

Non-Communicable Disease (NCD) Profile in Workers of a Private Iron Ore Mine in Jharkhand: A Cross-Sectional Study

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Abstract

Introduction: Non-Communicable Diseases (NCDs) are assuming increasing importance among the adult population worldwide and one of the major emerging health problems affecting both males and females. Over the last few years, India is experiencing a rising burden of NCDs, which mainly includes: cardiovascular diseases, stroke, diabetes, cancer, MSD, chronic respiratory diseases, accidents and injuries and mental health.

Methods: A cross-sectional study was conducted to find the epidemiological profile and prevalence of NCDs among 140 workers in a private Iron Ore Mine in Jharkhand.

Results: The study revealed, most of the employees (47%) were pre-obese or obese with a Body Mass Index (BMI) > 25. 41% of the workers were smoker, 31% alcoholic. Musculoskeletal Disorders (MSD), Hypertension and Diabetes found in 23%, 19% and 14% respectively. BMI was significantly associated (at $p < 0.05$) with hypertension ($\chi^2 = 5.1171$, $p = 0.023691$) and diabetes ($\chi^2 = 4.8922$, $p = 0.026979$). Smoking also showed statistically significant association ($\chi^2 = 6.86$, $p = 0.008815$, $p < 0.05$) with hypertension.

Conclusions: NCDs were common among the mining workers. The study emphasized the need of community-based wellness program along with some specific recommendations to prevent NCDs among the mining workers.

Keywords: BMI, Diabetes, Hypertension, MSD, NCD

Introduction

“Occupational Health” is the promotion and maintenance of highest degree of physical, mental and social well-being of workers in all occupations.¹

Non-Communicable Diseases (NCDs) are assuming increasing importance among the adult population worldwide and it is one of the major emerging health problems affecting both males and females.² Due to increased urbanization and industrialization, socio-economic development, changing

lifestyles, non-communicable diseases are posing major health problem globally.

Over the last few years, India is experiencing a rising burden of NCDs- which are an important public health problem.

Traditionally, agriculture is the backbone of Indian economy. But in recent years there is more urbanization and industrialization and hence migration of labour workers also increased. With these migrations of labour workers far away from their home, the habits like alcoholism, smoking

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and tobacco chewing is also increased due to various factors like loneliness, peer pressure etc.³ and the major causes for the increase in cases of non-communicable diseases are dyslipidaemia, overweight, obesity, physical inactivity, tobacco use, alcohol consumption, and taking unhealthy diet.^{4,5}



Figure 1. Employees' health check-up at shop floor

NCDs refer to those conditions which are chronic evolve slowly and progress relentlessly and it mainly includes: cardiovascular diseases, stroke, diabetes mellitus, cancer, MSD, chronic respiratory diseases, accidents and injuries and mental health.²

Many of the risk factors for NCD are due to lifestyle and can be prevented. Drug treatments can be inexpensive but remain out of reach for many people. Even when affordable, care is often not organized to deal with NCDs and their risk factors. The fight against non-communicable diseases needs to start today and be the prime focus tomorrow.⁶

Mining is a very old occupation, being recognized as a job which has high risk of injury and disease. It is one of the most hazardous industries. Mining is a multi-disciplinary industry, drawing on several professions and trades.

Mining workers are exposed to various potentially toxic or harmful materials or agents like fuels, reagents, solvents, detergents, dusts, heat, noise, welding fumes etc. As a result, many disorders develop through the passage of time.⁷

Few studies were carried out in India amongst mining workers and the factors associated with non-communicable diseases. So, this study was conducted with the objective to know the health status of mining workers, to find out the prevalence of NCDs among them and to study factors associated with it.

Methodology

A cross-sectional study was conducted through health check-up to find the spectrum, epidemiological profile and prevalence of NCDs among 140 workers in a private Iron Ore Mine in Jharkhand during April-July 2017. Data

were collected by their routine health check-up as a part of regular medical examination and among them 140 workers randomly selected for the study. They were from different departments, different age groups and from both the sex.

All the workers were given general pro forma and the answers were noted. Formal consent was taken from each individual and also from the HR department. The pro forma was used to collect information on socio-demographic profile, personal habit like smoking, tobacco, alcohol consumption etc.

A thorough clinical examination was done as routine medical examination. Main focus was given on past and family history also for major factors like hypertension, diabetes mellitus, obesity, previous history of any ischemic heart disease or acute coronary syndrome, any past history of injury or accident, cancer etc.

Prevalence of non-communicable diseases were analysed based on age, duration of exposure, educational qualification, socio-economic status, present working experience, onset of symptoms, pre-existing disease or illness etc.

