Original Article

HEALTH STATUS EVALUATION OF LIMESTONE MINE WORKERS

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ABSTRACT

Introduction: Mining is a hazardous occupation in which workers are exposed to adverse conditions. In India, limestone mining is carried out in a large scale and there are 549 reported mines producing about 154 million tonnes.

Objective: The present study was carried out in a limestone mine in India to determine the morbidity pattern among workers engaged actively in mining activities.

Methodology: 152 workers engaged actively in mining activities were included. The health status of the employees was evaluated by well defined medical questionnaire along with pulmonary function test (PFT).

Results: Findings of the study showed poor literacy rate amongst the miners. Lung function test showed restrictive impairment in about 15% of miners. Hypertension, diabetes and musculoskeletal morbidity were prevalent in miners.

Conclusion: The study findings indicate the need for regular health checkups, health education, personal protective devices and engineering control for better health and productivity of the miners..

Key words: Limestone, miners, morbidity, pulmonary impairment.

INTRODUCTION

Mining is one of the major occupation in India involving large number of work force which is going to grow in future.[1] Mining being a hazardous occupation, workers are exposed to adverse conditions involving physical labour, stress and environmental pollutants like dust, noise, heat, vibration, poor illumination, radiation etc,.

Limestone mining is being carried out world wide since ancient days and is especially popular in architecture. Many landmarks around the world, especially in North America and Europe, are made primarily of this material.[2] Limestone is a calcareous sedimentary rock composed mainly of calcium carbonate present in a finely divided non crystalline state as in amorphous limestone, or as crystallized grains of mineral calcite as in crystalline limestone. Limestone often contains magnesium carbonate, either as dolomite $CaMg(CO_3)_2$ or magnesite ($MgCO_3$) mixed with calcite.[3]

In India, limestone mining is carried out in a large scale, about 154 million tonnes. There were 549 reported mines in 2003-04. [4] Andhra Pradesh was the leading producing state accounting for 16% production, followed by Madhya Pradesh (15%), Rajasthan (14%), Gujrat (11%), Chhattisgarh and Tamilnadu (9% each), Karnataka (8%), Maharashtra (6%) and Himachal Pradesh (4%).[4] The remaining 8% was contributed by Orrisa, Jharkhand, Kerala, Assam, Meghalaya, Bihar,

Jammu& Kashmir, Uttaranchal and Haryana. Average daily labour employment was 18314.[4] Limestone is quarried mainly for roadbeds, building and landscape construction, and cement manufacture. [5] Limestone is readily available and relatively easy to cut into blocks or more elaborate carving. It is also long-lasting and stands up well to exposure. [5] However, it is a very heavy material, making it impractical for tall buildings, and relatively expensive as a building material.[5]

This present study was carried out in a limestone mine to study the morbidity pattern amongst the miners.

METHODS

The present study was carried out in a limestone mine in Rajasthan state. 152 workers engaged actively in mining activities were included. Informed consent of the study subjects was obtained. The study was carried out in accordance with the Mines Rules, 1955.

Medical Questionnaire The health status of the employees was evaluated by well defined medical questionnaire based on modified British Medical Research Council.[6]

A brief family and personal history, work history, present and past medical status, symptoms and signs related each body system etc. were noted in medical questionnaire.

Pulmonary Function Test Spirometry of 138 miners out of 152 was carried out by Cosmed Pony Graphic 4.0 by following standard procedure.[7] Three readings were obtained for each worker and the best reading was taken for reporting and analysis. The results were interpreted as normal Spirometry, obstructive, restrictive or combined impairment on the basis of the performance of the subject. Predictive FVC was calculated by predictive equation of Kamat et al (1982).[8]

RESULTS

Personal information about the subjects like age, height, weight, body mass index (BMI), smoking and tobacco chewing habit are given in table -1.

The educational status is depicted in table-2, showing about 11.18% illiteracy amongst miners.

The subjects exposed to mining activities are further sub grouped depending upon there occupational exposure is shown in table-3.

Table 1: Personal information of miners

Parameters	Miners (N=152)
Age (yr)*	36.73 ± 8.26
Height (cm) *	166.17 ± 6.82
Weight (kg) *	69.52 ± 12.85
BMI* (kg/m^2)	23.99 ± 3.38
Smokers	35 (23.02)
Non-smokers	116 (76.31)
Tobacco chewers	46 (30.26)

*X^2 ± Sd, figures in parentheses are in percentage.

