

FACTORS ASSOCIATED WITH OCCUPATIONAL INJURIES IN COAL MINERS

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ABSTRACT

Objective: To find the frequency and factors associated with occupational injuries among coal miners.

Material & Methods: This cross-sectional study was conducted among coal miners of Cherat, District Nowshera, Khyber Pakhtunkhwa, Pakistan, between September 2012 and March 2013. A sample size of 400 was selected based on 95% confidence interval, 50% prevalence and with $P < 0.05$. The non-probability cluster sampling technique was used in which the study area was divided into four clusters and then from each cluster 40% coal miners were selected based on simple random technique. There are approximately 80-90 Cherat coal mines in which around 1000 of coal miners are working. Coal miners of age range 20-60 years with more than one year of coal mining job were included while those who had less duration and had age either less than 20 or more than 60 years were excluded from the study. Field visits were conducted to collect relevant data from the study areas. The structured pretested questionnaire was used to collect data like age, duration of coal mining job, job satisfaction, smoking history: and then those coal miners who have history of mine injuries were evaluated for various risk factors.

Results: Our study results showed that 45.25% (n=181) had history of previous injuries. Among those coal miners who gave history of injuries, 81.77% (n=148) were due to lack of training, 85.08% (n=154) to health education, 63.54% (n=115) to early years of coal mining job, 65.74% (n=119) to less than 30 years miner age, 70.17% (n=127) to unsatisfied with coal mining job, 71.27% (n=129) for not using personnel protective measures and 78.45% (n=142) of injuries were related to smoking among coal miners.

Conclusion: The prevalence of occupational injuries among coal miners were high and had strong relationship with age, job duration, smoking, training, knowledge & with compliance of personnel protective devices.

Key Words: Injuries, Miners, Smoking, Training, Knowledge.

INTRODUCTION

Coal is the major source of energy being consumed in domestic and commercial sectors. Coal production helps a lot in the economic development but also renders a great deal of risk to the coal mine workers. Coal mining is considered as one of the dangerous occupation throughout the globe¹. The overall situation of occupational safety and health in mines was not encouraging and thus a significant number of coal miners were killed or became disabled due to occupational injuries/accidents. Mining, especially underground coal mining has always been a dangerous occupation and poses many health

problems to coal miners for example respiratory, cardiovascular, gastro-intestinal, bones/joints, skin and foot problems etc.² Heavy physical work, severity of the working conditions, noncompliance of personnel protective equipments, lack of knowledge regarding coal mining and modern machines, work place injuries and accidents were the main causes of occupational morbidity and mortality³. Injuries, resulting in death, were one of the major occupational risks⁴. In 2007, 5,488 workers died from injuries and 49,000 died from work-related injuries^{5,6}. National Institute of Occupational Safety and Health estimates that 4 million workers suffered from work related injuries or illnesses⁷. According to National Institute for Occupational Safety and Health and Bureau of Labor Statistics reports, globally an average of 15 workers die from traumatic injuries, and an additional 200 workers are hospitalized each day⁸.

Pakistan, being a developing country, faces many problems regarding occupational health

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& safety standards. The standards formulated by International Labor Organization (ILO) and World Health Organization (WHO) for implementation and monitoring are not followed and thus poses a significant potential risk to coal miners. There are around 90 million of tons of coal in Khyber Pukhtunkhwa Province Pakistan i.e. from Hangu/Orakzai and Cherat/Nowshera⁹. The coal miners of Cherat, were one of the neglected sectors, where no such standards were followed and monitored and thus this cross sectional study was conducted in order to find the frequency of occupational injuries and accidents; and to analyze various associated factors.

MATERIALS AND METHODS

This cross-sectional study was conducted from January 2013 to July 2013; in Cherat area, District Nowshera, Khyber Pakhtunkhwa, Pakistan. Cherat, is a hilly area located about 50 km from the District Peshawar, having a total of 80-90 coal mines and in them approximately one thousand coal miners were working. A study sample size of 400 was selected according to WHO sample calculation formula, based on 95% confidence interval, 50% prevalence and 5% precision. Coal miners who have more than one year of coal mining job were included in the study sample while those having less than one year mining job and having various pathological problems were excluded from the study. The non-probability cluster sampling technique was followed in which the whole area was divided into four clusters i.e. Shakot, Jaba Tar, Jaba Khushk and Dak Ismail Khel, and then from each cluster 40% coal miners were selected based on simple random technique/method. The coal miners having history of either minor/major or any injury/accident which resulted in loss of working days were used as a diagnostic criterion. A detailed structured questionnaire was formulated to collect data for important variables like age, duration of coal mining job, smoking history, job satisfaction, knowledge and training regarding occupational health and safety and compliance of personnel protective equipments. Job satisfaction was rated on a specially designed proforma with respect to monthly income, satisfied with current job, number of dependants, family pressure and marital status. Coal miners were considered as chronic smokers if they had history of smoking 15 or more cigarettes per day for more than one year. Statistical Package for Social Sciences (SPSS) version 16 and Microsoft Excel software were used for data analysis and interpretation. Continuous variables were analyzed using means and standard deviations for example: age etc; categorical variables were analyzed using percentages.