Operational Definitions

Diabetes Mellitus (DM)

The current WHO diagnostic criteria for diabetes should be maintained— fasting plasma glucose ≥ 7.0 mmol/l (126 mg/dL) or 2h plasma glucose ≥ 11.1 mmol/l (200 mg/dL).⁸

Fasting and post-prandial blood sugar levels were estimated for each employee and diabetes mellitus was defined as WHO definition mentioned above and the workers who are already diagnosed cases of diabetes and taking medicines, were also included as diabetic.

Hypertension (HTN)

Estimated with Sphygmomanometer and a level of Systolic >140 mmHg, Diastolic >90 mmHg was labelled as hypertension.⁹ As the diabetics, the workers who are already diagnosed cases of hypertension and taking anti-hypertensive medicines, were also included as hypertensive.

Body Mass Index (BMI)

BMI¹⁰ was calculated by considering height (m) and weight (Kg) by using following formula. $BMI = \text{Weight (Kg)} / \text{Height (m}^2\text{)}$.

Statistical Analysis

Chi-Square (χ^2) test used for statistical analysis by simple online Chi-Square calculator (at $p < 0.05$). As per the study, BMI was significantly associated (at $p < 0.05$)

with hypertension ($\chi^2=5.1171$, $df=1$, $p=0.023691$) and diabetes ($\chi^2=4.8922$, $df=1$, $p =0.026979$). Smoking also showed statistically significant association ($\chi^2=6.86$, $df=1$, $p =0.008815$, $p<0.05$) with hypertension (Table 3B, 4B & 5B).

Results

Socio demographic Profile (Table 1)

As per the study, mean age of employees was 43.43 ± 9.39

years, maximum of the workers were from the age group 41-50 years (35%). 94% were male, 6% female, 89% married. Per Capita Income was maximum (41%) among the income group with Rs. 5,001-10,000.

There were 41% (n=57) smoker whereas 31% (n=43) were alcoholic. Almost half of the workers (n=67, 48%) were miscellaneously addicted to smokeless tobacco, among them 57% were addicted to Khaini and 15% addicted to both Khaini and Gutkha, which are very dangerous for health.

Table 1. Socio demographic profile of study subjects

Characteristics of the participants (n=140)	Frequency	Percentage
Age (Years)		
21-30	19	14%
31-40	30	21%
41-50	49	35%
51-60	42	30%
Working experience in current job (years)		
5≤	33	24%
6-15	23	16%
16-25	46	33%
≥25	38	27%
Educational qualification		
Graduate and above	38	27%
Higher secondary and diploma	30	21%
Matriculation	47	34%
Below matriculation (Up to class IX)	25	18%
Marital status		
Married	124	89%
Unmarried	16	11%
Per capita income (Rs.)		
≤5,000	30	21%
5,001-10,000	57	41%
10,001-15,000	48	34%
> 15,000	05	04%
Personal habit (Smoking)		
Smoker	57	41%
Non- Smoker	83	59%
Habit of addiction to smokeless tobacco (n=67) *		
Khaini	38	57%
Gutkha	19	28%
Both (Khaini and Gutkha)	10	15%
Personal habit (Alcohol consumption)		
Alcoholic	43	31%
Non-alcoholic	97	69%

Non-Communicable Disease (NCD) with Risk Profile (Table 2)

Study revealed that, 19% of the workers were hypertensive and 14% were diabetic. 53% of the workers had normal BMI (18.5-24.9), whereas almost half of the workers (47%) have high BMI (≥ 25) among which 41% overweight and 6% obese. No person was in underweight group. 23% of the workers were suffering from MSD and most of them were above 40 years (84%) with working experience more

than 20 years.

4% (n=05) workers were suffering from IHD. Most of them were in age group of 41-50 and 51-60 years (40% each). Chronic respiratory disease (COPD, asthma) were seen among 2% (n=03) workers, all of them were above 45 years. Refractive error (cataract) were seen among 2% (n=03) workers and all of them were above 50 years. There was a single case (follow-up) of Carcinoma Right Lung (adenocarcinoma) under treatment.

