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Article

Prevalence of Hypertension and Associated Risk Factors among Adult Patients Attending Outpatient Clinics: A Cross-Sectional Study

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ABSTRACT

Background: Hypertension is a major public health problem and a leading contributor to cardiovascular morbidity and mortality worldwide, with a disproportionately high burden in low- and middle-income countries. In Pakistan, rapid urbanization and lifestyle transitions have increased hypertension prevalence, yet many cases remain undiagnosed, particularly in routine outpatient settings. **Objective**: To determine the prevalence of hypertension and identify associated risk factors among adult patients attending outpatient clinics in Lahore. **Methods**: A cross-sectional observational study was conducted among 165 adult patients attending selected outpatient clinics in Lahore. Blood pressure was measured using a standardized protocol, and hypertension was defined as systolic blood pressure ≥140 mmHg and/or diastolic blood pressure ≥90 mmHg or current use of antihypertensive medication. A structured questionnaire was used to collect data on demographic characteristics, body mass index, smoking status, physical activity, dietary salt intake, and family history of hypertension. Descriptive statistics and inferential analyses, including chi-square tests and multivariable logistic regression, were performed. **Results**: The overall prevalence of hypertension was 34.5%. Hypertension prevalence increased significantly with age, reaching 52.5% among participants older than 50 years. Obesity (adjusted OR 3.68; 95% CI 1.62–8.37), high dietary salt intake (adjusted OR 2.41; 95% CI 1.19–4.88), and positive family history of hypertension (adjusted OR 2.22; 95% CI 1.12–4.40) were independently associated with hypertension. **Conclusion**: Hypertension is highly prevalent among adult outpatients in Lahore, with several modifiable risk factors identified. Routine screening and targeted lifestyle interventions in outpatient settings are essential to reduce the growing burden of hypertension.

Keywords: Hypertension; Prevalence; Risk factors; Outpatient clinics; Cross-sectional study

INTRODUCTION

Hypertension is a major global public health challenge and a leading modifiable risk factor for cardiovascular disease, stroke, chronic kidney disease, and premature mortality (1). It affects more than one billion adults worldwide, with a disproportionate burden in low- and middle-income countries where rapid urbanization, population aging, and lifestyle transitions have accelerated its prevalence (2). Despite the availability of effective antihypertensive therapies and well-established preventive strategies, hypertension frequently remains undiagnosed or inadequately controlled, particularly in routine clinical settings (3).

In South Asian populations, including Pakistan, the burden of hypertension has increased substantially over recent decades, driven by changes in dietary patterns, reduced physical activity, rising obesity, and persistent tobacco use (4). National and regional studies have reported a wide range of hypertension prevalence among adults, reflecting heterogeneity in study populations, settings, and diagnostic approaches (5). However, a consistent finding across studies is that a large proportion of hypertensive individuals are first identified opportunistically during healthcare encounters rather than through systematic screening programs (6). This underscores the importance of outpatient clinics as critical points for early detection and risk stratification.

Adult patients attending outpatient clinics represent a heterogeneous population with varying sociodemographic backgrounds, health behaviors, and comorbidity profiles. These settings offer a unique opportunity to assess both the prevalence of hypertension and the distribution of associated risk factors in individuals who may not yet have established cardiovascular disease but are already engaged with the healthcare system (7). Previous research has identified advancing age, excess body weight, physical inactivity, high dietary salt intake, smoking, and positive family history as key determinants of hypertension across diverse populations (8,9). However, the relative contribution of these factors may differ by context, emphasizing the need for locally generated evidence.

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In Pakistan, existing studies on hypertension have predominantly focused on community-based surveys or tertiary care hospitals, with comparatively limited data derived from outpatient clinic populations, particularly in large urban centers such as Lahore (10). Moreover, there is insufficient integration of multiple behavioral and clinical risk factors within a single outpatient-based analysis, limiting the applicability of findings for routine clinical practice and preventive counseling. Addressing this gap is essential for informing targeted screening strategies and lifestyle-based interventions within outpatient care pathways.

Therefore, the objective of this study was to determine the prevalence of hypertension among adult patients attending outpatient clinics in Lahore and to identify associated demographic, behavioral, and clinical risk factors using a cross-sectional study design (11).

