and pretested tools were used to collect the data from various vulnerable groups working in quarries.

**Results and discussion:** Social wellbeing, most of the workers were migrants from neighbouring states were dissatisfied with their job and isolated working conditions. Nutritional status of under five children, 95% of the children were undernourished. Status of women employees, the common health problems were musculoskeletal pain, menstrual disorders and substance abuses in the form of alcohol. Among the elderly, majority were employed, cataract and vision were the most common problems. Most common injuries were cuts and bruises on the lower limbs. The workers in quarry had lowered lung function test as measured by the mean PEFr when compared to the standard mean PEFr among Indians.

**KEYWORDS:** quarry, workers, social wellbeing, women, children, elderly

### INTRODUCTION

The quarry is an open excavation or a type of open pit mine, from which the stone is obtained by digging, blasting or cutting. The process is called quarrying. The quarried stone is further processed before being used for various construction activities[1] [2]

Rock quarrying and stone crushing has been a worldwide phenomenon for thousands of years. Man has used stone

for building monuments, religious buildings or houses. Growing urbanization post the industrial revolution has increased the demand on housing which in turn has increased the need for stones and consequently the need for quarrying[3].

Quarrying and crushing are a problem not only in India but also in countries like Singapore, Lebanon, United States, Pakistan and Israel[3]. The demand for quarry products has increased from less than 500,000 tons in the 1940's to a current annual requirement of about 25,000,000 per year,

that's about 20 tons per man woman and child[4] It is obvious, our houses, schools and factories, our roads, railways and airports - and everything that travels on them - are made from minerals and yet people fail to make the connection between these every day essentials and the mines and quarries where they are produced[3] [4]

In India, there are various sand stone and rock quarries situated in states of Rajasthan, Madhya Pradesh, few locations in - Gujarat, Orissa, Karnataka, Tamil Nadu, Andaman and Nicobar islands and in many more places<sup>(1)</sup>. The Indian quarries cater to the needs of railways, road construction and maintenance, housing and infrastructure building. Rock quarrying has enormous impact on the environment, people and ecology [3]

The typical processes after quarrying involve the following four steps: dressing, cutting/sawing, surface grinding and polishing and edge-cutting-trimming. All these processes necessary for making the stone ready for further use pose hazard and involve risks to the health and life of the quarry workers[1]

The problems are related to the use of explosive materials, other occupational hazards include dust and noise pollution. Also the movement of heavy trucks, on roads which are not built for this purpose cause damage to the roads and quarrying of the hills changes the landscape and environment of the country. The disused quarries fill with water and become ponds or small lakes after abandonment of mining purposes and some quarries have become landfills. The land used for quarrying will not return to the way it was before the rocks was extracted and the species of flora and fauna that were disturbed and destroyed will not be able to re-establish themselves in that area[2] [3] [4] [5]

The risks of injuries are mainly due to[6] manual handling and lifting heavy weights, explosives and machineries/instruments, falls from height, slips and trips and transport related.

The main occupational health problems are[6] musculoskeletal injuries, effects of noise, asthma and silicosis.

It should also be noted that people exposed to excessive and long term exposures to dust, are likely to develop respiratory problems. The major respiratory health problem of working in the quarry industry is because of exposure to fine dust containing silica (also known as crystallinequartz)[7] Silica is found in almost all kinds of rock, sands, clays and gravel. Workers exposed to fine dust containing silica are at risk of developing a chronic and severely disabling lung disease known as "silicosis" and increased risk of lung cancer<sup>(7)</sup>. It usually takes a number of years of regular daily exposure before there is a risk of developing silicosis. Silicosis is a disease that has only been seen in workers from industries where there is a significant exposure to silica dust and has not been documented among members of the general public, indicating that environmental exposures to silica dust are not sufficiently high to cause this occupational silicosis[6] [7] This prompted us to study the health and social wellbeing of workers in stone quarries and crushing industries located in the outskirts of Bangalore city.

