



PREVALENCE AND DETERMINANTS OF HYPERTENSION AMONG ADULTS RESIDING IN URBAN SLUMS: A COMMUNITY-BASED CROSS-SECTIONAL STUDY

Dr Preeti Usha¹, Dr Neha Jain², Dr Sushil Kumar Singh³, Dr Rajat Gupta⁴

¹ Assistant Professor, Department of Community Medicine, Varun Arjun Medical College, Sahjahanpur, Uttar Pradesh, India. preetiusha243@gmail.com

² Assistant Professor, Department of Community Medicine, S R M Medical College, Potheri, Tamil Nadu, India. drnehanenahi@gmail.com

³ Assistant Professor, Department of Community Medicine, S R M Medical College, Potheri, Tamil Nadu, India. sksinghpsm22@gmail.com

⁴ Post Graduate Student, Department of Community Medicine, Post Graduate Institute of Medical Sciences, Rohtak, Haryana, India. rajatgupta936@gmail.com

***Corresponding Author:** Dr Preeti Usha

*Department of Community Medicine, Varun Arjun Medical College, Sahjahanpur, Uttar Pradesh, India

ABSTRACT

Background: Hypertension is a leading risk factor for cardiovascular diseases and contributes significantly to global morbidity and mortality. Urban slum populations are particularly vulnerable due to adverse socio-economic conditions and a high prevalence of behavioral risk factors. However, data on hypertension in such settings remain limited.

Objectives: To estimate the prevalence of hypertension and identify its determinants among adults residing in urban slums attached to a tertiary care hospital.

Methods: A community-based cross-sectional study was conducted from January 2021 to October 2021 among 400 adults aged ≥ 18 years. Participants were selected using multistage sampling. Data were collected using a pretested semi-structured questionnaire, along with anthropometric measurements and blood pressure assessment using standard protocols. Hypertension was defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or current use of antihypertensive medication. Data were analyzed using SPSS version 20. Chi-square test and multivariate logistic regression were applied to identify determinants. A p-value < 0.05 was considered statistically significant.

Results: The prevalence of hypertension was found to be 28%. Hypertension was significantly associated with age ≥ 45 years, tobacco use, alcohol consumption, inadequate physical activity, and BMI ≥ 25 kg/m² ($p < 0.05$). Multivariate analysis revealed that age ≥ 45 years (AOR: 3.2), inadequate physical activity (AOR: 2.1), BMI ≥ 25 kg/m² (AOR: 1.9), alcohol use (AOR: 1.8), and tobacco use (AOR: 1.6) were independent predictors of hypertension.

Conclusion: Hypertension is highly prevalent among urban slum populations, with multiple modifiable risk factors contributing to its occurrence. Strengthening community-based screening and promoting healthy lifestyle practices are essential for effective prevention and control. Integration with existing public health programs can improve early detection and management in such vulnerable settings.

Keywords: Hypertension; Urban slums; Prevalence; Risk factors; Cross-sectional study; India; Non-communicable diseases

INTRODUCTION

Hypertension is a major global public health problem and a leading risk factor for cardiovascular morbidity and mortality worldwide. It is estimated that over one billion adults are affected globally, with a disproportionately higher burden in low- and middle-income countries [1]. The condition contributes significantly to ischemic heart disease, stroke, and chronic kidney disease, accounting for nearly 10 million deaths annually [2]. Despite being largely preventable and treatable, hypertension often remains undiagnosed or inadequately controlled, particularly in resource-constrained settings. The epidemiological transition observed over the past few decades has led to a rising prevalence of non-communicable diseases (NCDs) in developing countries, including India [3]. Rapid urbanization, lifestyle changes, and population aging have contributed to an increasing burden of hypertension. According to the World Health Organization, the prevalence of hypertension in adults aged ≥ 18 years is around 22% globally, with higher rates reported in urban populations [1]. In India, recent estimates suggest that nearly one in four adults is hypertensive, with urban prevalence consistently higher than rural areas [4]. Urban slums represent a unique socio-demographic environment characterized by overcrowding, poor sanitation, low socioeconomic status, and limited access to healthcare services. These conditions predispose residents to both communicable and non-communicable diseases [5]. The dual burden of disease in such settings is compounded by behavioral risk factors such as tobacco use, unhealthy diet, physical inactivity, and alcohol consumption, which are prevalent among slum populations [6]. Additionally, psychosocial stressors related to poverty and insecure living conditions may further contribute to the development of hypertension.