RESULTS

The results of demographics of the coal miners showed that the mean age of coal miners was 30 years with standard deviation ± 1.26 (Table 1). About 221 (54.25%) of the coal miners had 1-8 years of coal mining job and the mean job duration was 8 years with

Table 1: Frequency of Various Occupational Injuries Vs Age Distribution

Age Distribution	Total Population (n=400)	Injuries (n=181)
< 20 years	21(5.25%)	09(4.97%)
20-25 years	146(36.50%)	78(43.09%)
25-30 years	69(17.25%)	32(17.68%)
31-35 years	48(12.00%)	20(11.05%)
36 years & above	116(29.00%)	42(23.20%)
Total	400	181

Table 2: Frequency of Occupational Injuries Vs Job Duration

Age Distribution	Total Population (n=400)	Injuries (n=181)
1-4 years	112(28.00%)	72(39.78%)
5-8 years	109(27.25%)	43(23.76%)
9-14 years	71(17.75%)	25(13.81%)
15 years & above	108(27.00%)	41(22.65%)
Total	400	181
Total	400	181

Table 3: Frequency of Occupational Injuries Vs Level of Knowledge Regarding Occupational Safety among Coal Miners

Level of Knowledge	Total Population (n=400)	Injuries (n=181)
Good	89(22.25%)	27(14.92%)
Poor/ Bad	311(77.75%)	154(85.08%)
Total	400	181

Table 4: Frequency of Occupational Injuries Vs Smoking/ Job Satisfaction/ Training/ Personnel Protective Devices

Variables	Response	Total Population (n=400)	Injuries (n=181)
Smoking History	Yes	289(72.25%)	142(78.45%)
	No	111(27.75%)	39(21.55%)
Job satisfaction	Yes	182(45.50%)	54(29.83%)
	No	218(54.50%)	127(70.17%)
Coal Mine Training	Yes	135(33.75%)	33(18.23%)
	No	265(66.25%)	148(81.77%)
Usage of Protective Devices	Yes	193(48.25%)	52(28.73%)
	No	207(51.75%)	129(71.27%)

standard deviation of ± 1.12 (Table 2) and 77.75% do not have any knowledge/education regarding occupational safety & health measures (Table 3).

From the results of our study the prevalence of coal mine injuries assessed among 400 coal miners were 45.25% (n=181). On assessment regarding the smoking behavior, 72.25% (n=289) of the coal miners gave positive history of 10 or more cigarettes per day for more than one year. On assessment regarding job satisfaction in coal miners, 54.50% (n=218) were not satisfied, and only 33.75% (n=135) had received adequate training regarding coal mining safety. Among those coal miners who had undergone effective training only 18.23% had history of coal mining injuries while among untrained coal miners there were approximately 81.77% of major and minor mining injuries. Approximately 35.75% (n=143) of coal miners did not follow the standard personnel protective equipments for example face mask, helmet, goggles, gloves, shoes etc; and the frequency of occupational injuries among these coal miners were high than those who had good compliance regarding Personnel Protective Devices (PPDs)(Table 4.)

DISCUSSION

Worldwide mining, especially underground coal mining is one of the dangerous occupation¹ and causing loss of many previous lives due to various occupational injuries and accidents. Heavy physical work, severity of the working conditions, noncompliance of personnel protective equipments, and lack of knowledge were the main causes of occupational morbidity and mortality³.

From the demographics of the coal miners, it was analyzed that the age ranged from 18-56 years; had mean 30 years with standard deviation of ± 1.26 . In various international studies^{1,10,11,12} there were positive relationship between injuries and young age of coal miners along with early years of life and thus these findings were confirmed in our study in which there were more than 65.74% (n=119) of occupational injuries among miners having age less than 30 years. Approximately 221 (54.25%) of the coal miners had 1-8 years of coal mining job and in these coal miners nearly 63.54% (n=115) of coal mining injuries and accidents had taken place; in previous studies it was confirmed that there was strong relation between occupational injuries and initial years of coal mining job^{10,11,12,13}.

In our study, 72.25% (n=289) of the coal miners showed positive history of smoking and 78.48% (n=142) of injuries occur in these coal miner smokers; the relationship of coal mining injuries and smoking/substance abuse were also revealed in Vivek study (2012)¹¹. In study of Gerald et al; a strong relation was found between occupational injuries and compliance of personnel protective equipments⁴; in our study, 51.75% (n=207) of coal miners do not follow the standard personnel protective equipments and thus among these coal miners 71.27% (n=129) had history of occupational injuries in past which was higher than the international rates of ILO and WHO.

In our study 54.50% (n=218) of coal miners were not satisfied with their coal mining job. Approximately 66.25% (n=265) of coal miners do not have any sort of training regarding coal mining safety measures and 77.75% (n=311) do not have any knowledge/education regarding occupational safety & health measures and thus having 70.17% (n=127), 81.77% (n=148) and 85.08% (n=154) of occupational injuries among coal miners respectively; and these relationships were also confirmed and founded in various international studies^{10,11,13,14}. Beside these factors the coal miners belong to low socioeconomic status, less income and thus most of these coal miners were illiterate and poor and thus were not following the adequate protective measures.

CONCLUSION & RECOMMENDATIONS

The age of coal miners, duration of coal mining job, smoking history, job satisfaction, training, knowledge regarding Occupational Safety and Health Administration; and compliance of personnel protective equipment showed strong relation with occupational injuries; and thus immediate remedial measures are needed from the Government and concerned departments in order to prevent occupational injuries resulting in unnecessary morbidity and mortality among coal miners.

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