Section: General Medicine

Original Research Article

CLINICAL PROFILE AND RISK FACTORS OF YOUNG HYPERTENSIVE PATIENTS IN A TERTIARY CARE SETTING

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ABSTRACT

Background: Hypertension among young adults is an emerging public health concern, associated with early onset of cardiovascular and renal complications. Despite increasing prevalence, data on the clinical and metabolic profile of young hypertensive patients in tertiary care settings in India remain limited. **Materials and Methods:** This hospital-based cross-sectional study was conducted at the Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, from April 2023 to March 2025. Adults aged 18–40 years diagnosed with hypertension per JNC 8 criteria were enrolled (N=81). Clinical evaluation, anthropometry, blood pressure measurement, and laboratory investigations (lipid profile, HbA1c, renal function tests) were performed. ECG, fundoscopy, and imaging were done when indicated. Associations between clinical factors and end-organ damage or blood pressure control were analyzed using chi-square and t-tests. **Result:** The mean age was 32.6±5.7 years; 64.2% were male. Hypertension was incidentally detected in 61.7% of patients. Primary hypertension accounted for 91.4%, secondary for 8.6%. Obesity was present in 55.6%, and increased waist–hip ratio in 76.5%. Family history was noted in 70.4%; tobacco and alcohol use in 46.9% and 34.6%, respectively. Comorbidities included diabetes (23.5%) and dyslipidemia (43.2%). End-organ damage was observed in 56.8% (LVH 40.7%, CKD 28.4%). Blood pressure control among primary hypertensives was achieved in 41.9%. End-organ damage was significantly associated with obesity, longer duration of hypertension, diabetes, dyslipidemia, and uncontrolled BP ($p<0.05$). **Conclusion:** Young hypertensive patients exhibit high metabolic risk, frequent end-organ damage, and suboptimal BP control. Early detection, lifestyle modification, and guideline-based therapy are essential to prevent long-term complications.

INTRODUCTION

Hypertension is a major modifiable risk factor for cardiovascular morbidity and mortality worldwide. Traditionally considered a disease of middle-aged and elderly individuals, its prevalence among young adults is steadily increasing, driven by rapid urbanization, sedentary lifestyles, unhealthy dietary habits, and psychosocial stress.[1] Early-onset hypertension, typically defined as onset before 40 years of age, is particularly concerning because it exposes individuals to prolonged periods of elevated blood pressure, thereby accelerating vascular remodeling and increasing lifetime risk of complications such as left ventricular hypertrophy, chronic kidney disease, and premature coronary artery disease.[2]

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Global estimates suggest that nearly one in six young adults may have elevated blood pressure, yet awareness, treatment, and control rates remain suboptimal in this age group. In India, the burden is compounded by high rates of obesity, tobacco use, and dyslipidemia, alongside limited screening, and poor adherence to therapy.[3] Despite these trends, there is a paucity of data on the clinical and biochemical profile of young hypertensive patients in tertiary care settings. Understanding these patterns is essential for early detection, targeted interventions, and prevention of long-term sequelae. This study aims to characterize the demographic, clinical, and metabolic profile of young hypertensive patients and identify factors associated with end-organ damage and blood pressure control.[4]

MATERIALS AND METHODS

Study Design and Population: This was a hospital-based, cross-sectional observational study conducted at the Department of General Medicine, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, India. The study period spanned from April 2023 to March 2025. Eligible participants were adults aged 18-40 years diagnosed with hypertension according to the Joint National Committee (JNC 8) criteria. Patients who were seriously ill with altered sensorium or pregnant women were excluded. A total of 81 patients were enrolled using purposive sampling after obtaining informed consent.

Data Collection and Tools: Data collection involved a pre-structured proforma and comprehensive questionnaires (Annexure 1). Clinical examinations were performed, followed by various investigations including Electrocardiogram, Urine Routine Examination (R/E), Urine Albumin Creatinine Ratio, Serum Lipid Profile, Glycated Hemoglobin (HbA1c), Fundoscopy, Fasting Blood Sugar, Post-Prandial Blood Sugar, and renal function tests. Specific tools used included a measuring tape for height, a spring board for weight, a mercury sphygmomanometer for blood pressure, RANDOX RX IMOLA auto-analyser for serum lipid profile, and ADAMSTM A1c HA-8180T for glycated hemoglobin.

End Points and Study Procedures: The primary objective was to evaluate the demographic, clinical, and biochemical profile of young hypertensive patients and identify factors associated with end-organ damage and blood pressure control.