## Objectives

- To assess the social wellbeing among quarry workers.
- To study the health issues peculiar to specific vulnerable population groups in the quarry, specifically under five children of quarry workers, women and the elderly.
- To enumerate if any health problems among workers, with specific reference to injuries and other work related morbidities.

## Materials and Methods

- This was a cross sectional study done over a period of one year among people working in three quarries, situated in the peri-urban area of Bangalore.
- The social wellbeing was assessed using Social Wellbeing Scale used by the Ministry of Social Development, New Zealand 2004<sup>(9)</sup>. 60 people above the age of 15 were interviewed using this tool.
- The nutritional status of 106 under five children (49 girls and 57 boys) were assessed by anthropometric methods – height, weight and mid arm circumference and then compared to the standard.
- A pretested questionnaire was used to assess the health status and problems among 80 of the 118 women in the age group of 15 – 49 years working in the quarry.
- All the elderly in the quarry were interviewed and examined to assess their health status and morbidity using a pretested interview schedule.
- . Total of 101 workers (30 females and 71 males) were examined to study the prevalence and the nature of work related injuries among quarry workers.
- . Modified American Thoracic Society (ATS) questionnaire was used to assess the Peak Expiratory Flow reading and respiratory morbidity among 124 quarry workers in the age group of 15 – 55 years with at least six months of work experience in the quarry.

## Results and Discussions

- Social wellbeing[9] :
- Employment status: Most of the workers continued their parent's profession and were dissatisfied doing the same. All men and most of the women in the age group of 18 – 55 years were employed full time and worked for more than 8 hours/day and 6 days/week.
- Getting together as a group or community seldom occurred but the trust between families was strong. Workers admitted feeling lonely and isolated. Most of the quarry workers had migrated from the neighbouring states like Tamil Nadu, Andhra Pradesh and Bihar.
- Most of the present generation quarry workers both men and women were uneducated, and were unable to read and write in their mother tongue, only 5.66% of females and 9.43% of males were

educated. Most of this quarry workers wanted their children to go to school and the eligible children were being sent to school.