Studies conducted in various parts of India have reported a wide variation in the prevalence of hypertension among urban slum populations, ranging from 20% to 40%, depending on demographic and methodological differences [7,8]. Furthermore, a substantial proportion of hypertensive individuals remain unaware of their condition, and among those diagnosed, treatment adherence and control rates are often suboptimal [9]. Identifying the determinants of hypertension in such vulnerable populations is essential for designing targeted interventions.

Although several studies have explored hypertension in urban populations, there is a relative paucity of data specifically focusing on urban slum communities attached to tertiary care institutions, where both clinical and community-based services intersect. Such settings provide an opportunity to assess not only prevalence but also associated socio-demographic, behavioral, and clinical determinants in a comprehensive manner. Moreover, understanding these factors in the context of field practice areas can help in strengthening primary healthcare delivery and NCD control programs.

In this context, the present study was undertaken to estimate the prevalence of hypertension and to identify its determinants among adults residing in urban slums attached to a tertiary care hospital. The objectives of the study were to determine the proportion of adults with hypertension and to assess the association between hypertension and selected socio-demographic, behavioral, and anthropometric factors.

METHODOLOGY

Study Design: A community-based cross-sectional analytical study was conducted to estimate the prevalence and determinants of hypertension among adults residing in urban slums.

Study Setting: The study was carried out in the urban slum field practice area attached to a tertiary care hospital. This area is routinely served by the Department of Community Medicine for healthcare delivery, outreach services, and public health activities.

Study Duration: The study was conducted over a period of ten months from January 2021 to October 2021.

Study Population: The study population comprised adults aged 18 years and above residing in the selected urban slum area for at least six months prior to the survey.

Inclusion Criteria

- Adults aged ≥ 18 years
- Permanent residents of the selected urban slum (residing ≥ 6 months)
- Individuals who provided informed written consent

Exclusion Criteria

- Pregnant women (due to physiological variations in blood pressure)
- Critically ill individuals unable to participate in the interview
- Individuals not available after two consecutive visits

Sample Size: The sample size was calculated using the formula for estimating prevalence in cross-sectional studies:

$$n = \frac{Z^2 \times p \times q}{d^2}$$

Assuming a prevalence (p) of hypertension as 30% based on previous studies, with 95% confidence level ($Z = 1.96$), and absolute precision (d) of 5%:

$$n = \frac{(1.96)^2 \times 0.3 \times 0.7}{(0.05)^2} \approx 323$$

After adding 20% for non-response, the sample size was rounded to 400 participants.

Sampling Technique: A multistage sampling technique was employed. Initially, the urban slum area was divided into clusters (wards/blocks). A required number of clusters were selected using simple random sampling. Within each selected cluster, households were chosen by systematic random sampling. From each household, one eligible adult was selected using the lottery method. If more than one eligible individual was present, one was randomly selected to avoid clustering effects.

Data Collection Tools & Procedure: Data were collected using a predesigned, pretested, semi-structured questionnaire. The tool included sections on socio-demographic characteristics, behavioral risk factors (tobacco use, alcohol consumption, dietary habits, physical activity), and medical history. Blood pressure was measured using a standardized and calibrated digital sphygmomanometer following WHO guidelines. Two readings were taken at an interval of 5 minutes in a seated position, and the average was considered for analysis. Anthropometric measurements such as height and weight were recorded using standard procedures, and body mass index (BMI) was calculated. Data collection was conducted through house-to-house visits by trained investigators.

Study Variables: The dependent variable was hypertension status (yes/no), defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or current use of antihypertensive

medication. Independent variables included socio-demographic factors (age, sex, education, occupation, socioeconomic status), behavioral factors (smoking, alcohol use, diet, physical activity), and anthropometric parameters (BMI).

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics such as proportions and means were calculated. The association between hypertension and categorical variables was assessed using the Chi-square test. Continuous variables were compared using independent t-test where applicable. Multivariate logistic regression analysis was performed to identify independent predictors of hypertension. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: The study was conducted after obtaining approval from the Institutional Ethics Committee (IEC) of the tertiary care hospital. Written informed consent was obtained from all participants prior to data collection. Confidentiality and anonymity of participants were strictly maintained. The study adhered to the ethical principles outlined in the Declaration of Helsinki. Participants diagnosed with hypertension during the study were counseled and referred to the tertiary care hospital for further evaluation and management.