MATERIALS AND METHODS

A cross-sectional observational study was conducted in Lahore, Pakistan, across selected outpatient clinics of public and private healthcare facilities over a defined data collection period. This study design was chosen to estimate the prevalence of hypertension and to examine its association with demographic, behavioral, and clinical risk factors within a routine outpatient population, consistent with recommended approaches for prevalence studies in clinical epidemiology (12). Adult patients were approached consecutively during outpatient clinic hours to reduce systematic selection related to appointment timing. All participants were provided with a standardized explanation of the study objectives and procedures, and written informed consent was obtained prior to enrollment.

The study population comprised adult patients aged 18 years and above attending outpatient clinics for any non-emergency medical consultation. Patients were eligible if they were clinically stable and able to provide informed consent. Individuals who were critically ill, pregnant, or had conditions that could acutely influence blood pressure readings were excluded to minimize outcome misclassification. A non-probability convenience sampling technique was used due to feasibility constraints in busy outpatient settings; to mitigate selection bias, recruitment was conducted across multiple clinics and on different days of the week.

Data collection involved direct blood pressure measurement and administration of a structured questionnaire. Blood pressure was measured using a calibrated sphygmomanometer following standardized procedures: participants were seated comfortably with back support, feet flat on the floor, and the arm supported at heart level after at least five minutes of rest.

Two measurements were taken at an interval of two minutes, and the average of the readings was recorded for analysis. Hypertension was operationally defined as a systolic blood pressure of ≥140 mmHg and/or a diastolic blood pressure of ≥90 mmHg, or self-reported current use of antihypertensive medication, in accordance with established clinical guidelines (13).

The questionnaire collected information on age, gender, body mass index (BMI), smoking status, physical activity level, dietary salt intake, and family history of hypertension. BMI was calculated from measured height and weight and categorized using standard cut-offs. Physical activity was classified as active or sedentary based on self-reported routine activity, and dietary salt intake was categorized as high or normal/low based on habitual consumption patterns.

Several measures were implemented to reduce bias and enhance data quality. Blood pressure measurements were performed by trained data collectors using a uniform protocol to minimize measurement error. Questionnaires were administered in a standardized manner, and participants were assured that their responses would not affect their medical care to reduce information bias. Potential confounding by age and gender was addressed analytically through stratified analyses and inclusion of these variables in multivariable models, based on prior evidence of their association with hypertension risk (14).

The sample size was set at 165 participants to estimate the prevalence of hypertension with adequate precision, assuming an anticipated prevalence of approximately 35%, a 95% confidence level, and an acceptable margin of error of around 7%, while accounting for feasible recruitment within the study timeframe. Data were entered into a secure database and cross-checked for accuracy. Statistical analyses were conducted using SPSS (IBM Corp., Armonk, NY).

Categorical variables were summarized as frequencies and percentages. Associations between hypertension and potential risk factors were assessed using chi-square tests, and multivariable logistic regression was performed to estimate adjusted odds ratios with 95% confidence intervals. A two-sided p-value of <0.05 was considered statistically significant.

Ethical approval for the study was obtained from the relevant institutional ethics review committee in Lahore, and the study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki (15). Data integrity and reproducibility were supported through predefined variable definitions, use of standardized measurement protocols, and restricted access to anonymized data limited to the research team.

RESULTS

A total of 165 adult patients attending outpatient clinics in Lahore were included in the analysis. Slightly more than half of the participants were male (55.8%), and nearly half belonged to the 31–50 years age group (47.9%). Patients aged over 50 years accounted for 24.2% of the sample, while 27.9% were aged between 18 and 30 years, indicating representation across adult age categories (Table 1).

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The overall prevalence of hypertension was 34.5%, with 57 participants classified as hypertensive based on measured blood pressure and/or current antihypertensive use. The remaining 65.5% of participants were normotensive (Table 2). Hypertension prevalence varied significantly by age group, increasing from 17.4% among participants aged 18–30 years to 35.4% among those aged 31–50 years and reaching 52.5% among individuals older than 50 years (p=0.003). No statistically significant difference in hypertension prevalence was observed between males and females (p=0.571) (Table 4).

Analysis of risk factor distribution showed that 42.4% of participants were overweight and 21.2% were obese, while 29.1% reported current smoking. A sedentary lifestyle was reported by 41.8% of participants, and more than half (54.5%) reported high dietary salt intake. A positive family history of hypertension was present in 38.2% of the study population (Table 3).

Univariate analysis demonstrated significant associations between hypertension and several modifiable and non-modifiable risk factors. The prevalence of hypertension increased progressively across BMI categories, from 20.0% among participants with normal BMI to 37.1% among those overweight and 54.3% among obese individuals (p=0.003).

