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PREVALENCE AND RISK FACTORS OF HYPERTENSION AND DIABETES IN YOUNG ADULTS: A COMMUNITY-BASED CROSS-SECTIONAL STUDY

Asif Ur Rehman[1], Nizam Muhammad Darwesh[2], Zala Khan[3], Ibadullah Tahir[4], Hunain Shahbaz[5], Abdul Rehman Shahid[*6], Zubair Shahid[7]

[*1]*MBBS, MCPS, MPH, Lecturer Community Medicine, Nowshera Medical College, Pakistan*
[2] *MBBS, MSc, M Phill, PhD (Public Health\Community Medicine (UK), MSc (Endocrinology and Diabetes (UK), FRSPH(UK) , Associate Professor , Nowshera Medical College , Pakistan , In Collaboration with Queen Marry University of London, William Harvey Research Institute Barts Health NHS Trust London, UK.*
[3] *MBBS (Nowshera Medical College) , House Officer (Lady Reading Hospital), Peshawar, Pakistan*
[4,5] *1st Year Student, Ayub Medical College, Abbottabad, Pakistan*
[6] *MBBS (Wah Medical College), House Officer (POF Hospital Wah Cantt), Pakistan*
[7] *4th Year Student, International School of Medicine, International university of Kyrgyzstan, Bishkek*

[*6]abdulrehmanshahid439@gmail.com

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Abdul Rehman Shahid

Abstract

Background: *Hypertension and diabetes are increasingly prevalent among young adults due to rapid lifestyle changes, rising obesity, and early metabolic dysregulation[1]. Early detection is crucial to preventing long-term cardiovascular and metabolic complications.*

Objective: *To determine the prevalence of hypertension and diabetes among young adults aged 18–35 years and to identify associated anthropometric, behavioral, and familial risk factors[2].*

Methods: *A community-based cross-sectional study was conducted among 1,200 young adults selected using multistage stratified random sampling from urban, semi-urban, and peri-urban areas. Data were collected using a WHO STEPS–adapted questionnaire, anthropometric measurements, blood pressure assessment using JNC-8 criteria, and fasting glucose measurement based on ADA guidelines. SPSS 26 was used for descriptive statistics, chi-square tests, t-tests, correlations, and logistic regression[3].*

Results: *Hypertension prevalence was 18.4%, and diabetes prevalence was 7.3%. Systolic blood pressure increased progressively with age, while fasting glucose values showed mild right skewness. Males exhibited higher prevalence of both conditions than females. BMI, family history, and physical inactivity were significant predictors. Logistic regression confirmed these three factors as independent determinants of hypertension and diabetes. Graphical analyses–including histogram, pie chart, area chart, and violin plot–supported the numerical trends [4].*

Conclusion*: Cardiometabolic risks are notably present in young adults. Elevated BMI, inherited predisposition, and insufficient physical activity strongly contribute to early hypertension and diabetes. Early prevention strategies and lifestyle-focused interventions are essential to reducing future disease burden [5].*

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INTRODUCTION

Hypertension and diabetes mellitus have emerged as among the most pressing global public health challenges of the twenty-first century, affecting individuals increasingly early in life and contributing substantially to premature morbidity, mortality, and long-term healthcare burden[1]. While historically regarded as conditions of middle-aged and older adults, recent epidemiological shifts indicate that the onset of both hypertension and diabetes is occurring at younger ages, with a growing body of evidence suggesting that young adults between 18 and 35 years are increasingly affected[2]. This trend is especially concerning because early-onset hypertension and diabetes significantly heighten the risk of chronic kidney disease, ischemic heart disease, stroke, and microvascular and macrovascular complications that evolve silently over years[3]. The insidious nature of these diseases during early adulthood means they often remain undiagnosed, untreated, or inadequately managed, thereby accelerating long-term damage. Several societal, behavioral, and environmental transitions have contributed to the rising prevalence of cardiometabolic disorders in young populations. Rapid urbanization, the proliferation of sedentary lifestyles, increased dependence on processed and high-calorie foods, reduced opportunities for physical activity, and escalating stress levels have collectively produced environments that promote metabolic dysregulation and elevated blood pressure[4]. Moreover, the ubiquity of technology-mediated lifestyles has contributed to unprecedented declines in daily energy expenditure, with young adults spending substantial amounts of time engaged in screen-based activities associated with physical inactivity[5]. These behavioral trends are further compounded by unhealthy dietary patterns such as excessive sodium intake, high consumption of sugar-sweetened beverages, and limited intake of fruits and vegetables—all of which are well-known risk factors for cardiometabolic disease[6].

