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The First Spike: Mapping New-Onset Hypertension Across India (HTN INDIA Study)

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Abstract

Background: Hypertension is a significant global health concern due to its high prevalence and its association with increased morbidity and mortality. ***Methods:*** A retrospective observational study was conducted by extracting and analyzing data from existing medical records of patients newly diagnosed with hypertension. The extracted information encompassed demographic variables, clinical parameters, and lifestyle factors. ***Results:*** This study analyzed 11,124 individuals newly diagnosed with hypertension, with a mean age of 55.9 years and a predominance of males (65.6%). Nearly half were overweight or obese, and 42.9% had a family history of hypertension. Lifestyle risks included alcohol (6.2%) and tobacco use (16%). Headache (25%) and blackouts (21%) were common symptoms. Telmisartan was the most frequently prescribed antihypertensive, followed by Olmesartan and Amlodipine. After 3.2 months of treatment, significant reductions in systolic and diastolic blood pressure were observed ($p < 0.0001$). Cardiovascular complications such as CAD (25.6%), stroke (17.8%), and heart failure (16.2%) were prevalent. ***Conclusions:*** This study provides valuable insights into the demographic and clinical profiles of individuals newly diagnosed with hypertension in India. The findings underscore the importance of factors such as age, gender, BMI, and family history, highlighting the need for targeted public health strategies and interventions.

Keywords: ***Hypertension, demographics, clinical profile, risk factors, India, epidemiology.***

Introduction

Hypertension, defined as a persistent elevation in blood pressure exceeding 130/80 mmHg, is a major global health concern contributing significantly to morbidity and mortality [1]. Approximately 1.28 billion adults aged 30-79 years worldwide are affected, with two-thirds residing in low and middle-income countries. Notably, nearly 46% of individuals with hypertension are unaware of their condition, highlighting the critical need for early detection and public awareness initiatives [2].

Blood pressure regulation is a complex interplay involving cardiac output, systemic vascular resistance, renal function, and neurohormonal mechanisms. Key contributors include the renin-angiotensin-aldosterone system (RAAS), sympathetic nervous system activation, endothelial dysfunction, oxidative stress, and excessive sodium retention. These interconnected pathways underscore the multifactorial nature of hypertension development and progression [3,4].

Hypertension arises from both modifiable and non-modifiable risk factors. Modifiable factors encompass obesity, high sodium intake, excessive alcohol consumption, physical inactivity, smoking, and chronic stress. Non-modifiable factors include advancing age, family history, and ethnicity, with certain groups demonstrating heightened susceptibility due to genetic and environmental influences [5].

Often termed the "silent killer," hypertension may remain asymptomatic for extended periods. Comprehensive evaluation, including laboratory and imaging studies, is essential to assess target organ damage and identify secondary causes. Renal function testing is especially vital for the early detection of hypertensive nephropathy and for preventing its progression to end-stage renal disease [6-8].

Effective management of hypertension requires a comprehensive approach, combining lifestyle modifications with pharmacological interventions when necessary. Recommendations include regular physical activity (≥150 minutes per week), weight reduction (5-10% of body weight), moderation in alcohol consumption, smoking cessation, stress management, and ensuring adequate sleep (7-9 hours per night) [9-14]. Pharmacological therapies are tailored to the individual's clinical profile and target various physiological pathways [15].

Uncontrolled hypertension can lead to severe complications including myocardial infarction, heart failure, cerebrovascular accidents, chronic kidney disease, hypertensive retinopathy, and hypertensive emergencies that demand urgent intervention. The condition's widespread impact across multiple organ systems underscores the necessity of early diagnosis, robust preventive measures, and individualized treatment plans to reduce long-term risk [16-26].

Understanding demographic trends in hypertension across rural and urban populations is critical to designing effective and targeted public health interventions. Variables such as age, gender, socioeconomic status, and occupation significantly influence both the prevalence and outcomes of hypertension. Additionally,

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behavioural factors such as levels of physical activity, dietary habits, tobacco use, and alcohol consumption affect the distribution and severity of hypertension among different population groups [27].