Participants with high dietary salt intake had more than twice the odds of hypertension compared with those reporting normal or low salt intake (OR 2.73; 95% CI 1.38–5.40; p=0.006). Similarly, individuals with a positive family history of hypertension had significantly higher odds of being hypertensive (OR 2.53; 95% CI 1.30–4.89; p=0.009). Sedentary lifestyle was also associated with increased hypertension prevalence (43.5% vs 28.1%; OR 1.97; 95% CI 1.02–3.77; p=0.042), whereas smoking showed a non-significant trend toward higher hypertension prevalence (p=0.076) (Table 5).

Table 1. Socio-Demographic Characteristics of Adult Outpatients (n = 165)

Variable	Category	n (%)
Gender	Male	92 (55.8)
	Female	73 (44.2)
Age group (years)	18–30	46 (27.9)
	31–50	79 (47.9)
	>50	40 (24.2)

Table 2. Overall Prevalence of Hypertension (n = 165)

Blood pressure status	n (%)
Hypertensive	57 (34.5)
Normotensive	108 (65.5)

Table 3. Distribution of Risk Factors among Participants (n = 165)

Risk factor	Category	n (%)
Body Mass Index	Normal	60 (36.4)
	Overweight	70 (42.4)
	Obese	35 (21.2)
Smoking status	Smoker	48 (29.1)
	Non-smoker	117 (70.9)
Physical activity	Sedentary	69 (41.8)
	Active	96 (58.2)
Dietary salt intake	High	90 (54.5)
	Normal/Low	75 (45.5)
Family history of HTN	Yes	63 (38.2)
	No	102 (61.8)

Table 4. Association Between Hypertension and Participant Characteristics

Variable	Category	HTN n/N (%)	p-value
Gender	Male	34/92 (37.0)	0.571
	Female	23/73 (31.5)	
Age group (years)	18–30	8/46 (17.4)	0.003
	31–50	28/79 (35.4)	
	>50	21/40 (52.5)	

Table 5. Association of Hypertension with Modifiable and Non-Modifiable Risk Factors

Risk factor	Category	HTN n/N (%)	Odds Ratio (95% CI)	p-value
BMI	Normal	12/60 (20.0)	Reference	—
	Overweight	26/70 (37.1)	2.36 (1.06–5.24)	0.031
	Obese	19/35 (54.3)	4.78 (1.93–11.8)	0.003

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Smoking	Smoker	22/48 (45.8)	1.98 (0.99–3.96)	0.076
	Non-smoker	35/117 (29.9)	Reference	—
Physical activity	Sedentary	30/69 (43.5)	1.97 (1.02–3.77)	0.042
	Active	27/96 (28.1)	Reference	—
Dietary salt intake	High	40/90 (44.4)	2.73 (1.38–5.40)	0.006
	Normal/Low	17/75 (22.7)	Reference	—
Family history	Yes	30/63 (47.6)	2.53 (1.30–4.89)	0.009
	No	27/102 (26.5)	Reference	—

Table 6. Multivariable Logistic Regression Analysis: Predictors of Hypertension (n = 165)

Predictor	Adjusted OR	95% CI	p-value
Age >50 years	3.21	1.45–7.11	0.004
Obesity	3.68	1.62–8.37	0.002
High salt intake	2.41	1.19–4.88	0.014
Sedentary lifestyle	1.89	0.97–3.67	0.061
Family history of HTN	2.22	1.12–4.40	0.022
Male gender	1.18	0.61–2.28	0.618

In multivariable logistic regression analysis adjusting for age and gender, older age, obesity, high dietary salt intake, and positive family history remained independent predictors of hypertension. Participants aged over 50 years had more than threefold higher odds of hypertension (adjusted OR 3.21; 95% CI 1.45–7.11; p=0.004), and obese individuals had nearly fourfold higher odds compared with those of normal weight (adjusted OR 3.68; 95% CI 1.62–8.37; p=0.002). High dietary salt intake (adjusted OR 2.41; 95% CI 1.19–4.88; p=0.014) and family history of hypertension (adjusted OR 2.22; 95% CI 1.12–4.40; p=0.022) remained significantly associated with hypertension, while sedentary lifestyle showed a borderline association (p=0.061) (Table 6).

