

Effect of age and body mass index on the status of prehypertension and hypertension among mine employees

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Abstract

Background and Aim: The burden of cardiovascular disease is on the rise and this rise in cases may be attributed to industrialization and adoption in modern lifestyle in India. In this rapid industrialization and economic growth, mining plays an important part in a gross domestic product. The mine workers cannot remain unaffected, with the overall scenario. Therefore, the present study was conducted to determine the prevalence of prehypertension and hypertension among mine employees and to study its association with body mass index (BMI) and age.

Methods: The health surveillance data of 1690 mine employees in the age group of 18–60 years was analyzed. Based on the World Health Organization criteria for BMI, mine employees were categorized as normal, overweight, and obese. Furthermore, as per the US Seventh Joint National Committee on Detection, Evaluation and Treatment of Hypertension criteria, the study population was categorized as normotensive, prehypertensive, and hypertensive. Statistical analysis was performed using Graph-pad software. One-way ANOVA and Chi-square test was used to analyze the data.

Results: The overall prevalence of prehypertension and hypertension was found to be 45.7% and 15.6%, respectively, and was higher among overweight and obese as compared to normal BMI ($P < 0.001$). It was also observed that the occurrence of hypertension is directly proportional to the age. The rising trend with increasing age was statistically significant ($P < 0.001$).

Conclusion: The prevalence of about 47% prehypertensive among mine employees call for the need of awareness programs and lifestyle interventions for the prevention of both prehypertension and hypertension and its associated future cardiovascular-related complications.

Key words: Age, body mass index, hypertension, mine employees, prehypertensive

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INTRODUCTION

It is well documented that hypertension is an important risk factor for cardiovascular disease and mortality.^[1] Hypertensives are known to have a twofold higher risk of developing coronary artery disease, 4 times higher risk of congestive heart failure, and 7 times higher risk of cerebrovascular disease and stroke as compared to normotensive subjects. A recent report on the global burden of hypertension indicates that nearly 1 billion adults had hypertension in 2000, and this is predicted to increase to 1.56 billion by 2025.^[2] Prehypertension is a condition

where a persons blood pressure is elevated above normal cut-off blood pressure, but not to the level considered as hypertension as per an American medical classification.^[3]

It has been observed that person with prehypertension have a threefold risk of developing hypertension compared with normotensive people. It is associated mostly with high body mass index (BMI) (overweight and

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obesity), increased age (>45 years old), and smoking.^[4] Hence, the cases with prehypertension are also of serious concern.

The burden of cardiovascular disease is on the rise particularly in South Asian countries, and this rise in cases may be attributed to industrialization and adoption in a modern lifestyle.^[5-7] Similar trend is seen in India, especially among the urban population.^[8] In this rapid industrialization and economic growth, mining plays an important part in a gross domestic product (GDP). The mine workers cannot remain unaffected from the overall scenario. Therefore, the present study was conducted to determine the prevalence of prehypertension and hypertension among mine employees.

MATERIALS AND METHODS

The study was conducted in nine organized mines located in the Kachchh, Surat, Bharuch, Vadodara and Bhavnagar districts of Gujarat state. The health surveillance data of 1690 mine employees of the age group of 18–60 was analyzed. The health surveillance was carried out as per standards prescribed under Rule 29B of Mines Rules, 1955 with the consent of mining company and its employees and in line with ethical guidelines. Based on the World Health Organization criteria for BMI, mine employees were categorized into three groups. BMI 18.5–24.9 kg/m² were classified as a normal group, BMI 25–29.9 were termed as an overweight group, while BMI ≥30 kg/m² were classified as obese.^[9]

The study population was categorized as normotensive (systolic blood pressure [SBP] 120 and diastolic blood pressure [DBP] <80 mmHg), prehypertensive (SBP = 120–139 and/or DBP = 80–89 mmHg), and hypertensive (SBP > 140 and/or DBP >90 mmHg and persons on antihypertensive medication) as per the US Seventh Joint National Committee on Detection, Evaluation and Treatment of Hypertension criteria.^[3]

Statistical analysis of data

Data analysis was performed using Graph-pad prism software version 5 (GraphPad Software, Inc. 7825 Fay

Avenue, Suite 230 La Jolla, CA 92037 USA) (California corporation). Data are represented as mean ± standard deviation for each of the parameters. ANOVA test was used for the comparison of a continuous variable, while categorical variables were compared by Chi-Square test. In addition, correlation of BMI with SBP and DBP in normal, prehypertension and hypertension group was done using Pearson's correlation analysis. The level of statistical significance considered was $P < 0.05$.

RESULTS

General characteristics of the subjects with reference to their hypertensive status are summarized in Table 1. All the parameters except height were significantly higher among the hypertensive subjects as compared to normotensive subjects ($P < 0.001$). Among 1690 mine employees, 653 (38.6%) had normal blood pressure, 773 (45.7%) had prehypertension, and 264 (15.6%) had hypertension. Table 2 shows the status of hypertension according to age group. Table 3 shows the relationship of BMI with hypertension among the study group. The increase in BMI is directly proportional to the occurrence of hypertension. The correlation of BMI with SBP and DBP in normal, prehypertension and hypertension group is shown in Table 4.