Statistical Analysis: Data were analyzed using IBM SPSS Statistics version 26.0. Categorical variables were presented as frequencies and percentages, and quantitative variables as means ± standard deviations or medians with interquartile ranges. Hypertension prevalence was reported with 95% confidence intervals. Associations between sociodemographic or clinical factors and outcomes were assessed using Chi-square and independent t-tests. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 81 young hypertensive patients were included in the study. The mean age of the cohort was 32.6 years, and males constituted a higher proportion, with a male-to-female ratio of 1.8:1, indicating a clear male predominance in young-onset hypertension.

Most patients were asymptomatic at presentation. Hypertension was incidentally detected in 61.7% of participants, often during clinical evaluations for unrelated complaints such as dizziness. Headache was the most common symptom among those with clinical presentation, reported by 25.9% of individuals. Palpitations (7.4%) and cerebrovascular events (4.9%) were reported less frequently, reflecting that symptomatic hypertension remains relatively uncommon in early disease stages.

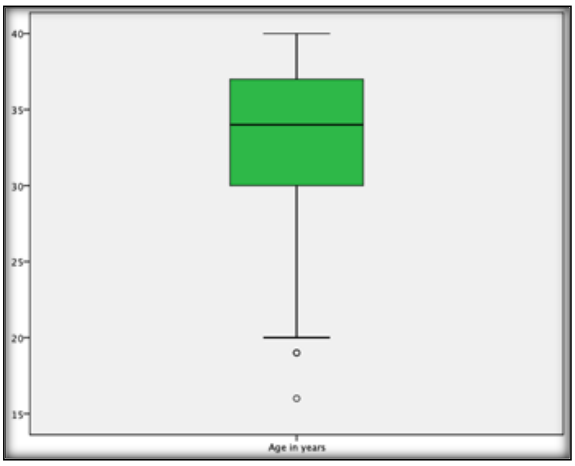

Figure 1: Box plot showing the age distribution of the study participants (N=81)

Primary hypertension was overwhelmingly predominant, diagnosed in 91.4% of patients, whereas secondary hypertension accounted for 8.6% of cases demonstrated in [Figure 2].

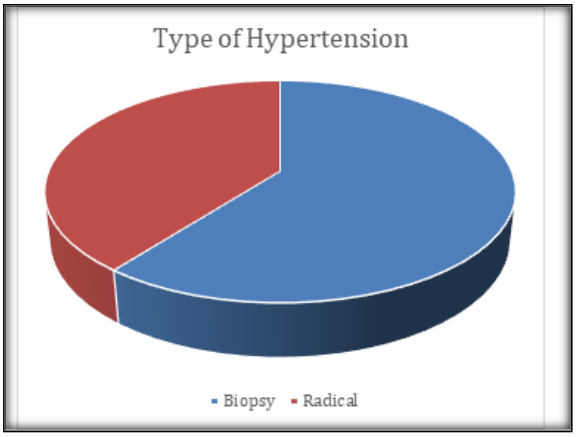

Figure 2: Distribution of the study participants by their type of hypertension (N=81)

Excess body weight emerged as a major concern: 17.3% of patients were overweight and 55.6% were obese as shown in figure 3, and with 76.5%

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exhibiting an increased waist-hip ratio, suggesting a high prevalence of central obesity as a significant cardiometabolic risk factor. A strong familial association was also evident, with 70.4% reporting a positive family history of hypertension.

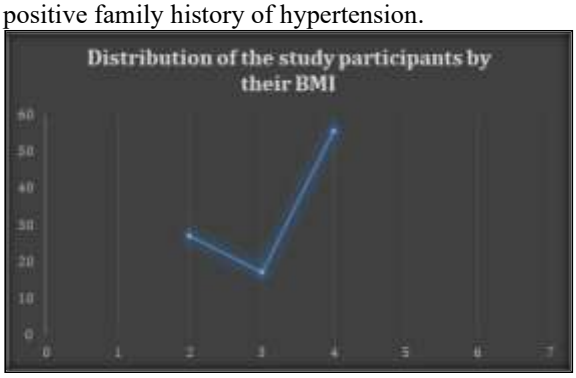

Figure 3: Distribution of the study participants by their BMI (N=81)

Age of Onset and Duration of Hypertension: The mean age at onset of hypertension was 30.8 ± 5.8 years, with a median of 32.0 years (IQR: 28.0–36.0). Onset after 30 years was observed in 46 patients (56.8%). The median duration of hypertension was 12.0 months (IQR: 2.0–42.0). Duration ≤12 months was seen in 41 patients (50.6%), 1–5 years in 28 patients (34.6%), and >5 years in 12 patients (14.8%)

Central Obesity: Increased waist circumference was present in 54 patients (66.7%). The median waist circumference was 92.0 cm (IQR: 84.0–101.0), and the median hip circumference was 99.0 cm (IQR: 94.0–105.5). The median waist–hip ratio was 0.91 (IQR: 0.88–0.98), with increased waist–hip ratio observed in 76.5% of participants.