DISCUSSION

This cross-sectional study provides evidence that hypertension is highly prevalent among adult patients attending outpatient clinics in Lahore, with more than one-third of participants identified as hypertensive. This prevalence is consistent with recent estimates from urban South Asian populations, where hypertension prevalence among adults ranges from 30% to 45%, reflecting the growing burden of non-communicable diseases in rapidly urbanizing settings (16,17). The findings reinforce the role of outpatient clinics as critical points for opportunistic screening and early identification of hypertension among adults who may otherwise remain undiagnosed.

Age emerged as one of the strongest determinants of hypertension in this study, with a marked increase in prevalence among individuals older than 50 years. This association is well documented and can be attributed to age-related vascular changes, including arterial stiffness and endothelial dysfunction, which contribute to elevated systolic blood pressure with advancing age (18). Similar age-related gradients in hypertension prevalence have been reported in national surveys and clinic-based studies across Pakistan and neighboring countries, underscoring the need for age-targeted screening strategies in outpatient care (19).

Obesity was another significant independent predictor of hypertension, with obese participants exhibiting nearly fourfold higher odds of hypertension compared with those of normal weight. Excess adiposity contributes to hypertension through multiple mechanisms, including activation of the renin–angiotensin–aldosterone system, increased sympathetic nervous system activity, and insulin resistance (20). The high proportion of overweight and obese individuals observed in this outpatient population highlights the interplay between nutritional transition, sedentary lifestyles, and cardiovascular risk in urban environments.

Dietary salt intake showed a strong and independent association with hypertension, consistent with extensive evidence linking high sodium consumption to elevated blood pressure (21). In Pakistan, high salt intake is common due to dietary habits that include processed foods and discretionary salt use. The significant association observed in this study emphasizes the importance of dietary counseling and public health initiatives aimed at reducing salt consumption as part of hypertension prevention and control strategies (22).

A positive family history of hypertension was also independently associated with hypertension, reflecting the combined influence of genetic susceptibility and shared environmental factors. This finding aligns with previous studies demonstrating that individuals with a familial predisposition are at higher risk of developing hypertension, particularly when exposed to adverse lifestyle factors (23). Identification of individuals with a family history of hypertension in outpatient settings provides an opportunity for early risk stratification and preventive intervention.

Although sedentary lifestyle was associated with higher odds of hypertension in univariate analysis, its association did not remain statistically significant after adjustment for other factors. This attenuation may reflect overlap with obesity and age-related factors or limitations in the measurement of physical activity, which relied on self-report. Nonetheless, physical inactivity remains a well-established risk factor for hypertension and cardiovascular disease, and its role should not be underestimated in preventive strategies (24). Smoking showed a non-significant trend toward higher hypertension prevalence, consistent with mixed findings in

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the literature, where smoking is more strongly associated with acute blood pressure elevations and long-term cardiovascular risk rather than sustained hypertension alone (25).

The findings of this study have important clinical and public health implications. Routine blood pressure measurement in outpatient clinics, combined with assessment of modifiable risk factors such as body weight, diet, and physical activity, can facilitate early diagnosis and timely intervention. Given the high prevalence of hypertension and its associated risk factors observed in this population, integrated lifestyle modification counseling within outpatient services may substantially reduce future cardiovascular morbidity.

Several limitations should be considered when interpreting these results. The cross-sectional design limits causal inference, and the use of convenience sampling may affect generalizability beyond the study setting. Additionally, self-reported lifestyle factors may be subject to recall bias. Despite these limitations, the study provides valuable local data from outpatient clinics in Lahore and contributes to the growing body of evidence on hypertension epidemiology in urban Pakistan.

Overall, this study underscores hypertension as a prevalent and multifactorial condition among adult outpatients and highlights the importance of strengthening screening and preventive efforts within routine clinical practice to address the rising burden of cardiovascular disease (26).

CONCLUSION

This study demonstrates that hypertension is highly prevalent among adult patients attending outpatient clinics in Lahore, with more than one-third of participants affected. Advancing age, obesity, high dietary salt intake, and a positive family history of hypertension emerged as significant independent risk factors, highlighting the multifactorial nature of hypertension in this population. These findings underscore the importance of routine blood pressure screening in outpatient settings and the integration of targeted lifestyle modification strategies, including weight management, dietary salt reduction, and early risk identification, into standard clinical care. Strengthening preventive services within outpatient clinics may play a critical role in reducing the burden of hypertension and its associated cardiovascular complications in urban populations.

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