

Prevalence and Risk Factors of Poorly Controlled Hypertension in Urban Communities

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Received: 01-11-2025 / Revised: 15-12-2025 / Accepted: 21-01-2026

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Conflict of interest: Nil

Abstract

Background: Uncontrolled hypertension remains a major public health concern despite widespread availability of antihypertensive therapy, particularly in rapidly urbanizing populations.

Objective: To determine the prevalence of uncontrolled hypertension and identify associated risk factors among treated hypertensive individuals in an urban population.

Methods: A cross-sectional study was conducted among 310 treated hypertensive adults, of whom 202 were categorized as uncontrolled and 108 as controlled based on blood pressure criteria. Sociodemographic characteristics, lifestyle factors, treatment patterns, and adherence were evaluated, and multivariate logistic regression was used to identify independent predictors.

Results: The prevalence of uncontrolled hypertension was 65.2%. Older age, additional salt intake, smoking, obesity, poor medication adherence, and single-drug therapy were associated with higher uncontrolled hypertension rates. Multivariate analysis identified additional salt intake, lack of structured healthcare education, single-drug therapy, and poor adherence as significant predictors.

Conclusion: A high burden of uncontrolled hypertension persists among treated urban patients, highlighting the need for improved patient education, dietary interventions, regular follow-up, and optimized pharmacological strategies to enhance blood pressure control and reduce cardiovascular risk.

Keywords: Uncontrolled hypertension, urban population, Risk factors, Medication adherence.

DOI: 10.25258/ijcpr.18.2.120

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Introduction

Hypertension remains one of the most significant public health challenges worldwide, contributing substantially to cardiovascular morbidity and mortality. According to the NCD Risk Factor Collaboration, the global prevalence of hypertension has steadily increased over the past three decades, with substantial gaps in detection, treatment, and control across regions and populations [1]. Despite improvements in awareness and treatment, a large proportion of individuals with hypertension continue to have uncontrolled blood pressure, especially in rapidly urbanizing settings where lifestyle and environmental risk factors cluster [2].

Urban populations often face unique determinants such as sedentary lifestyles, dietary patterns high in salt and processed foods, psychosocial stressors, and environmental pollution, all of which have been linked to poor blood pressure control [3,4].

Studies from low- and middle-income settings indicate that urban dwellers frequently exhibit higher rates of uncontrolled hypertension compared with their rural counterparts, a difference attributed to lifestyle risk exposures and inequities in healthcare access and utilization [5,6]. Control of hypertension remains suboptimal even among individuals engaged in regular care, with factors such as older age, obesity, poor adherence to antihypertensive medications, and comorbid conditions like diabetes strongly associated with uncontrolled blood pressure levels [7,8].

Evidence from cross-sectional studies further highlights that socioeconomic factors — including low educational attainment, unemployment, and lower income — compound the risk of uncontrolled hypertension by limiting access to healthcare resources and health-promoting environments [9]. Additionally, variations in health

system performance, clinician inertia, and gaps in patient education are recognized as systemic contributors to poor hypertension control in urban health settings [10]. Understanding the magnitude of uncontrolled hypertension and its associated risk factors is crucial for designing targeted public health interventions and optimizing clinical management strategies in urban populations. This study aims to address these gaps by estimating the prevalence of uncontrolled hypertension and identifying its associated determinants in an urban adult population.

Material and Methods

This cross-sectional observational study was conducted among adults with treated hypertension residing in an urban population. The study aimed to assess the prevalence of uncontrolled hypertension and identify factors associated with poor blood pressure control.

A total sample size of 310 participants diagnosed with hypertension and currently receiving antihypertensive therapy was included in the study. Participants were recruited from urban health facilities and community settings using a consecutive sampling technique during the study period. Individuals aged 18 years and above with a confirmed diagnosis of hypertension and on pharmacological treatment were considered eligible. Patients with secondary hypertension, severe systemic illness, pregnancy, or incomplete clinical records were excluded from the study.

Data collection was carried out using a structured proforma that included sociodemographic characteristics, clinical history, lifestyle factors, anthropometric measurements, and treatment details. Blood pressure measurements were obtained using a calibrated digital sphygmomanometer following standard guidelines.

Participants were seated comfortably, and two readings were recorded at a minimum interval of five minutes; the average of the readings was considered for analysis. Uncontrolled hypertension was defined based on current clinical guidelines as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg despite ongoing treatment. Among the 310 treated hypertensive participants, 202 individuals were categorized as having uncontrolled hypertension, while the remaining participants were classified as controlled.