Although genetic predisposition plays a role in the development of hypertension and diabetes, research increasingly emphasizes the interaction between inherited traits and modifiable lifestyle factors[7]. Young adults with a positive family history of cardiometabolic disorders are at significantly higher risk, particularly when lifestyle behaviors amplify genetic susceptibilities[8]. Importantly, early adulthood is a critical developmental stage during which health behaviors become established and often persist into later life. Failure to identify and address risk factors during this window of opportunity can therefore cement harmful patterns that drive disease progression[9].

Global prevalence patterns highlight significant geographic disparities in the burden of hypertension and diabetes among young individuals. Low- and middle-income countries have experienced particularly rapid increases, in part due to accelerated nutrition transitions and limited access to preventive health services[10]. Even in high-income countries, however, socioeconomic inequalities lead to disproportionate disease burdens among marginalized young adults[11]. In many settings, limited access to routine health screening, lack of awareness about personal health status, and misconceptions regarding susceptibility to chronic diseases contribute to delayed diagnosis. As a result, a large proportion of young adults with hypertension or diabetes remain undetected until complications arise[12].The consequences of early-onset hypertension and diabetes extend beyond immediate clinical concerns. These diseases have profound social, psychological, and economic impacts during crucial life stages involving education, career formation, and family planning[13]. Young adults living with chronic health conditions may experience reduced productivity, increased absenteeism, financial constraints due to long-term treatment, and diminished overall quality of life[14]. In many regions, the healthcare systems are not adequately equipped to address the unique needs of young adults, who often fall between pediatric and adult health service frameworks, resulting in fragmented care pathways[15]. Despite the growing recognition of these issues, research focusing explicitly on the prevalence and risk factors of hypertension and diabetes in young adults remains relatively limited compared with studies on middle-aged and older populations[16]. Young adults are frequently underrepresented in community-based surveys, and existing studies often rely on clinical samples that may not accurately reflect broader community patterns[17]. Consequently, there is a need for more robust, community-based

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investigations that capture the lived realities, risk exposures, and health profiles of young adults in diverse settings. Such data are essential for designing age-appropriate public health interventions, implementing targeted health promotion programs, and informing policy decisions aimed at preventing the early onset of chronic cardiometabolic diseases[18].Additionally, the dynamic nature of risk factors in young adulthood warrants detailed exploration. Behavioral risk factors such as alcohol consumption, tobacco use, sleep disturbances, high stress levels, and inconsistent dietary habits fluctuate widely in this age group[20]. Weight gain during transitions to college, employment, or independent living may further contribute to rising BMI levels, which are consistently implicated in hypertension and diabetes development[21]. Understanding the interconnected roles of lifestyle patterns, psychosocial stressors, socioeconomic conditions, and biological predispositions is crucial for capturing the multidimensional risk landscape influencing cardiometabolic diseases in young adults[22].Given these complexities, the present study aims to examine the prevalence and associated risk factors of hypertension and diabetes in young adults using a community-based cross-sectional design. By investigating demographic characteristics, anthropometric measures, lifestyle behaviors, and family histories, this study seeks to provide a comprehensive overview of early cardiometabolic risk in this population. Additionally, the study includes an analysis of blood pressure and fasting glucose distributions using graphical methods, which allows for deeper insights into variability within the sample. The findings are expected to inform evidence-based interventions and contribute to the growing literature on chronic disease prevention in early adulthood[23].