Table 2. Subjects suffering from non-communicable disease and risk profile

Non-communicable disease profile	Frequency	Percentage
Hypertension		
Hypertensive	27	19%
Normotensive	113	81%
Hypertension-age wise distribution (n=27)		
21-30	00	00%
31-40	02	07%
41-50	10	37%
51-60	15	56%
Diabetes mellitus		
Diabetic	20	14%
Non-Diabetic	120	86%
Diabetes mellitus - age wise distribution (n=20)		
21-30	00	00%
31-40	02	10%
41-50	07	35%
51-60	11	55%
BMI		
18.5-24.9 (Normal)	74	53%
25.0-29.9 (Overweight)	58	41%
≥ 30 (Obese)	08	06%
High BMI - age wise distribution (n=66)		
21-30	04	06%
31-40	13	20%
41-50	26	39%
51-60	23	35%

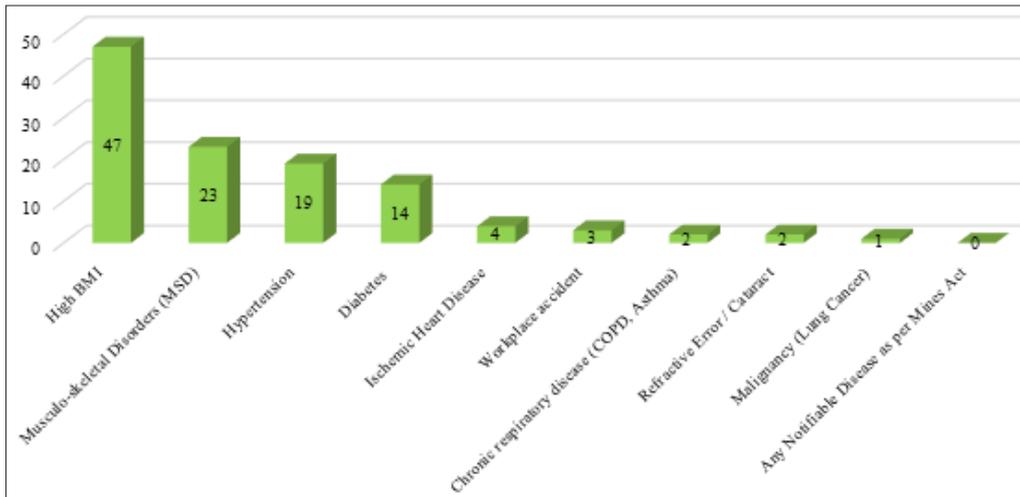


Figure 2. Distribution of workers according to study findings (%)

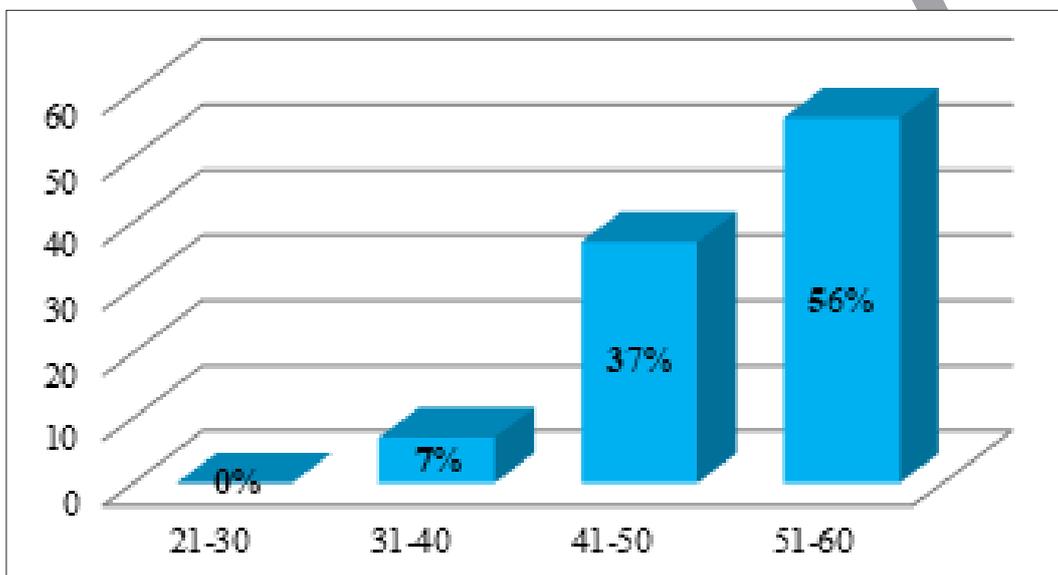


Figure 3. Distribution of worker according to hypertension in relation to age

Table 3A. Distribution of worker according to their BMI and Diabetes (DM)

BMI	No. of workers (n=140)			
	DM		No DM	
	No.	Percentage (%)	No.	Percentage (%)
18.5-24.9 (Normal)	06	30	68	57
25.0-29.9 (Overweight)	11	55	47	39
≥30 (Obese)	03	15	05	04
Total	20	100	120	100

Table 3B. Chi-square test (association between BMI and Diabetes)