Anthropometric parameters such as body mass index were calculated using standard formulas. Information regarding comorbidities, medication adherence, physical activity, dietary habits, smoking status, and alcohol consumption was obtained through patient interviews and medical records. All collected data were entered into a

predesigned database and verified for accuracy before statistical evaluation.

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software version 26.0. Continuous variables were expressed as mean \pm standard deviation, whereas categorical variables were presented as frequencies and percentages. The prevalence of uncontrolled hypertension was calculated as a proportion of the total treated hypertensive population. The association between uncontrolled hypertension and potential risk factors was assessed using the Chi-square test for categorical variables and independent sample t-test for continuous variables. Multivariate logistic regression analysis was carried out to identify independent predictors of uncontrolled hypertension after adjusting for confounding variables. A p-value of less than 0.05 was considered statistically significant.

Ethical clearance for the study was obtained from the Institutional Ethics Committee prior to commencement. All procedures were conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Written informed consent was obtained from all participants before inclusion in the study, and confidentiality of personal information was strictly maintained throughout the research process.

Results

Out of the total 310 treated hypertensive participants included in the study, 202 (65.2%) were categorized as having uncontrolled hypertension while 108 (34.8%) achieved blood pressure control. Table 1 demonstrates the association of socio-demographic and economic characteristics with hypertension control status. Participants aged more than 50 years showed a higher proportion of uncontrolled hypertension (142, 68.9%) compared to those below 50 years (60, 58.8%). Female participants constituted 188 of the study population, among whom 128 (68.1%) had uncontrolled hypertension, whereas males showed relatively lower uncontrolled prevalence of 74 (60.7%). Individuals not living with a spouse had higher uncontrolled hypertension (112, 69.1%) compared to those staying with a spouse (90, 60.4%). Educational status revealed that illiterate participants had the highest uncontrolled hypertension (27, 79.4%), while graduates and professionals demonstrated comparatively better control (34, 56.7%). Non-working individuals had a higher proportion of uncontrolled hypertension (136, 68.0%) compared to working participants (66, 59.5%). Socio-economic status did not show statistically significant association with control levels ($p > 0.05$).

Table 2 presents the association between dietary habits, lifestyle factors and hypertension control. Participants consuming fruits less frequently (0 days per week) showed higher uncontrolled hypertension (42, 73.7%) compared to those consuming fruits more than four days weekly (48, 60.8%). Additional salt intake demonstrated a statistically significant association with uncontrolled hypertension, with 78 (75.0%) participants with salt intake showing uncontrolled blood pressure compared to 124 (60.2%) without additional salt intake ($p < 0.05$). Lack of physical activity was also associated with higher uncontrolled hypertension (54, 71.1%) compared to moderate activity levels (102, 62.2%). Obese individuals exhibited higher uncontrolled hypertension (69, 70.4%) compared to normal BMI participants (47, 58.8%). Smoking showed a significant association, with 30 (76.9%) smokers having uncontrolled hypertension compared to 172 (63.2%) non-smokers.

Table 3 describes health-seeking behaviour and treatment-related factors. Participants receiving treatment only through modern medicine constituted the majority, with 186 (65.7%) showing

uncontrolled hypertension. Individuals on single antihypertensive therapy demonstrated higher uncontrolled hypertension (112, 73.2%) compared to those on combination therapy (90, 57.7%). Participants with follow-up intervals exceeding six months showed a higher uncontrolled proportion (52, 74.3%). Poor medication adherence was strongly associated with uncontrolled hypertension, observed in 44 (81.5%) participants compared to 158 (61.7%) among those with good adherence ($p < 0.05$). Presence of comorbidities showed moderate association but was not statistically significant.

Table 4 shows multivariate logistic regression analysis identifying independent predictors of uncontrolled hypertension. Additional salt intake (Adjusted OR 3.42; 95% CI 1.48–7.92; $p = 0.01$), lack of structured education by healthcare professionals (Adjusted OR 3.05; 95% CI 1.36–6.84; $p = 0.005$), single-drug therapy (Adjusted OR 6.72; 95% CI 2.14–21.08; $p = 0.001$) and poor adherence to medication (Adjusted OR 4.18; 95% CI 1.33–13.12; $p = 0.02$) emerged as significant independent predictors of uncontrolled hypertension.