Table 2: Educational status of the study subjects

Education	Miners (N=152)
Illiterate	17 (11.18)
Primary	44 (28.94)
Secondary	70 (46.05)
University	21 (13.81)

Figures in parentheses are in percentage.

Table 3: Number of subjects according to their work exposure

Duration (years)	Miners (N = 152)
0 - 10	81 (53.28)
11 - 20	49 (32.23)
21 - 30	21 (13.81)
> 30	1 (0.65)

Figures in parentheses are in percentage.

Table 4: Findings of pulmonary function test (PFT) amongst study subjects

PFT	Miners (N=138)
Normal	117 (84.78)
Obstructive impairment	0
Restrictive impairment	20 (14.49)
Combined impairment	1 (0.72)

Figures in parentheses are in percentage.

Significantly higher numbers of workers, about 85% have occupational exposure in between 0-20 years. Lung function test carried out in miners showed about 15 % prevalence of restrictive impairment (table-4).

The persons with normal pulmonary functions were compared with persons with impaired pulmonary function using chi square test; the findings are depicted in table -5.

The observed morbidity pattern amongst the study group is shown in table-6. The prevalence of hypertension was 5.92 %. 7% of miners showed musculoskeletal symptoms. Diabetes was prevalent amongst 5.26%, whereas asthma,

urolithiasis and hypothyroidism were found in 0.72% each.

Table 5: Comparison between subjects having normal and impaired PFT

Particulars	Normal PFT (n=134)	Impaired PFT (n=21)	p value
Age	38.4 ± 8.0	40.3 ± 8.9	NS
BMI	23.9 ± 3.1	24.6 ± 3.2	NS
Work exposure	14.1 ± 7.7	15.5 ± 8.5	NS
Smoking status			
Smoker	28 (20.8)	7 (33.3)	NS
Non smoker	106 (79.1)	14 (66.6)	NS
Tobacco history			
Chewer	36 (26.8)	7 (33.3)	NS
Non chewer	98 (73.1)	14 (66.6)	NS
Education			
Illiterate	11 (8.2)	4 (19)	NS
Literate	123 (91.7)	17 (80.9)	NS

Chi squre test, NS: Non Significant

Table-6: Morbidity pattern of study subjects.

Morbidity	Miners (N=152)
Cardiovascular System	
Hypertension	9 (5.92)
Musculoskeletal system	
Backache	1 (0.72)
Joint pain	9 (6.52)
Metabolic Disorders	
Diabetes	8 (5.26)
Hypothyroidism	1 (0.72)
Urolithiasis	1 (0.72)
Respiratory System	
Asthma	1 (0.72)

Figures in parentheses are in percentage.

DISCUSSION

There are very few studies carried out among the miners pertaining to the health status. Most of the studies has been carried out to determine the prevalence of pneumoconiosis mainly silicosis. This may be the first kind of study among limestone mine workers depicting the overall health status.

The literacy rate amongst miners was found poor, illiteracy and primary level education seen to the extent of 40%. Smoking was seen in 23% of miners, which is an important predisposing factors in augmentation of lung disease.[9] About 15% restrictive lung function impairment was seen in miners that might be attributed to working condition and smoking habit. Musculoskeletal symptoms were prevalent in miners may be attributed to heavy physical work and associated machinery vibration. When the persons with normal pulmonary functions were compared with persons with impaired pulmonary function it was observed that smoking habits and tobacco chewing habits was more prevalent among the persons having impaired pulmonary function. However the findings were statistically insignificant.

In one of the study carried out among workers from an open-cast iron ore mine with an objective to assess morbidity among the workers revealed 3.2% had abnormal Spirometry findings, diabetes 5.1%, hypertension 8.3% and dyslipidemia 37.5% respectively.[10] In another study carried out among gypsum mine workers the illiteracy rate was 10.6%. 13.3 % miners had pulmonary impairment while 22.6% Hypertension, 8.8% diabetes and 8 % musculoskeletal morbidity.[11] Findings in both the studies are more or less in line with present study showing similar morbidity pattern among mine workers.

More elaborative studies are required to know the detailed morbidity pattern amongst Indian miners.

RECOMMENDATIONS

Regular periodical health examination, health education and use of personal protective equipments amongst the workers have to be encouraged. Implementation of engineering measures to control exposure levels will significantly benefit the health and productivity of the miners. Enforcing legal regulations especially regarding environmental monitoring will ensure better working condition. Awareness regarding prevention of health hazards in mining industry should be created among the mine management by conducting training and education programmes.

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