	DM	No DM	Row totals
BMI > 25	14 (9.43) [2.22]	52 (56.57) [0.37]	66
BMI < 25	6 (10.57) [1.98]	68 (63.43) [0.433]	74
Column totals	20	120	140 (Grand total)

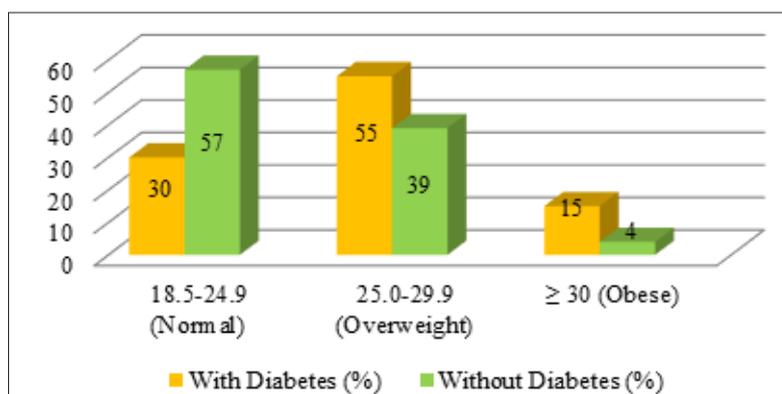


Figure 4. Comparison between BMI and Diabetes

Table 4A. Distribution of worker according to their BMI and hypertension

BMI	No. of workers (Total, n=140)			
	HTN		No HTN	
	No.	Percentage (%)	No.	Percentage (%)
18.5-24.9 (Normal)	09	33	65	58
25.0-29.9 (Overweight)	13	48	45	40
≥ 30 (Obese)	05	19	03	02
Total	27	100	113	100

Table 4B. Chi-square test (association between BMI and hypertension)

	HTN	No HTN	Row totals
BMI > 25	18 (12.73) [2.18]	48 (53.27) [0.52]	66
BMI < 25	9 (14.27) [1.95]	65 (59.73) [0.47]	74
Column totals	27	113	140 (Grand total)

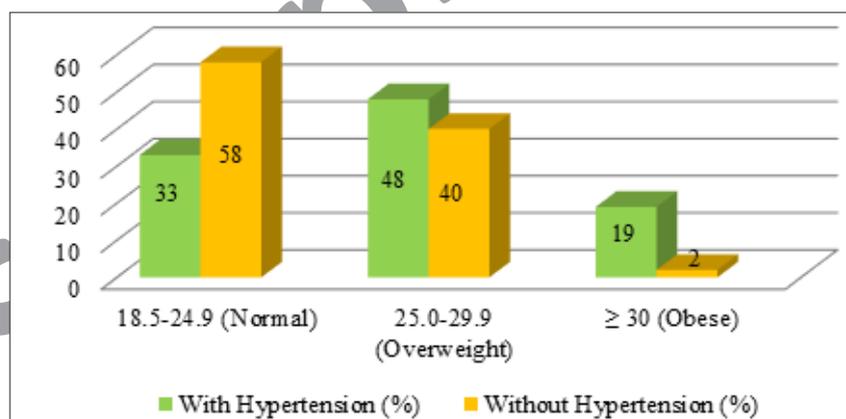


Figure 5. Comparison between BMI and Hypertension

Table 5A. Distribution of workers according to their Smoking habit and hypertension

	HTN		No HTN		Total
	No.	Percentage (%)	No.	Percentage (%)	
Smoker	17	63	40	35	57
Non-Smoker	10	37	73	65	83
Total	27	100	113	100	140 (Grand total)

Table 5B. Chi-square test (association between smoking and hypertension)

	HTN	No HTN	Row totals
Smoker	17 (10.99) [3.28]	40 (46.01) [0.78]	57
Non-Smoker	10 (16.01) [2.25]	73 (66.99) [0.54]	83
Column totals	27	113	140 (Grand total)

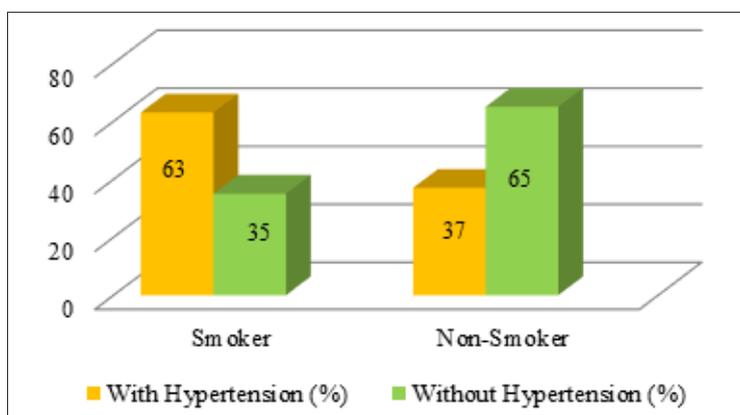


Figure 6. Association between smoking and hypertension

Discussion

Due to increased industrialization, socio-economic development, changing lifestyles, non-communicable diseases are posing major health problem in India as well as globally, mining workers are not the exception.