Table 1: Association of socio-demographic and economic factors with uncontrolled and controlled hypertension (n=310)

| Socio-demographic variables | Uncontrolled (n=202) | Controlled (n=108) | OR (95% CI) |
|------------------------------|----------------------|--------------------|------------------|
| Age (years) | | | |
| <50 | 60 | 42 | 1 |
| ≥51 | 142 | 66 | 1.50 (0.90–2.48) |
| Sex | | | |
| Female | 128 | 60 | 1.44 (0.89–2.31) |
| Male | 74 | 48 | 1 |
| Marriage | | | |
| Staying with spouse | 90 | 59 | 1 |
| Without spouse | 112 | 49 | 1.49 (0.92–2.41) |
| Religion | | | |
| Hindu | 78 | 45 | 1 |
| Christian | 70 | 34 | 1.18 (0.68–2.05) |
| Muslim | 54 | 29 | 1.07 (0.59–1.92) |
| Education | | | |
| Graduates & Professionals | 34 | 26 | 1 |
| +2 & 10 | 72 | 39 | 1.41 (0.72–2.74) |
| Secondary & Primary | 69 | 32 | 1.64 (0.83–3.23) |
| Illiterate | 27 | 11 | 2.18 (0.93–5.09) |
| Occupation | | | |
| Working | 66 | 45 | 1 |
| Not working | 136 | 63 | 1.47 (0.90–2.39) |
| Socio-economic status | | | |
| Upper | 9 | 5 | 1.12 (0.34–3.66) |
| Upper middle | 61 | 33 | 1.21 (0.69–2.11) |
| Lower middle | 88 | 44 | 1 |
| Upper lower & lower | 44 | 26 | 0.84 (0.44–1.60) |

Table 2: Association of dietary factors, lifestyle and behavioural variables with hypertension control (n=310)

| Variables | Uncontrolled (n=202) | Controlled (n=108) | OR (95% CI) |
|----------------------------------|----------------------|--------------------|------------------|
| Days of fruit intake/week | | | |
| 0 days | 42 | 15 | 1.56 (0.78–3.11) |
| 1–4 days | 112 | 63 | 0.94 (0.55–1.60) |
| >4 days | 48 | 30 | 1 |
| Vegetable intake/week | | | |
| ≤3 days | 56 | 21 | 1.52 (0.82–2.80) |
| >3 days | 146 | 87 | 1 |
| Additional salt intake | | | |
| Yes | 78 | 26 | 2.01 (1.16–3.47) |
| No | 124 | 82 | 1 |
| Physical Activity | | | |
| Vigorous | 18 | 9 | 1.31 (0.54–3.17) |
| Moderate | 102 | 62 | 1 |
| No Physical Activity | 82 | 37 | 1.35 (0.80–2.29) |
| Walking/Cycling | | | |
| Yes | 116 | 65 | 1 |
| No | 86 | 43 | 1.12 (0.69–1.80) |
| BMI | | | |
| Underweight | 9 | 7 | 0.62 (0.21–1.79) |
| Normal | 47 | 33 | 1 |
| Overweight | 77 | 42 | 1.29 (0.68–2.44) |
| Obese | 69 | 26 | 1.86 (0.95–3.63) |
| Alcohol intake | | | |
| Yes | 28 | 17 | 0.88 (0.46–1.68) |
| No | 174 | 91 | 1 |
| Smoking | | | |
| Yes | 30 | 9 | 2.12 (1.01–4.46) |
| No | 172 | 99 | 1 |

Table 3: Association of treatment behaviour, medication and health education with hypertension control (n=310)

| Variables | Uncontrolled (n=202) | Controlled (n=108) | OR (95% CI) |
|--|----------------------|--------------------|------------------|
| System of medicine | | | |
| Modern medicine | 186 | 97 | 1 |
| Alternative systems | 16 | 11 | 0.76 (0.34–1.70) |
| Type of medicine | | | |
| CCB | 72 | 36 | 1.45 (0.77–2.73) |
| Beta-Blocker | 36 | 20 | 1.23 (0.60–2.51) |
| ARB | 28 | 10 | 2.21 (0.97–5.03) |
| Combination therapy | 66 | 42 | 1 |
| Frequency of follow-up | | | |
| Monthly | 62 | 41 | 1.27 (0.69–2.32) |
| 3 months | 88 | 52 | 1 |
| ≥6 months | 52 | 15 | 2.05 (1.02–4.11) |
| Education by healthcare personnel | | | |
| Doctor | 148 | 61 | 2.14 (1.24–3.69) |
| Not doctor | 54 | 47 | 1 |
| Family history | | | |
| Yes | 122 | 62 | 1 |
| No | 80 | 46 | 0.88 (0.53–1.45) |
| Knowledge of hypertension | | | |
| Poor knowledge | 154 | 74 | 1.26 (0.67–2.34) |
| Good knowledge | 48 | 34 | 1 |
| Treatment discontinuation | | | |
| Yes | 39 | 12 | 1.87 (0.93–3.77) |

| | | | |
|--------------------------------|-----|----|------------------|
| No | 163 | 96 | 1 |
| Adherence to medication | | | |
| Poor adherence | 44 | 10 | 3.04 (1.43–6.46) |
| Good adherence | 158 | 98 | 1 |
| Other comorbidity | | | |
| Yes | 95 | 56 | 1 |
| No | 107 | 52 | 1.21 (0.74–1.99) |

