

Assessment of Health Status among Mine Workers of Maharashtra

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Abstract

Mine workers are exposed to harsh working condition as they carry out numerous activities with variable exposure which is hazardous to their health in various ways. This study was conducted on 97 randomly selected workers from two different mines of Maharashtra for the assessment of health status. To determine the health status of each worker, weight and height was measured by standard procedure and underwent medical examination and various clinical investigations. Data analysis was performed using Microsoft excel and online Graph Pad statistical software. Majority (80.4%) of the workers belonged to the age group of 30-50 years. Comparatively underweight (22.6%) workers were found more as compared to overweight and obese (12.3%) workers. 30.9% workers had hearing loss of which 9.27% had noise induced hearing loss (NIHL). 8.24% workers had respiratory impairment. Overall prevalence of anaemia was found to be 19.5%. Electrocardiography (ECG) results showed 11.3% workers had significant ECG changes. 19.5% workers were having high blood pressure while one worker each had diabetes and hypertriglyceridemia. 6.18% workers had refractive error. Urine analysis showed that 1 (1.03%) worker was having glycosuria and 5 (5.15%) workers having urinary tract infection. On evaluation of chest X-rays no case of pneumoconiosis and other abnormality was found in the mine worker. Present study suggests that NIHL and respiratory impairment is an important health problem in these mine workers. There is need of periodical medical examination of workers and awareness programme to educate mine workers regarding occupational and non-occupational problems should be regularly arranged.

Keywords: Mining Industry; Mine worker; Health status; Respiratory impairment; NIHL.

Introduction

Mining is an old occupation, being recognized for elevated risk of injury and occupational/non-occupational diseases. In India, workers working in different mining industries are directly or indirectly exposed to various types of hazards. There are about 481.7 million workers in India as per data

given in the Indian Labour Yearbook 2015 (source office of registrar general India) out of which 348.9 million workers are in rural areas and 133.1 million workers in urban areas of which unorganised sector accounts for 83% of the total work force [1]. There are about 3703 mines according to Indian Bureau of Mines [2]. However it is known that many unreported mining is also prevalent in many parts of India, which leads to many health hazards going unregistered. In India mining sector contributes approximately 4% to GDP and workers represent half the working population and are the major contributors to economic and social development [3,4].

Mine workers are exposed to various toxic or harmful materials like fuels, coal dust, silica dust,

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noise etc. as a result during the course of period many disorders develop. According to mining processes mining are divided into deep and open cast mine. Deep mines are associated with the risk of higher blood pressure, heat exhaustion, myocardial infarction and nervous system disorders. Surface mining is associated with health risk related to dust exposure [5]. Mines are noisy places and noise is generated by drilling, blasting, cutting, material handling, ventilation, crushing and ore processing, due to which miners are continuously exposed to higher level of noise that leads to increased prevalence of noise induced hearing loss among mine workers [6-8].

Mining activity involves different process like drilling, blasting etc., these processes generate dust which contains free crystalline silica. Exposure to this respirable dust is an important risk factor for many respirable diseases. Long term exposure to respirable dust in mine workers may lead to silicosis, silico-tuberculosis, pulmonary tuberculosis, COPD and occupational asthma. Workers are exposed to dust for short term can cause irritation to the upper respiratory tract [9]. Therefore this study was conducted to assess the present health status of mine workers of Maharashtra.

Materials and Methods

Present health survey comprised of 97 mine workers, randomly selected from various occupations from two different mining industries in Maharashtra for the assessment of health status.

First the workers were registered and basic information was collected from them (name, age, work exposure etc.) then the mine workers underwent medical examination with various clinical investigations. Height and weight was measured using standard techniques. BMI was calculated and classified according to WHO classification [10]. Medical examination of the workers was done with the help of questionnaire including their personal history present and past occupational and medical history etc. Systolic and diastolic blood pressure was measured by using standard mercury sphygmomanometer in the seating position. Hypertension was classified based on the joint national committee seventh classification [11]. Chest radiographs (posterior view) of all the workers were taken on 300 MA X-Ray machines. The chest X-Ray was classified as per ILO classification 2000 [12]. Audiometry test for hearing loss of each worker was conducted in sound proof audiometry booth by using Labat Asia