Family History and Behavioral Factors: A family history of hypertension in first-degree relatives was present in 57 patients (70.4%). Tobacco use was reported by 38 patients (46.9%), and alcohol consumption by 28 patients (34.6%).

Comorbidities: Diabetes mellitus was present in 19 patients (23.5%), while dyslipidemia was observed in 35 patients (43.2%).

End Organ Damage: Overall end organ damage was present in 46 patients (56.8%). Left ventricular hypertrophy was the most common manifestation (33; 40.7%), followed by chronic kidney disease (23; 28.4%).

Control Status and Treatment Pattern: Among 74 patients with primary hypertension, blood pressure was controlled in 31 (41.9%) and uncontrolled in 43 (58.1%).

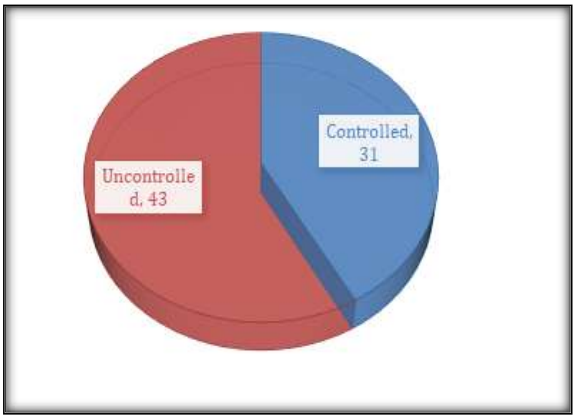

Figure 4: Control status

Calcium channel blockers were the most frequently used antihypertensive drugs (49.0%), followed by ACE inhibitors or ARBs (44.0%).

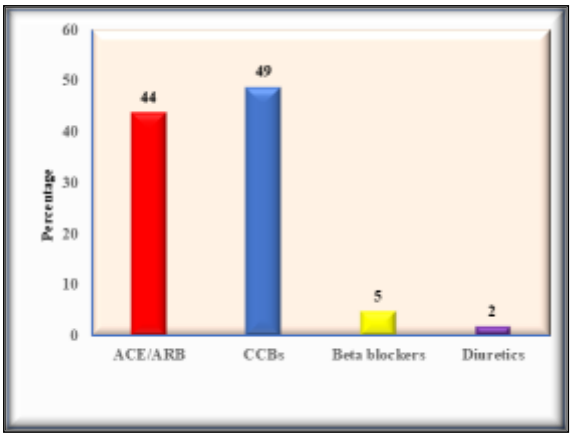

Figure 5: Antihypertensive drug used.

Factors Associated with End Organ Damage

End organ damage was significantly associated with overweight/obesity ($p = 0.019$), longer duration of hypertension (>5 years; $p < 0.001$), diabetes mellitus ($p = 0.048$), dyslipidemia ($p = 0.040$), and uncontrolled hypertension ($p < 0.001$).

Factors Associated with Hypertension Control

Uncontrolled hypertension was significantly associated with duration of hypertension >5 years ($p = 0.002$) and dyslipidemia ($p = 0.048$). No significant association was observed with age, gender, BMI, waist–hip ratio, family history, diabetes mellitus, tobacco use, or alcohol consumption.

DISCUSSION

Hypertension is one of the most significant modifiable risk factors for cardiovascular morbidity and mortality worldwide. Although commonly associated with older age groups, recent evidence demonstrates a rising prevalence of hypertension among young adults, driven by rapid urbanization, lifestyle transitions, genetic predispositions, and environmental exposures.[5] Young hypertension, defined as onset before the age of 40, carries major public health relevance due to prolonged lifetime exposure to elevated blood pressure, which

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substantially increases the risk of early cardiovascular events, premature mortality, and irreversible target organ damage.[6] Despite its growing burden, hypertension in young adults frequently remains undiagnosed and undertreated due to its largely asymptomatic nature and a widespread underestimation of cardiovascular risk in younger age groups.[7]

This study, conducted in a tertiary-care center, provides essential insights into the clinical characteristics, risk profile, and complications of hypertension among young adults aged 18–40 years. The mean age of the cohort was 32.6 years with a clear male predominance (M:F ratio 1.8:1), which is supported by studies such as Geevar Z et al., Devi LS et al., and Desai N et al., who also reported higher rates of hypertension among young males.[8-10] Male susceptibility has been attributed to higher exposure to behavioral risk factors such as tobacco consumption, alcohol use, and occupational stress. Similar male predominance has been observed worldwide.[11]

In the present study, 61.7% of young hypertensives were diagnosed incidentally, highlighting hypertension's "silent" nature in early adulthood. This finding underscores the importance of routine screening and opportunistic blood pressure measurement to enhance early detection.[12] Symptomatically, headache was the most common presenting complaint (25.9%), which is consistent with previous studies by Sharma G et al., Sundeep S et al., and Kejriwal A et al., who also reported headache as the dominant clinical manifestation among young hypertensives.[13-15] The pathophysiology involves increased intracranial pressure, vascular stretching, and impaired cerebral autoregulation during periods of uncontrolled hypertension.