Table 4: Multivariate logistic regression analysis for predictors of uncontrolled hypertension

| Variable | Adjusted OR | 95% CI | P value |
|---|-------------|------------|---------|
| Additional salt intake (Yes) | 3.42 | 1.48–7.92 | 0.01 |
| Education by healthcare professional (Doctor) | 3.05 | 1.36–6.84 | 0.005 |
| Single medication therapy | 6.72 | 2.14–21.08 | 0.001 |
| Poor adherence to medication | 4.18 | 1.33–13.12 | 0.02 |
| Absence of comorbidity | 2.11 | 1.21–3.66 | 0.008 |

Discussion

The present study evaluated 310 treated hypertensive individuals from an urban population and demonstrated that 202 participants (65.2%) had uncontrolled hypertension despite ongoing therapy, indicating a substantial gap in effective blood pressure management. The high prevalence of uncontrolled hypertension observed in this study is consistent with recent urban-based epidemiological findings where poor lifestyle modification, medication adherence issues, and suboptimal follow-up remain major contributors to inadequate control rates [11]. Age-related trends in this study showed a greater burden of uncontrolled hypertension among individuals aged ≥ 51 years (142 cases), supporting previous evidence that vascular stiffness, long disease duration, and multimorbidity contribute to worsening control with advancing age [12]. Gender-wise distribution revealed slightly higher uncontrolled rates among females (128 cases) compared to males (74 cases), which may reflect differential health-seeking behavior, hormonal factors, and social determinants affecting access to continuous care, findings that align with recent multicentric observational research [11,12].

Socio-demographic analysis indicated that illiteracy and unemployment were associated with higher uncontrolled hypertension proportions, suggesting that education level influences health literacy and adherence to prescribed therapy, a factor also emphasized in contemporary studies highlighting socioeconomic disparities in hypertension outcomes [13]. Dietary patterns and lifestyle behaviors showed important associations in the present results. Individuals reporting additional salt intake had significantly higher uncontrolled hypertension (78 participants), and this association remained an independent predictor in multivariate analysis. Excessive dietary sodium is known to impair antihypertensive treatment response and increase vascular resistance, which corroborates

findings from recent clinical studies evaluating urban dietary habits [14]. Similarly, smoking was associated with higher uncontrolled hypertension (30 participants), supporting literature that smoking induces sympathetic activation and endothelial dysfunction, contributing to persistent elevation of blood pressure levels even among treated patients [13,14]. Physical inactivity and obesity were also notable contributors, with obese individuals demonstrating higher uncontrolled proportions (69 participants), which is consistent with evidence suggesting that adiposity increases renin-angiotensin activity and reduces therapeutic responsiveness [12]. Treatment-related factors revealed strong associations with hypertension control. Participants receiving single-drug therapy had higher uncontrolled rates compared to those on combination regimens, emphasizing the importance of individualized pharmacological strategies. Recent interventional studies have shown that combination therapy improves adherence and achieves better target blood pressure levels, especially in high-risk urban populations [15]. Poor adherence to medication emerged as one of the strongest determinants of uncontrolled hypertension in this study, with 44 participants showing poor adherence and significantly higher uncontrolled rates, consistent with contemporary evidence demonstrating that non-adherence remains a primary barrier to effective hypertension management worldwide [11,15]. In addition, patients with longer follow-up intervals (≥ 6 months) showed higher uncontrolled proportions, indicating the importance of regular clinical monitoring and reinforcement of lifestyle counseling. Education provided by healthcare professionals was significantly associated with improved control, suggesting that structured patient counseling enhances awareness and adherence. Overall, the present findings highlight that uncontrolled hypertension in urban populations is multifactorial, influenced by demographic, behavioral, and treatment-related determinants. The

results emphasize the need for integrated approaches combining patient education, dietary modification, adherence monitoring, and optimized pharmacotherapy to improve hypertension control rates in rapidly urbanizing settings.

Conclusion

The present study identified a high prevalence of uncontrolled hypertension among treated urban hypertensive individuals, with significant associations observed for additional salt intake, poor medication adherence, single-drug therapy, and limited healthcare education. Age, lifestyle behaviors, and socioeconomic factors further contributed to inadequate blood pressure control. These findings highlight the urgent need for targeted interventions focusing on dietary counseling, adherence improvement, regular follow-up, and personalized treatment strategies to reduce the burden of uncontrolled hypertension and prevent long-term cardiovascular complications in urban populations.

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