

A study on factors associated with hypertension among workers in the cement industry



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ABSTRACT

Background: Hypertension is a significant global health issue, particularly in industrial environments where employees are perpetually subjected to occupational hazards. **Aims and Objectives:** The study aims to evaluate the correlation between various modifiable factors and hypertension among these workers. **Materials and Methods:** A cross-sectional study was performed among cement industry workers utilizing a pre-tested questionnaire that included socio-demographic variables, daily and weekly work duration, physical activity levels, awareness of health risks, dietary practices, water consumption, junk food intake, high-sodium diet, personal habits, sleep patterns, stress levels, and health-seeking behavior regarding hypertension. **Results:** The study involving 164 male cement industry workers aged 18–65 revealed that 39 (24%) of the participants had hypertension. There was a statistically significant correlation with modifiable risk factors, including tobacco use, stress, reduced sleep duration, lack of physical activity, and obesity. A substantial number of employees suffered from persistent hypertension-related symptoms, prompting some to seek medical attention. However, sticking to long-term treatment was challenging due to the work environment's setup. **Conclusion:** This study underscores the high incidence of hypertension among cement industry workers, associated with stress, tobacco consumption, physical inactivity, and obesity. Making lifestyle changes can significantly reduce your risk of developing health problems related to high blood pressure.

Key words: Hypertension; Cement industry workers; Occupational health; Stress management

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INTRODUCTION

Hypertension is recognized as the primary cause of cardiovascular disease and deaths globally, particularly in low- and middle-income countries, contributing to 10 million cardiovascular and overall fatalities in 2021.¹ This condition is increasingly prevalent and poses a significant risk as part of the growing epidemic of non-communicable diseases. Often referred to as a silent killer because it usually shows no symptoms.² According to the World Health Organization (WHO), hypertension is defined as having

blood pressure levels above 140/90. This condition is serious and can affect the heart, brain, kidneys, and other organs, contributing to premature deaths globally, affecting about one in four men and one in five women.³ Various factors, including genetics, unhealthy lifestyle choices, and underlying medical conditions, can cause hypertension. Key contributors include excessive salt intake, obesity, lack of physical activity, stress, and excessive alcohol consumption. Screening for hypertension is crucial for early detection and prevention of complications. Lifestyle modifications are essential to manage and reduce the risk

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of hypertension-related diseases.⁴ The cement industry is vital for infrastructure, but it can affect workers' health due to exposure to dust and long hours. These extended hours lead to changes in lifestyle and enhance the development of non-communicable diseases such as hypertension, diabetes, and coronary artery diseases. Efforts toward sustainability are helping to reduce these challenges. Employers should adhere to government guidelines to safeguard the health of their workforce.⁵ There is a dearth of data related to this in industrial setups. Therefore, this study examined the factors associated with hypertension among cement industry workers.⁶

Aims and objectives

The main objective of this study was to assess the association of various modifiable risk factors and hypertension among workers of cement industry.

MATERIALS AND METHODS

Study design

This was a cross-sectional study.

Study period and setting

This was conducted for 2 weeks at cement corporation Pvt. Ltd, Palanadu District, Andhra Pradesh.

Sample size was calculated using the formula $n = \frac{4pq}{l^2n}$ = Where n=sample size=1.96 p=31% q=1-p d= absolute error 8%. The previous prevalence of hypertension was taken as 31%.⁷ The sample size calculated was 133 by taking 8% absolute error and a 95% confidence level. By taking 10% of the non-response rate, the sample size (n) was rounded to 164. Simple random sampling was adopted to get the desired sample size using lottery method.

Methodology in detail

All the workers from the industry were interviewed using a questionnaire schedule, which was pretested on five subjects before conducting the study. This questionnaire consisted of socio-demographic variables, duration of work per day and week, physical activity, their knowledge about health risks, dietary habits, water intake, and junk food intake for >3 days a week was considered as regular intake, extra salt intake in the form of added table salt, consuming chutneys, papads and processed foods, personal habits, sleep duration in number of hours, presence of stress categorized as yes and no, and their health-seeking behavior for hypertension were assessed. Weight was measured using the standard method on a calibrated weighing machine, and height was measured using a stadiometer. Body mass index (BMI) was then calculated using the formula: Weight in kilograms divided by (height)² in meters.

Blood pressure was measured using standardized methods on validated aneroid device calibrated every 6 months. Subjects were asked to rest for 5 min before measurement. Subjects were seated comfortably with back supported, feet flat on floors and legs uncrossed. A cuff was wrapped on the right arm with 2–3 cm above the antecubital fossa, and three readings, 5 min apart, were measured. The average of the last two readings is used for diagnosis as per the Joint National Committee 8. The JNC 8 hypertension guidelines consider systolic blood pressure <120 mm of hg and diastolic blood pressure <80 mm of hg as normal, 120–129 mm hg of systolic blood pressure and <80 mm of hg as pre-hypertension; 130–139 mm hg of systolic blood pressure and 80–89 mm hg as hypertension I; 140–159 mm hg of systolic blood pressure and 90–99 mm hg as hypertension II; ≥160 mm hg of systolic blood pressure; and >100 mm hg as hypertension III.