Audiometer. Audiometry test was performed for both air conduction and bone conduction and results were interpreted as per WHO guidelines [13]. ECG was recorded by using 12 Lead Maestros magic RXI machine and interpreted by expert panel. Pulmonary function test was performed with the help of RMS Helios 102 Spirometer. Three readings of spirometry test of each worker were obtained and the best result was analysed as per the American Thoracic Society guideline for assessment of respiratory impairment [14]. Blood sample were taken from the entire workers and the level of haematology and biochemistry parameters were estimated by fully automated haematology and biochemistry analyser respectively. Anaemia was diagnosed on the basis of haemoglobin concentration and severity of anaemia was categorised as per WHO criteria [15]. Routine urine examination for ten parameters was done by strip method. Visual acuity and colour blindness of each worker was measured by Snellen's chart and Ishihara chart. Collected data and findings of various parameters were entered in excel sheet and tabulated. Data analysis was performed using Microsoft excel and Graph Pad statistical software. Variables are expressed in frequency, percentage, mean and standard deviation.

Results

Table 1 shows the distribution of workers according to age group and BMI class. The workers working in this mine are mostly 30-50 years of age group with mean age of 39.3 while only 19.5% workers are 51-60 years of age group with mean age of 54.1. According to BMI, 22.6% workers were underweight with mean BMI 17.1 and 12.3% workers were having BMI more than or equal to 25 with mean BMI 27. Table 2 showed results of the

Table 1: Distribution of workers according to age group and BMI class

Variables	Number	Percentage	Mean \pm S.D.
<i>Age groups (years)</i>			
30 - 40	48	49.4	35.9 \pm 3.09
41 - 50	30	30.9	44.7 \pm 3.15
51 - 60	19	19.5	54.1 \pm 2.26
Total	97	100	42.2 \pm 7.63
<i>BMI (kg/m²)</i>			
< 18.5	22	22.6	17.1 \pm 1.03
18.5 - 24.9	63	64.9	21.7 \pm 1.81
25.0 - 29.9	10	10.3	26.2 \pm 1.23
\geq 30	2	2.06	31.2 \pm 0.01
Total	97	100	21.3 \pm 3.34

Table 2: Results of audiometry screening among mine workers

Findings	Number	Percentage
NIHL	9	9.27
High frequency sensorineural hearing loss	7	7.21
Mild hearing loss	9	9.27
Moderate hearing loss	1	1.03
High frequency hearing loss	4	4.12
Normal	67	69.0
Total	97	100

Table 3: Prevalence of respiratory impairment in study subjects

Findings	Number	Percentage
Mild Restriction	5	5.15
Moderate Restriction	1	1.03
Mild Obstruction	1	1.03
Mixed Impairment	1	1.03
Normal	89	91.7
Total	97	100

Table 4: Distribution of the workers according to the level of hemoglobin and age group

Level of hemoglobin (g/dl)	Age group			Total
	30 - 40	41 - 50	51 - 60	
≥ 13.0	45 (93.7)	21 (70)	12 (63.1)	78 (80.4)
11.0 - 12.9	2 (4.16)	8 (26.6)	6 (31.5)	16 (16.4)
8.0 - 10.9	1 (2.08)	1 (3.33)	1 (5.26)	3 (3.09)
> 8.0	0	0	0	0
Total	48	30	19	97

Table 5: ECG findings among mine workers

ECG findings	Number	Percentage
T wave indicating ventricular overload/ ischemia	4	4.12
Bundle branch block	4	4.12
Sinus tachycardia	2	2.06
Left ventricular hypertrophy	1	1.03
Total	11	11.3

Table 6: Distribution of workers according to other clinical findings

ECG findings	Number	Percentage
Hypertension	19	19.5
Visual impairment	6	6.18
Defective colour vision	1	1.03
Pterygium	4	4.12
Conjunctivitis	1	1.03
Elevated blood sugar level	1	1.03
Elevated triglycerides level	1	1.03
Glycosuria	1	1.03
Urinary tract infection	5	5.15

audiometry screening among mine workers. 30.9 workers were having hearing loss of which 9.27% had mild hearing loss, 1.03% had moderate hearing loss and 4.12% had high frequency hearing loss. 9.27% had noise induced hearing loss while 7.21% had high frequency sensorineural hearing loss. The prevalence of respiratory impairment in mine workers is shown in table 3. The overall prevalence of respiratory impairment was seen in 8.24% workers of which 5.15% had mild restriction while one worker each had moderate restriction, mild obstruction and mixed impairment. 91.7% of mine workers showed normal pulmonary function test.