RESULTS

A total of 400 participants were included in the study. The majority belonged to the age group of 30–44 years (32%), with a slight male predominance (53%) as shown in Table 1. More than half of the participants (55%) belonged to lower socioeconomic classes (Class IV & V).

Table 1: Socio-demographic Characteristics of Study Participants (n = 400)

Variable	Category	Frequency (n)	Percentage (%)
Age Group (years)	18–29	96	24.0
	30–44	128	32.0
	45–59	104	26.0
	≥60	72	18.0
Gender	Male	212	53.0
	Female	188	47.0
Education	Illiterate	132	33.0
	Primary	108	27.0
	Secondary & above	160	40.0
Occupation	Unemployed/Housewife	150	37.5
	Unskilled/Skilled	180	45.0
	Professional	70	17.5
Socioeconomic Status (BG Prasad)	Class I & II	62	15.5
	Class III	118	29.5
	Class IV & V	220	55.0

Behavioral risk factors revealed that 37% of participants used tobacco and 24% consumed alcohol. A significant proportion (57%) had inadequate physical activity, and 47.5% were either overweight or obese (Table 2).

Table 2: Behavioral and Anthropometric Risk Factors among Participants

Variable	Category	Frequency (n)	Percentage (%)
Tobacco Use	Yes	148	37.0
	No	252	63.0
Alcohol Consumption	Yes	96	24.0
	No	304	76.0
Physical Activity	Adequate	172	43.0
	Inadequate	228	57.0
BMI (kg/m ²)	Normal (<25)	210	52.5
	Overweight (25–29.9)	122	30.5
	Obese (≥30)	68	17.0

The overall prevalence of hypertension in the study population was 28% (Table 3).

Table 3: Prevalence of Hypertension among Study Participants

Variable	Category	Frequency (n)	Percentage (%)
Hypertension Status	Hypertensive	112	28.0
	Normotensive	288	72.0

Hypertension was significantly associated with increasing age, tobacco use, alcohol consumption, inadequate physical activity, and higher BMI ($p < 0.05$) as shown in Table 4. Although a higher prevalence was observed among males, the association was not statistically significant.

Table 4: Association of Hypertension with Selected Variables

Variable	Category	Hypertensive n (%)	Normotensive n (%)	p-value
Age Group	<45 years	38 (16.2)	196 (83.8)	<0.001
	≥45 years	74 (44.0)	92 (56.0)	
Gender	Male	66 (31.1)	146 (68.9)	0.08
	Female	46 (24.5)	142 (75.5)	
Tobacco Use	Yes	52 (35.1)	96 (64.9)	0.02
	No	60 (23.8)	192 (76.2)	
Alcohol Use	Yes	36 (37.5)	60 (62.5)	0.01
	No	76 (25.0)	228 (75.0)	
Physical Activity	Inadequate	78 (34.2)	150 (65.8)	0.003
	Adequate	34 (19.8)	138 (80.2)	
BMI	≥25 kg/m ²	62 (32.8)	128 (67.2)	0.01
	<25 kg/m ²	50 (23.8)	160 (76.2)	

Multivariate logistic regression analysis (Table 5) identified age ≥45 years, inadequate physical activity, higher BMI, alcohol use, and tobacco use as independent predictors of hypertension. Increasing age emerged as the strongest predictor.

Table 5: Multivariate Logistic Regression Analysis for Determinants of Hypertension

Variable	Adjusted Odds Ratio (AOR)	95% CI	p-value
Age ≥ 45 years	3.2	2.0–5.1	<0.001
Tobacco Use	1.6	1.0–2.5	0.04
Alcohol Use	1.8	1.1–3.0	0.02
Inadequate Physical Activity	2.1	1.3–3.3	0.002
BMI ≥ 25 kg/m ²	1.9	1.2–3.0	0.01

DISCUSSION

The present study assessed the prevalence and determinants of hypertension among adults residing in urban slums attached to a tertiary care hospital. The overall prevalence of hypertension was found to be 28%, indicating a substantial burden of disease in this vulnerable population. Increasing age, tobacco use, alcohol consumption, inadequate physical activity, and higher BMI were identified as significant determinants, with age ≥ 45 years emerging as the strongest predictor.