Ethical considerations

Prior Permission from the Institutional ethical committee was obtained and the approval Number was ESICMC/SNR/IEC/S0445/08-2024. Written informed consent was also obtained from the participants and explained the purpose of the research by maintaining confidentiality and privacy.

Statistical methods

Data were entered in Microsoft Excel and analyzed. Descriptive statistics were calculated, such as percentages, mean, and standard deviation. We used Chi-square to check the associated factors (dependent variables) and the outcome (Hypertension), and P<0.05 was taken as significant. For analysis purposes, we combined stress at home and job, regular junk food intake (more than 3 times a week), and physical activity (at least 5 days a week) into a single category. BMI was considered obese for grades I and II. For statistical purposes, hypertension stages I, II, and III were considered as the presence of hypertension.

Inclusion criteria

The inclusion criteria were as follows: adult workers in the cement industry aged between 18 and 65 years, who had worked in the industry for at least a year, and provided consent, were included.

Exclusion criteria

All those were already diagnosed with complications of hypertension, and secondary causes of hypertension were excluded from the current study.

RESULTS

The Cement Industry is a well-diversified group serving various sectors of the economy with ISO: 9001–2015 QMS Certified and is equipped with the most modern cement

manufacturing equipment. This covers 700 employees working at raw material preparation, pyro processing, and cement grinding. We have contacted 197 factory workers, and out of these, 33 were excluded, and 164 factory workers fulfilled the inclusion criteria. We found that the majority of our study population was under 50 years of age, with 67 (41.1%) belonged to 18–30 years age group and all were male as per gender distribution. Various sociodemographic factors are detailed in Table 1.

Job characteristics of factory workers

Most of the workers have been working at the same factory for 5 years or less 66 (40.2%), 6–10 years among 35 (21.3%), and 11 years and above among 63 (38.4%). The number of working hours per week illustrated that those worked for 25–35 h were 16 (9.2%), 35–50 h were 70 (42.94%) of factory workers, and more than 50 h/week in 78 (47.85%).

Dietary and physical activity

The present study included 128 (78%) of them consuming non-vegetarian with >3 days of consumption; vegetables and fruits were consumed daily among 32 (19%), once a week consumption of fruits was found among 95 (58%), rarely among 22 (13%), and never among 15 (10%). High salt intake was observed in only 16 (10%), while regular consumption of junk food for more than 3 days per week was found in 103 (63%). One hundred and thirty-four (81.7%) of the workers reported engaging in some form of sport or physical activity outside of work, reflecting the physically demanding nature of many jobs, especially in industries such as manufacturing and construction. Family history of hypertension was found among 127 (78%). The BMI was calculated according to the WHO's Asian BMI Classification, as detailed in Table 2.

Proportion of hypertension was found among 39 (24%). On univariate analysis, we discovered that dietary factors, such as the consumption of junk food, did not exhibit any statistically significant association with hypertension among the cement factory workers. Nonetheless, modifiable risk factors such as tobacco consumption, workplace and domestic stress, inadequate sleep patterns, insufficient physical activity, and obesity were statistically significant in relation to hypertension (Table 3).

Twenty-eight (17%) workers in the industry voluntarily had their blood pressure measured weekly, 58 (35.4%) had it measured monthly, and 78 (47.6%) never got a blood pressure measurement. The study also revealed that 126 (76.8%) of respondents are aware of the risks of hypertension and focus on preventive health measures. However, around 38 (23.2%) of workers do not know the risks associated with it.

Table 1: The sociodemographic variables among workers

Variables	Number of respondents (%) (n=164)
Age group	
18–30 years	67 (41.10)
31–40 years	47 (28.83)
41–50 years	32 (19.63)
51–60 years	14 (8.59)
>61 years	4 (1.84)
Marital status	
Married	123 (76.20)
Unmarried	41 (23.80)
Educational status	
Matriculation	41 (25.15)
Under graduate	61 (36.20)
Postgraduate	62 (38.65)

Table 2: Body mass index distribution among respondents

BMI group	No. of respondents (percentage) n=164
Underweight (<18.5)	5 (3.07)
Normal (18.5–22.9)	28 (16.56)
Overweight (23–24.9)	37 (22.7)
Pre-obese (25–29.9)	72 (44.17)
Obese I (30–34.9)	21 (12.88)
Obese II (35–39.9)	1 (0.61)