This study utilizes a cross-sectional observational design to collect demographic data and lifestyle characteristics, from individuals newly diagnosed with hypertension. The research aims to highlight geographic disparities and shared epidemiological patterns of hypertension in India. By tailoring interventions to the specific needs of diverse demographic groups, the findings may contribute to lowering hypertension-related morbidity and mortality, enhancing cardiovascular health, and promoting equity in healthcare delivery across India.

Methods

Study Design & Population

This study utilized a retrospective observational study to examine the demographic profiles of individuals newly diagnosed with hypertension in both rural and urban areas across India. The study population comprises patients newly diagnosed with hypertension, with data extracted from existing medical records collected from multiple centers, including hospitals, clinics, and healthcare institutes throughout India.

Data Collection

This data encompassed demographic characteristics such as age, gender, socio-economic status, education level, occupation, and marital status, as well as clinical data including patient diagnoses, blood pressure measurements, and the presence of comorbidities like diabetes, heart failure, stroke, and chronic kidney disease. Additionally, lifestyle factors, specifically smoking and tobacco use, and dietary habits, were recorded. Finally, documented treatment strategies employed for these patients were extracted.

Ethical Considerations

Ethical approval was obtained from the relevant Ethics Committee (EC) before the commencement of data extraction. Due to the retrospective nature of the study and the use of anonymized patient data, a waiver of informed consent was sought.

Statistical Analysis

SAS 9.4 was used for statistical analysis. Continuous variables (age, weight, height) are presented as mean, median, SD, and IQR; categorical variables (gender, BMI, family history, alcohol intake, tobacco use, newly diagnosed HTN) as percentages. Proportional analysis summarized complaints, complications, and prescribed antihypertensive drugs. Chi-Square tests revealed significant associations between newly diagnosed hypertension and obesity, smoking status, and family history.

Results

The study population comprised 11,124 individuals newly diagnosed with hypertension, with a mean age of 55.9 years (range: 20–90 years), indicating a predominantly middle-aged cohort. Males constituted 65.6% of the participants. The average weight and height were 73.8 kg and 163.4 cm, respectively. Body mass index (BMI) analysis revealed that approximately 45% of participants fell within the normal range, while 48.4% were classified as overweight or obese. A family history of hypertension was reported by 42.9% of participants. Regarding lifestyle factors, 6.2% of individuals reported frequent or heavy alcohol consumption, and 16% reported varying degrees of tobacco use. Both alcohol and tobacco consumption are recognized contributors to the development and progression of hypertension (**Table 1**).

Table 2 represents the occurrence of specific symptoms within the study cohort of 11,124 individuals. Headache emerged as the most prevalent symptom, reported by 2,781 participants, accounting for 25% of the cohort followed by sudden blackouts were reported by 2336 individuals, representing 21% of the study population. Table 3 illustrates the distribution of prescribed antihypertensive medications within the study cohort (N = 11,124). Telmisartan 20 and 40mg emerged as the most frequently prescribed agent, administered to 6650 individuals (59.73%), followed by Olmesartan 20 mg, 40 mg, prescribed to 4412 individuals (39.66%), and Amlodipine 5mg mg, prescribed to 3182 individuals (28.6%). Figure 1 shows the changes in systolic blood pressure (SBP) and diastolic blood pressure (DBP) from baseline among the study population. The average duration of therapy was 3.2 months. Post-treatment, both SBP and DBP exhibited significant reductions (p-value of <0.0001).

Table 4 presents the prevalence of cardiovascular complications within the study population. Coronary artery disease (CAD) was identified in 25.6% of participants, heart failure in 16.2%, and stroke in 17.8%. These findings underscore the significant burden of cardiovascular comorbidities associated with hypertension. Below data presents the distribution of hypertension diagnosis status among active smokers within the hypertensive cohort. Among active smokers, 13.9% were newly diagnosed with hypertension, while 8.4% had a prior diagnosis. The association between smoking status and hypertension diagnosis was statistically significant ($p < 0.0001$). Additionally, individuals with a positive family history of hypertension exhibited a higher proportion of newly diagnosed cases (21.6%) compared to those without such a history (21.3%), a difference that was also statistically significant ($p < 0.0001$).