Table 4 showed distribution of anemia among workers with association of age. The overall prevalence of anemia among the workers was found to be 19.5%. Among them 16.4% workers had mild anemia while 3.09% had moderate anemia. 16.4% workers were having anemia are in 41-60 years of age group. No case of severe anemia was found.

Table 5 showed ECG findings in mine workers. 4.12% workers showed T wave indicating ventricular overload/ ischemia. Various types of bundle branch block were seen in 4 workers. 2.06 workers had sinus tachycardia while 1 worker had left ventricular hypertrophy. Other clinical findings present among these mine workers are shown in table 6. Hypertension was found in 19.5% and 6.18% mine workers were had refractive error, 4 (4.12%) workers were had pterygium and conjunctivitis was seen in one worker. Defective colour vision was also seen in one worker. There were one worker each had elevated level of blood sugar and triglycerides respectively. Urinary tract infection was found in 5.15% workers and Glycosuria was found in one worker.

Discussion

Workers are exposed to more adverse working condition like stress, noise, dust, heat, vibration etc that affects the health of workers in various ways. Among these mine workers near about 50% workers are in the age group of 30-40 years while 22.6% workers were underweight. On evaluation of chest x-rays no case of pneumoconiosis and other abnormality was found in present study. Development of pneumoconiosis among the mining workers depend on the chemical composition of dust, concentration of dust in the air, period of exposure and health status of the exposed worker [16]. Present study showed 6.1% workers had restrictive impairment while one worker each had mild obstruction and mixed impairment.

Overall pulmonary impairment was seen in 9.1% workers. Prevalence of pulmonary impairment in this study was lower than other studies. Study conducted in limestone mine workers in Rajasthan State showed prevalence was 15.2% while study conducted by Nandi et al. showed that 14% of the workers had pulmonary impairment [17,18]. In this study low prevalence of pulmonary impairment and no case of pneumoconiosis was observed. It might be due to low dust level in working environment.

In our study 30.9% workers were having hearing problem of which 9.27% had noise induced hearing loss. These observations were lowered when compared to study done by Dhatrak et al. which showed 23.8% mine workers had NIHL [19]. Similar findings reported among gold mining workers in Ghana [20]. Present study showed 21.6% workers were having different grade of hearing loss which is lower when compared to study conducted by Oliveira et al. [16].

In this study 11.3% mine workers had significant ECG changes. One worker each had elevated level of blood sugar and triglycerides. 5.15% workers were had urinary tract infection and one worker had Glycosuria. A history of osteoarthritis was present in 2.06% of the mine workers. Overall prevalence of anemia was seen in 19.5% workers which are slightly higher than study conducted by Giri et al. [21]. In our study 6.18% mine workers were had refractive error, 4 (4.12%) workers were had pterygium and conjunctivitis was seen in one worker. These observation were lower when compared to the studies conducted by Rajshekhhar S et al showed that 22.72% mine workers had refractive error, 12.37% had conjunctivitis and 4.87% had pterygium [22]. Defective colour vision was also seen in one worker. In this study 19.5% workers had hypertension. These findings were lower than study conducted in Gypsum mine workers in India which showed hypertension in 22.6% workers [18].

Conclusion

Workers in mining industry are exposed to a number of hazards physical, chemical or biological leading to a number of health problems or diseases. Dust and noise are more common in mining as a result, risk and prevalence of respiratory impairment and hearing loss was found among these mine workers. There is a need of regular periodical medical examination of workers and should be regularly arrange awareness program and educate the mine workers regarding occupational and non

occupational health problems. Workers should be encouraged for regular use of personal protective equipment to protect them from occupational disorders.

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