BMI: Body mass index

DISCUSSION

The present study included 164 workers in the Cement Industry, with two-fifths belonging to the age group of 18–30 years, with the highest level of education being post-graduation among 39%. Their job characteristics were compounded by the fact that 40% had worked for ≤5 years and had a maximum number of working hours per week >50, among 48%. Dietary habits included only 19% consuming vegetables and fruits every day, and extra salt intake among only 10% but regular intake of greater than or equal to 3 times consumption of junk food and non-vegetarian food per week was found among 63% and 78%, respectively. We also found a statistically significant association between tobacco usage, presence of stress, sleep duration of 4–6 h, no physical activity, and obesity with the outcome variable of presence of hypertension.

Similar to our study, Xavier et al., study among 20,792 Industrial workers from various sectors found only a 10% proportion having hypertension and statistically significant factors such as smoking, no physical activity, higher BMI, and presence of family history.⁸

A cross-sectional study among 100 male workers in the production department of a manufacturing industry in Bekasi, Indonesia, by Rengganis et al., reported a strong correlation between work stress and hypertension.⁹

Table 3: Association of various modifiable factors with hypertension

Factors	Hypertension present (n=39)	Hypertension absent (n=125)	Chi-square	P-value
Tobacco usage				
Yes	29 (74.4)	8 (6.4)	78.58	<0.0000001
No	10 (25.6)	117 (93.6)		
Stress				
Yes	29 (74.4)	45 (36)	17.66	0.000026
No	10 (25.6)	80 (64)		
Junk food consumption				
Regularly	26 (66.6)	77 (61.6)	0.3267	0.5676
Irregularly	13 (33.3)	48 (38.4)		
Sleep duration				
4–6 h	20 (51.3)	22 (17.6)	17.7	0.000025
>7 h	19 (48.7)	103 (82.4)		
Physical activity				
Yes	13 (33.3)	107 (85.6)	41.37	<0.0000001
No	26 (66.6)	18 (14.4)		
BMI				
Normal	7 (17.9)	62 (49.6)	12.22	0.00047
Obese	32 (82.1)	63 (50.4)		

BMI: Body mass index

Contrast to our study, Goyal *et al.*, reported 48.6% having hypertension among Faridabad industrial workers in manufacturing sector with statistically significant factors such as increased age, consumption of smoking and alcohol, longer duration of working, and obesity to be independently associated with hypertension.¹⁰ Thankappan and Mini, in their study among industrial workers of Kerala, found hypertension in 37.1% of the population where 50.5% were aware and 19.2% had their blood pressure under control. Compared to their counterparts, those with abdominal obesity (OR 1.80, CI: 1.48–2.18), those with a family history of hypertension (OR 1.54, CI: 1.25–1.89), those who drank alcohol (OR 1.42, CI: 1.14–1.76), men (OR 1.38, CI: 1.08–1.75), and smokers (OR 0.69, CI: 0.53–0.90) had higher odds of having hypertension in age-adjusted multiple logistic regression analysis.¹¹ These variations in the proportion and associated factors may be due to variation in industrial set up where they are under constant stress to achieve the production targets. Furthermore, the exposure to heat, noise, and vibration are confounding factors present in the industry.

A comparative analysis between our study and other studies worldwide reveals many similarities and differences in health and lifestyle patterns. While common challenges are found globally, the Indian workers face unique occupational health risks due to limited access to preventive healthcare and heightened job-related stress. Other national and international studies highlight the importance of implementing integrated health programs that focus on nutrition, stress management, physical activity, regular health check-ups, and smoking cessation to improve the overall well-being of industrial workers.

Strength of the study is that very few studies are recorded among industrial workers, particularly the cement industry in India, and we have also included mainly the modifiable risk factors that are amenable to adopting preventive strategies.

Limitations of the study

The generalizability of the present study may be limited, as it consists of subjects from a single factory in a single geographical area. A larger-scale study involving subjects from multiple factories over a wider geographical distribution could help nullify the demerits and increase the external validity of the data obtained. Moreover, other confounding factors present at the workplace also need to be evaluated. In addition, the workers included were only active – that is, those who were employed at the time of the study, and not those who were on leave due to health issues, for example, bias on the part of a healthy worker or survivor cannot be completely eliminated. The absence of an intra- and inter-examiner variability analysis for the systolic and diastolic blood pressure measures is another study constraint.

CONCLUSION

Protecting worker health is essential for safe workplaces. Strategies for reducing workplace stress and increasing treatment-seeking behavior should be incorporated into any effort to lower blood pressure. Effective promotion of a healthy lifestyle is required, as is routine screening for prompt detection and suitable management. To evaluate the temporal connection, further prospective study designs are also needed.

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