DISCUSSION

Mining during the present phase of economic development is one of the major contributors to GDP. The mine workers are exposed to the hazardous working environment and lead a strenuous lifestyle. Apart from the occupational diseases related to exposure to dust, noise, etc, they are also prone to diseases such as diabetes, hypertension, and obesity due to personal habits like smoking and alcohol consumption.

As hypertension and related complications have a major impact on quality of life,^[4] this study tries to throw light on the issue, in particular, prehypertension among mining community. Prehypertension usually remain unnoticed

Table 1: General characteristic of mine employees according to hypertensive status

Characteristics	Normotensive	Prehypertensive	Hypertensive	P
Age (years)	43.4±10.4	45.4±9.6	49.2±6.8	<0.0001
Heights (cm)	163.3±8.3	164.1±7.9	163.6±7.9	0.170
Body weight (kg)	64.2±11.0	68.3±12.0	70.9±13.3	<0.0001
BMI (kg/m ²)	24.0±3.4	25.2±3.7	26.4±4.4	<0.0001
SBP (mmHg)	110.7±7.3	128.1±8.3	149.1±11.0	<0.0001
DBP (mmHg)	74.1±5.1	83.2±3.4	95.9±7.6	<0.0001

Data expressed as Mean±SD. Statistical analysis of data was done by one-way ANOVA. $P > 0.05$ was considered significant. BMI: Body mass index, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

as it is asymptomatic and even if diagnosed during routine checkups medications are not prescribed and necessarily recommended lifestyle modifications such as change in dietary habit, and importance of exercise are not taken seriously by a person, which ultimately leads to hypertension.

This is probably the first study depicting the prevalence of prehypertension and hypertension among mining population which was 45.7% and 15.6%, respectively. It was also observed that the occurrence of hypertension is directly proportional to the age. The prevalence of hypertension increased from 1.8%, 8.4%, 14.4%, and 24.2% in the age group of 18–30, 31–40, 41–50, and 51–60, respectively. The rising trend with increasing age was statistically significant ($P < 0.001$). The findings are in line with other studies wherein the prevalence of hypertension increases with age.

However, prehypertension trend shows an increasing pattern up to the age of 40 years and thereafter, there is a decline in cases. The prevalence was 40.6%, 52.3%, 44%, and 47% in the age group of 18–30, 31–40, 41–50, and 51–60, respectively. The decline trend after the age group of 40 can be attributed to the prehypertensive cases being converting into hypertensive ones. In one of the study conducted

among industrial population reported the prevalence rate of prehypertension and hypertension was 44% and 30%, respectively.^[10]

Many studies have stated BMI to be strongly related with prehypertension and hypertension.^[11-14] In the present study, the prevalence of hypertension was highest among obese (26.9%) as compared to overweight (18.9%) and normal (11.2%) category. Similarly, the prevalence of prehypertension was highest among the obese group with 49.7% followed by 47.9% in overweight group and 43.5% in persons having a normal weight. Correlation of BMI with SBP and DBP was observed in control subjects but such a correlation was not observed in hypertension group; hence, the relationship of BMI with hypertension could not be ascertained. Therefore, the findings of the present study suggest that rise in SBP and DBP may be attributed to the factors related with their occupation, rather than the effect of BMI.

Limitations of the study

The details of their job profile were not available. Thus, the study population could not be categorized into different groups as different job profile involves different levels of physical activity and stress which may have impacted toward their increase in blood pressure.

CONCLUSION

The overall prevalence of prehypertension and hypertension was found to be 45.7% and 15.6%, respectively. There was also a significant positive correlation between age and hypertension in the employees, irrespective of their level of BMI. Hence, more emphasis must be given toward awareness programs and lifestyle interventions for the prevention of both prehypertension and hypertension and thereby prevent many other related complications.

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Conflicts of interest

There are no conflicts of interest.

Table 2: Status of hypertension according to age group

Age group (years)	Prehypertension	Hypertension
18-30 (n=219)	89 (40.6)	4 (1.8)
31-40 (n=212)	111 (52.3)	18 (8.4)
41-50 (n=649)	286 (44.1)	94 (14.4)
51-60 (n=610)	287 (47.0)	148 (24.2)

Figure in parentheses indicates percentage. $P < 0.0001$ HS (Chi-square test). HS: Highly significant

Table 3: Relationship of BMI with hypertension

BMI category	Normal	Prehypertension	Hypertension
Normal (n=912)	412 (45.1)	397 (43.5)	103 (11.2)
Overweight (n=607)	201 (33.1)	291 (47.9)	115 (18.9)
Obese (n=171)	40 (23.3)	85 (49.7)	46 (26.9)
Total (n=1690)	653 (38.6)	773 (45.7)	264 (15.6)

Figure in parentheses indicates percentage. $\chi^2=58.0$, $P < 0.001$ (Chi-square test). BMI: Body mass index

Table 4: Correlation of BMI with SBP and DBP in three groups

Parameters	Normal		Prehypertension		Hypertension	
	r	P	r	P	r	P
SBP (mmHg)	0.203	<0.00001	-0.042	0.243	-0.024	0.697
DBP (mmHg)	0.209	<0.00001	0.195	<0.00001	0.098	0.112

Data are express as mean±SD. Statistical analysis was done by Pearson’s correlation. $P < 0.05$ was considered significant. BMI: Body mass index, SD: Standard deviation, SBP: Systolic blood pressure, DBP: Diastolic blood pressure

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