In the study population, 19% (n=27) were suffering from Hypertension. Among them, 56% were in the age of 51-60 years, and 37% and 7% were in the age of 41-50 years and 31-40 years respectively. It proves that hypertension is associated with advancement of age, which is a normal phenomenon. This finding was similar with the study by Mungreiphy NK et al.¹¹ in India which showed Blood Pressure (both systolic and diastolic BP) increased with age steadily from the youngest to the oldest age group showing the dependence of BP on age. Similar findings of high blood pressure in relation to age were established in the study conducted by Bowman TS et al.¹² in USA.

As per the study, 14% (n=20) were suffering from Diabetes, among them 55% were in age of 51-60 years and rest of the population in below 50 years. So, the prevalence of diabetes steadily increases with advancement of age. This finding is quite similar with the study published in American Journal of Hypertension¹² in 2006.

66 workers (47%) had high BMI. Among them mostly in the age of 41-50 years (39%) followed by age of 51-60 years (35%). So, most of the workers (74%) with high BMI were above 40 years by age. Similar study¹¹ in India revealed age was positively correlated with BMI.

Chi-Square test (χ^2) was used for statistical analysis in the study and it was observed that BMI was significantly

associated (at $p < 0.05$) with diabetes ($\chi^2 = 4.8922$, $df = 1$, $p = 0.026979$) and hypertension ($\chi^2 = 5.1171$, $df = 1$, $p = 0.023691$). Table 3A-3B, 4A-4B and Figure 4 and 5 showed the analysis among the workers according to diabetes (DM) and hypertension respectively. Similar study¹³ at New Delhi, India, among the Punjabi populations showed significant positive correlation between BMI, fat percentage and both- systolic and diastolic blood pressure. Studies outside India also established high BMI as a contributory factor for hypertension.^{14, 15}

The present study found that those suffering from hypertension tend to be older, as well as overweight or obese. A higher prevalence of hypertension in older adults is generally known, as well as the higher prevalence of hypertension among those with BMI > 25 (overweight or obese). It has been described, that overweight or obese patients suffer more often by chronic medical disorders.¹⁶

Smoking also showed statistically significant association ($\chi^2 = 6.86$, $df = 1$, $p = 0.008815$, at $p < 0.05$) with hypertension (Table 5A-5B and Figure 6). Similar findings of high blood pressure among the smokers were established in the study conducted by Halperin RO et al.¹⁷ in USA in American Journal of Hypertension in 2008.

Conclusions

From the data analysed, it has been found that non-communicable diseases (NCD) are important issue in today's working environment and NCDs are supposed to be major health problem in India, as well as globally in coming days. NCDs are also major problem for mining workers.

Like all occupational diseases, prevention takes the

major role for NCDs. With more restricted life, life-style modifications, following good habits and healthy food habits NCDs can be prevented.

Although WHO warned in different occasions in different forum about the topic and different studies are going on but Global concerns and effort by ILO/WHO is required to encourage formulation of national program and strategies for prevention of NCDs. Detailed studies should be conducted in future on the same topic, in a large sample with long duration by the Govt. / large private organizations/ in joint venture for more analytical data and specific result. More research works to be needed.

General Recommendations

- Workers must be aware of hazards present in workplace.
- To identify all "High Risk" cases and awareness in personal level, strict follow up of all the workers suffering from non-communicable diseases.
- More emphasis on Pre-employment and Periodical medical examination (PME) of workers to detect the non-communicable diseases in early stages.
- Motivate them to do Physical exercise, Yoga regularly to keep them fit & for stress management.

Specific Recommendations

- **Weight management plan** by regular follow-up of the workers who are overweight or obese and prepare "Diet Chart" for them.
- **Hypertension and Diabetes control plan** by regular follow up for persons suffering from those chronic ailments and advise them for lifestyle modifications and other valuable suggestions. If not controlled, advise them to take regular medicines.
- **De-addiction program, Smoking- cessation program** on regular basis. "One to one" counselling and advice to give up their personal habits like smoking, alcoholism etc.
- **More Awareness sessions** / shop floor classes/ training program on NCDs / Life-style related diseases.

Conflict of Interest: None

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