Primary hypertension constituted the majority (91.4%) of cases in this study, indicating a multifactorial etiology predominantly shaped by genetics, dietary habits, and lifestyle. Secondary hypertension was identified in 8.6% of cases, most commonly due to renal and endocrine causes, consistent with findings from Sari DI et al. and Jones ESW et al. Although variations exist across studies, such as a higher proportion reported by Iqbal MA et al. and Devi LS et al,[9,16-18] secondary hypertension in young adults must be recognized early due to its reversible nature when appropriately treated.

Obesity emerged as a major risk factor, with 55.6% obese and 17.3% overweight individuals in the cohort. Central obesity, observed in 76.5% of patients, reflects a high burden of metabolic risk. Comparable observations were noted by Martell-Claros N et al., Putri L et al., and Widjaja FF et al,[19-21] who associated increased BMI and waist-hip ratio with hypertension in young adults. Family history of hypertension, identified in 70.4% of participants, reiterates its strong genetic contribution, like findings by Sundeep S et al., Iqbal MA et al., and Desai N et al.[10,14,18]

Metabolic comorbidities further compounded cardiovascular risk, with diabetes mellitus seen in 23.5% and dyslipidemia in 43.2% of patients, comparable with the data reported by Sharma Lamsal K et al. and Martell-Claros N et al.[19,22] These conditions are known to accelerate endothelial dysfunction, atherosclerosis, and progression to major cardiovascular events.

One of the most significant findings of this study was the high prevalence of target organ damage (56.8%). Left ventricular hypertrophy (40.7%) and chronic kidney disease (28.4%) were the most prevalent complications, consistent with studies by Sharma G et al. and Sundeep S et al,[13,14] which showed early cardiac and renal involvement in young hypertensives. Presence of obesity, diabetes, dyslipidemia, uncontrolled blood pressure, and disease duration >5 years were strongly associated with organ damage, confirming the cumulative impact of modifiable risk factors and chronic hypertension exposure.

Control of blood pressure was suboptimal, with only 41.9% of patients achieving targets, similar to findings by Rao T et al. Kayima J et al.[23,24] reported even lower control rates (20%), emphasizing that poor BP control among young adults is a global concern. Inadequate adherence, low awareness, and insufficient lifestyle modification likely contribute to poor control levels. Lifestyle-related behaviors including tobacco use (46.9%), alcohol intake (34.6%), and high salt consumption (63.0%) were also prominent contributors, as reported in other Indian and international studies.[25-28]

This study is strengthened by its representative sample and comprehensive evaluation of comorbidities and organ damage. However, the cross-sectional design limits causal interpretations, and self-reported data may be subject to recall and social desirability bias.

CONCLUSION

Young-onset hypertension is emerging as a significant public health challenge, particularly in low- and middle-income countries like India. Our study demonstrates that young hypertensive patients not only have elevated blood pressure but also exhibit a clustering of metabolic risk factors, including obesity, dyslipidemia, and diabetes, along with a high prevalence of behavioral risks such as tobacco and alcohol use. Alarmingly, more than half of these patients already show evidence of end-organ damage primarily left ventricular hypertrophy and chronic kidney disease underscoring the aggressive nature of the disease when it begins early in life.[29,30]

The suboptimal blood pressure control observed in our cohort highlights gaps in treatment adherence, lifestyle modification, and timely follow-up. These findings emphasize the need for comprehensive strategies that go beyond pharmacotherapy, incorporating patient education, behavioral

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counseling, and structured screening programs for early detection. Clinicians should maintain a high index of suspicion for secondary causes in atypical cases and adopt guideline-based therapy tailored to individual risk profiles.

Future research should focus on longitudinal studies to assess long-term cardiovascular outcomes and explore innovative interventions, including digital health tools and single-pill combinations, to improve adherence. Addressing young hypertension proactively can significantly reduce the lifetime burden of cardiovascular and renal complications, ultimately improving population health outcomes.

Ethics: The study protocol was approved by the Research Ethics Board of the Regional Institute of Medical Sciences, Imphal. Informed written consent was obtained from all participants after explaining the purpose and procedures of the study. Participation was voluntary, and individuals were free to withdraw at any time. Privacy and confidentiality were strictly maintained; identifying information was not disclosed, and all data were securely stored and accessible only to the investigators.

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