Table 1: Demographic Characteristics in Hypertensive Population

Demographic Characteristics	**Total (N=11124) n (%)**
Age (Years)	
Mean ± SD	55.9 ± 11.9
Gender, n (%)	
Male	7300 (65.6)
Female	3824 (34.4)
Weight (kg)	
Mean ± SD	73.8 ± 12.2
Height (cm)	
Mean ± SD	163.4 ± 9.0
Obesity (BMI), n (%)	
Normal BMI (18.5-22.9 kg/m2)	5003 (45.0)
Overweight (23.0 - 24.9 kg/m2)	4099 (36.8)
Obese (>25 kg/m2)	1290 (11.6)
Underweight (<18.5 kg/m2)	732 (6.6)
Patients with positive Family History, n (%)	4769 (42.9)
Alcohol Intake, n (%)	
No	8908 (80.1)
Yes	2216 (19.9)
Tobacco Use, n (%)	
No	9350 (84.1)
Yes	1774 (15.9)
Active Smoker, n (%)	
No	8650 (77.8)
Yes	2474 (22.2)

Table 2: Symptom Prevalence in Hypertensive Population

Symptoms	Total (N=11124) n (%)
Asymptomatic	5005 (45%)
Headache	2,781 (25%)
Sudden Blackout	2,336 (21%)
Dizziness	2,225(20%)
Shortness of Breath	1,669(15%)
Palpitations	1,112(10%)
Nausea/Vomiting	334 (3%)
Chest pain	111 (1%)

Table 3: Drug prescribed in Hypertensive Population

Prescribed Antihypertensive Drug	Total (N=11124) n (%)
Telmisartan 20 mg, 40 mg	6650 (59.78)
Olmesartan 20 mg, 40 mg	4412 (39.66)
Amlodipine 5 mg, 10 mg	3182 (28.6)
Cilnidipine 10 Mg	2529 (22.73)
Chlorthalidone 125 Mg	1954 (17.56)
Metoprolol 25, 50 Mg	1346 (12.09)
Hydrochlorothiazide 125 Mg	185 (1.7)
Dapagliflozin 10 Mg	307 (2.75)
Ramipril 5 Mg	136 (1.2)

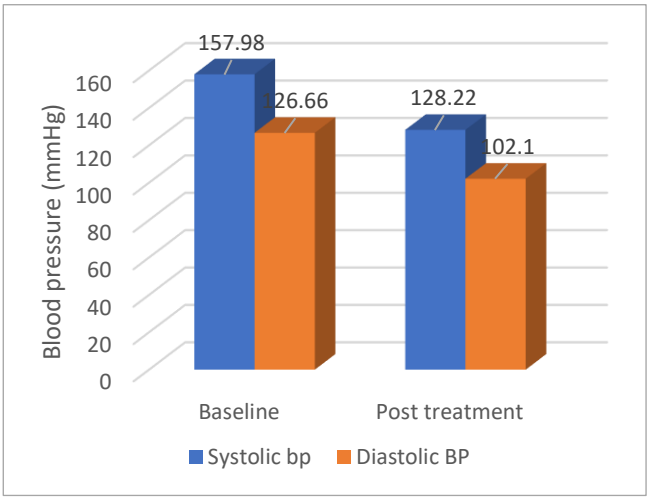

Figure 1: Change in SBP and DBP from Baseline

Table 4: Cardiovascular Complications prevalence

Complications	Total (N=11124) n (%)
CAD	2849 (25.6)
Heart Failure	1805 (16.2)
Stroke	1975 (17.8)

Discussion

This extensive observational study, encompassing 11,124 individuals, offers valuable insights into the demographic patterns, risk factors, symptom profiles, pharmacologic trends, and associated complications of hypertension. The demographic data, with a mean age of 55.9 years, indicates that hypertension is prevalent in middle-aged individuals, aligning with the understanding that the risk of hypertension increases with age. The predominance of males (65.6%) in the study population is consistent with epidemiological trends suggesting a higher prevalence of hypertension in men. Similar trends were observed in the ICMR-INDIAB study, which reported a higher prevalence of hypertension among men compared to women, particularly in the 40-60 age group, highlighted the gender and age-related risk patterns within the Indian population [28].