- The quarry workers were paid on a daily bases. The male worker earns about Rs. 75 to Rs. 200 per day and the female worker earns about Rs. 40 to Rs. 120 per day. Mean per-capita was Rs. 400 per month.
- The workers had difficulty in accessing and affording the cost of health care services. Due to injuries sustained during work most of the workers lost 2 – 3 days of work per month and did not seek medical care unless the injury was severe or major.
- The quarry workers resided in temporary (kaccha) houses, single room divided into kitchen and leaving room. These houses did not have water and electrical supply. The solid wastes of the houses were dumped into a common pit and the liquid waste passed through an open drain which stagnated at a distance from the houses – both these were potential vector breeding sites. Since there were no latrine facilities, the workers practiced open air defecation.
- The workers were not provided with any Personal Protective Equipments (PPE), and most of the workers had one – two external injuries per year which could be protected by using proper PPEs.
- Nutritional Status of Under 5 Children [10] [11]
- Of the 106 children surveyed, 95.28% of the children were undernourished – 96% female and 95% male children less than 5 years were undernourished. There was no significance difference in the nutritional status of children in different age groups or family size or birth order of the children.
- Only 2.8% of the children in quarries were immunised for age. There was an association between presence of infection and children who were undernourished and children non-immunised.
- Due to poor socio-economic status, lack of knowledge, illiteracy and ignorance there was a delay in initiation of weaning foods and this group of children had significant undernutrition.
- Health status of women quarry workers [12]
- 80 of the 118 women were interviewed and 70% of them were in the age group of 21 – 30 years.
- Most of the families live in kaccha houses (temporary huts or tents) which were overcrowded with no water supply, electricity and toilet facilities. Fire wood as used for cooking purposes.
- The social problems include consumption of alcohol, tobacco and domestic violence. Most of the daily earnings of male workers and some part of the female workers was spent on consumption of alcohol and tobacco.
- The essential care necessary during antenatal, natal and postnatal were lacking.
- The most common health and work related problems include
- Musculoskeletal problems among 70% of the women – myalgia, osteoarthritis and deformities secondary to work accidents.
- Respiratory problems 27% - bronchial asthma, chronic cough, pneumonia and tuberculosis.
- Gynecological problems 19% - dysmenorrhoea, menstrual irregularities and prolapse (uterus and rectum).
- Environmental problems 17% - headache, tiredness, heat cramps and photosensitivity.
- Morbidity profile among elderly (above the age of 60 years) migrant quarry workers [13]
- Elderly represented 10% of the quarry population, with more elderly females than males, 36:19. Among the elderly 70% assisted in carrying and loading, 11% were home makers and remaining 19% looked after grandchildren at home.
- Majority (87%) of the elderly were independent.
- The BMI of the elderly males and females was 21.87 and 23.0 respectively.
- The average systolic blood pressure was 127.60 and 139.40 and average diastolic blood pressure was 81.70 and 84.70 among elderly males and females respectively.
- Vision had decreased among 56% of elderly males and 33% of the elderly females due to cataract.
- Dental problems, anaemia, respiratory problems, musculoskeletal problems and consumption of tobacco were the other problems among the elderly quarry workers.
- Injuries among quarry workers [14]
- Among the 101 surveyed, 72 were males and 29 were females. All the 101 were daily wage workers earning between Rs. 50 to Rs. 150 per day. The work experience in quarry ranged from 5 years to 25 years. They are involved in works like crushing, cutting, jelly work, loading, drilling and marking. Most of the works were male dominated and females were mainly employed in jelly crushing.
- The common injuries include cuts, bruises and lacerations followed by crush injuries and fractures. Most common injuries occurred on the lower limbs followed by the upper limbs and least commonly on the face (including the eye) and scalp.
- Workers employed in stone crushing and cutting were involved in more severe injuries compared to injuries among workers involved in other works. Prevalence of injuries among quarry workers was 100%.
- Utilization of health care facilities following last injury was 70% - 7% were treated on outpatient basis and 63% were admitted in hospital. The remaining 30% took self-medication. All the workers had complaints with respect to the affordability of health care services and the

support or compensation received from the quarry owners.

- Comparison of Peak Expiratory Flow Rate (PEFR) among quarry workers and normal Indian population[15][16]:
- PEFR is a physiological parameter that can measure the degree of insult to the respiratory tract. This is attributed to the deposition of the particulate matter in the alveoli and the alveolar lining which in turn causes disturbance in ventilation perfusion kinetics of the lungs.
- In our study the workers in quarry had lowered lung function test as measured by the mean PEFR when compared to the standard mean PEFR among Indians.
- Further studies are necessary to study the specific agents that contribute to the insult and damage to the lungs and lung functions.

	Age groups	Mean PEFR (Quarry)	Mean PEFR (Normal)	Test of significance
<b>Males</b>	15 – 25	338.00	524.36	P value is < 0.05
	26 – 35	309.53	507.87	P value is < 0.05
	36 – 45	305.56	484.31	P value is < 0.05
	46 – 56	291.67	478.75	P value is < 0.05
<b>Females</b>	15 – 25	305.88	405.49	P value is < 0.05
	26 – 35	316.67	374.93	P value is < 0.05
	36 – 45	333.33	375.26	P value is < 0.05

### CONCLUSIONS

Many of the workers in quarries are migrants, continuing their parent’s profession. At the same time they do not want their children to continue in the same profession. Occupational injuries are a very common phenomenon among these workers. The use of personal protective equipment was rare. The accessibility and affordability of health care services is also a problem. Parental illiteracy, ignorance, poverty and poor socioeconomic and poor living conditions are the causes for increased prevalence of infections and malnutrition among children residing in the quarry. Common health related problems among people of all age group working in the quarries are – musculoskeletal problems, respiratory problems and work related injuries. Further studies are necessary to establish correlation between decrease lung function test and working in quarries.

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