The observed prevalence of 28% is consistent with findings from several studies conducted in similar urban settings in India. Kokiwar et al. reported a prevalence of approximately 26% among urban slum populations [7], while Anchala et al., in their systematic review, documented a pooled prevalence ranging from 25% to 30% in urban areas [9]. These findings suggest that the burden of hypertension in urban slums is comparable to, or even approaching, that of the general urban population, reflecting the ongoing epidemiological transition [3]. The slightly higher prevalence in the present study may be attributed to differences in age distribution, lifestyle factors, and improved detection through standardized measurement.

Age was found to be the most significant determinant of hypertension, with individuals aged ≥ 45 years having more than three times higher odds compared to younger adults. This is in line with established evidence that blood pressure increases with age due to arterial stiffness and cumulative exposure to risk factors [2]. Similar associations have been consistently reported in Indian and global studies [4,9]. The aging population in urban slums, coupled with limited access to preventive healthcare, may further exacerbate this risk.

Behavioral risk factors such as tobacco use and alcohol consumption were significantly associated with hypertension. Participants using tobacco had higher odds of hypertension, which aligns with the known vasoconstrictive and endothelial-damaging effects of nicotine [6]. Similarly, alcohol consumption was independently associated with hypertension, consistent with previous studies demonstrating dose-dependent increases in blood pressure among alcohol users [9]. These findings highlight the need for targeted behavioral interventions in slum populations, where such risk factors are often prevalent.

Physical inactivity was another important determinant identified in this study. Individuals with inadequate physical activity had significantly higher odds of hypertension. This finding is supported by global evidence indicating that sedentary lifestyles contribute to the development of hypertension and other cardiovascular diseases [1]. Urban slum environments, despite being physically demanding in some contexts, may paradoxically promote inactivity due to occupational patterns and lack of recreational spaces.

Overweight and obesity (BMI ≥ 25 kg/m²) were also significantly associated with hypertension. This is consistent with the well-established relationship between adiposity and elevated blood pressure through mechanisms such as insulin resistance, increased sympathetic activity, and altered renal sodium handling [2]. The coexistence of undernutrition and overnutrition in slum populations represents a growing public health challenge and underscores the complexity of the nutrition transition in low-resource settings.

Gender was not found to be a statistically significant determinant in this study, although a higher prevalence was observed among males. This finding is similar to some Indian studies where gender differences were minimal after adjusting for other risk factors [7]. It suggests that lifestyle and

environmental factors may play a more prominent role than biological sex in influencing hypertension risk in such settings.

The findings of this study have important public health implications. Given the high prevalence of hypertension and its modifiable risk factors, there is a need for strengthening screening, early diagnosis, and lifestyle modification programs in urban slum areas. Integration of hypertension control strategies into existing primary healthcare services and national programs such as the NPCDCS could improve outcomes. Community-based interventions focusing on tobacco cessation, alcohol reduction, promotion of physical activity, and healthy diet are essential.

The strengths of the study include its community-based design, adequate sample size, and use of standardized measurement techniques, which enhance the validity of the findings. However, certain limitations should be considered. The cross-sectional design limits causal inference between risk factors and hypertension. Self-reported data on behavioral factors may be subject to recall or social desirability bias. Additionally, biochemical parameters such as lipid profile and blood glucose were not assessed, which could have provided a more comprehensive risk profile.

In conclusion, the study highlights a significant burden of hypertension in urban slum populations and identifies key modifiable determinants. Addressing these factors through targeted public health interventions is crucial for reducing the growing burden of cardiovascular diseases in such vulnerable communities.

CONCLUSION

The present study demonstrates that hypertension is highly prevalent (28%) among adults residing in urban slum areas attached to a tertiary care hospital, indicating a substantial and often under-recognized public health burden. Increasing age, physical inactivity, overweight/obesity, tobacco use, and alcohol consumption were identified as significant and independent determinants of hypertension. These findings underscore the urgent need for targeted community-based interventions focusing on early screening, risk factor modification, and health education in urban slum settings. Strengthening primary healthcare services, particularly through integration with national programs for non-communicable diseases, can facilitate early diagnosis and improved management. Lifestyle modification strategies, including promotion of physical activity, tobacco cessation, and reduction of alcohol consumption, should be prioritized. Furthermore, regular surveillance and community engagement are essential to address the dual burden of disease in slum populations. Policymakers and healthcare providers must focus on inclusive and accessible healthcare delivery models to effectively reduce the burden of hypertension and its complications in vulnerable urban communities.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.

Consent: Written informed consent was obtained from all participants prior to inclusion in the study.

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