The variability observed in weight and height, and consequently in BMI, highlights the heterogeneity of the study population. While a significant proportion of participants fell within the normal BMI range (45%), a substantial percentage was overweight or obese (48.4%). This finding underscores the well-established association between excess weight and hypertension. This supports the findings of Global Burden of Disease Study 2017, which reported obesity as a significant contributor to hypertension [29]. Similarly, studies from South Asia also reported a high correlation between elevated BMI and hypertension, reinforcing the need for weight management in hypertension prevention programs [30].

The prevalence of a family history of hypertension among 42.9% of participants emphasizes the significant role of genetic predisposition in the development of hypertension. This aligns with existing research indicating that individuals with a family history of hypertension are at an increased risk of developing the condition.

In terms of behavioural risk factors, 22.2% of participants were active smokers. This subgroup demonstrated a notably higher rate of new hypertension diagnosis (13.9%) compared to non-smokers (8.4%). The relatively low proportion of participants reporting high levels of alcohol consumption (6.2%) and tobacco use (16%) is noteworthy. However, it is important to acknowledge that even low to moderate levels of alcohol consumption and tobacco use are risk factors for hypertension. Findings from Framingham Heart Study linked regular alcohol intake with increased systolic blood pressure over time also INTERHEART Study identified tobacco use as a major modifiable risk factor for cardiovascular disease, including hypertension, especially in low- and middle-income countries [31,32].

While 45% of patients were asymptomatic, headaches were the most frequently reported complaint (25%). This is consistent with the report from WHO indicating that although hypertension is often silent, when asymptomatic, headaches are among the most common complaints-particularly during hypertensive crises [33].

The analysis of prescribed antihypertensive drugs showed that Telmisartan 20 and 40 mg, followed by Olmesartan 10 mg, and Amlodipine 5 mg were the most frequently prescribed medications. This reflects current clinical practice patterns in the management of hypertension. These findings align with treatment guidelines from the European Society of Hypertension (ESH) 2024 European Society of Cardiology (ESC) guidelines recommend angiotensin-converting enzyme (ACE) inhibitors, angiotensin receptor blockers (ARBs), dihydropyridine calcium channel blockers, and thiazide or thiazide-like diuretics as the first-line blood pressure-lowering agents [34].

The data on complications revealed that a notable proportion of individuals with hypertension had already developed cardiovascular complications, including coronary artery disease (25.6%), heart failure (16.2%), and stroke (17.8%). This highlights the importance of early detection and management of hypertension to prevent or delay the onset of these complications. These findings are consistent with global estimates, which indicate that hypertension contributes to 54% of strokes and 47% of ischemic heart disease worldwide [29]. The SPRINT trial highlighted that aggressive blood pressure control significantly reduces the incidence of cardiovascular events, including heart failure and stroke [35].

The study also found a significant association between BMI and newly diagnosed hypertension. Also, the study demonstrated a significant association between smoking status and newly diagnosed

hypertension, with higher smoking frequencies associated with higher rates of newly diagnosed HTN. This finding reinforces the detrimental effects of smoking on cardiovascular health and its role in the development of hypertension.

Despite its strengths including a large sample size and comprehensive data across multiple variables this study has notable limitations. It does not account for medication adherence, the duration of hypertension, or socioeconomic factors, all of which are critical in understanding long-term blood pressure control and outcomes. Therefore, future studies should incorporate these variables to provide a more comprehensive understanding of hypertension management and its outcomes

Conclusion

This retrospective observational study offers valuable insights into the demographic and clinical characteristics of individuals newly diagnosed with hypertension. The findings underscore the importance of considering various factors, including age, gender, body mass index (BMI), family history, and lifestyle habits, in the assessment and management of hypertension. The study also highlights the "silent" nature of hypertension and the need for increased awareness and screening to facilitate early detection and intervention. The effectiveness of antihypertensive therapy in reducing blood pressure and the prevalence of cardiovascular complications among individuals with hypertension emphasize the importance of adherence to treatment guidelines. Further research is needed to explore the complex interplay of various risk factors in the development of hypertension and to identify effective strategies for prevention and management.

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Conflict of interest declaration

No

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Ethical Clearance

Approved by Independent Ethics Committee

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