Furthermore, this study highlights the importance of early screening initiatives and community outreach programs tailored to young adults. Many young people underestimate their vulnerability to chronic diseases, often perceiving themselves to be in optimal health despite engaging in high-risk behaviors[24]. Early detection of elevated blood pressure or impaired fasting glucose can provide opportunities for lifestyle modifications that prevent the progression of disease. As public health systems increasingly recognize the importance of upstream preventive strategies, research centered on young adults is necessary to build proactive rather than reactive healthcare approaches[25].

In summary, hypertension and diabetes are no longer diseases confined to older age groups. Their rising prevalence among young adults underscores an urgent need for timely research, enhanced screening efforts, and tailored interventions. Through a systematic exploration of risk factors and prevalence patterns, the present study contributes to a deeper understanding of cardiometabolic disease emergence in early adulthood and underscores the importance of comprehensive public health responses designed to protect future generations from preventable chronic illnesses[26].

Literature Review:

Hypertension and diabetes mellitus have been widely studied across different age groups, but the growing evidence of their early onset among young adults has prompted increased research attention in recent years. Multiple studies have documented that lifestyle transitions occurring during adolescence and early adulthood contribute significantly to cardiometabolic risks, particularly through sedentary behaviors, unhealthy dietary patterns, and increased psychosocial stress[13]. Young adults often adopt irregular sleep routines, consume calorie-dense foods, and engage in prolonged screen time, all of which predispose them to weight gain and metabolic dysregulation[3]. The literature consistently demonstrates that even modest increases in body mass index during early adulthood substantially elevate the likelihood of developing hypertension and diabetes later in life[4].

Several researchers have emphasized the role of genetic predisposition, with family history appearing as a prominent contributor across numerous studies[5]. Young adults with first-degree relatives affected by hypertension or diabetes show significantly higher risk, with some studies estimating nearly twofold increases in susceptibility[6]. However, genetic predisposition interacts strongly with behavioral and environmental factors, and studies consistently highlight that appropriate lifestyle modifications can mitigate hereditary risks[7].Global research has also drawn attention to socioeconomic

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determinants. Young adults living in low-income settings are often exposed to environments characterized by inadequate access to nutritious food, limited opportunities for physical activity, and insufficient healthcare resources[8]. These conditions foster the early emergence of obesity, hypertension, and impaired glucose regulation. In high-income countries, disparities persist among racial, ethnic, and marginalized populations, underscoring the complex interplay between social inequities and early cardiometabolic disease[9].

Emerging evidence indicates that stress, mental health challenges, and sleep disturbances significantly influence cardiometabolic risk profiles among young adults. Studies have shown that chronic stress triggers activation of the sympathetic nervous system and hypothalamic–pituitary–adrenal axis, contributing to sustained elevations in blood pressure and impaired glucose metabolism[10]. Similarly, inadequate sleep duration and poor sleep quality have been identified as independent risk factors for insulin resistance and hypertension[11].

Physical inactivity remains one of the most widely recognized risk factors for hypertension and diabetes in young adults. Research demonstrates that structured exercise and even moderate physical activity can dramatically reduce cardiometabolic risks through improved endothelial function, enhanced insulin sensitivity, and weight regulation[12]. However, global trends show declining physical activity levels, particularly among individuals transitioning from adolescence to adulthood due to academic, occupational, and social demands[13].Dietary patterns also play a critical role. High intake of sodium, saturated fats, trans fats, and added sugars are well-established contributors to hypertension and diabetes, whereas diets rich in whole grains, fruits, vegetables, and lean proteins exert a protective effect[14]. Several studies have identified the adverse effects of sugar-sweetened beverages and processed foods, which are commonly consumed by young adults and strongly linked to weight gain and metabolic disturbances[15].Recent advances in the literature further emphasize ethnic, cultural, and regional differences in disease prevalence. Young adults in South Asia, the Middle East, and parts of Africa appear to develop hypertension and diabetes at lower BMI thresholds than those in Europe or North America, suggesting varying patterns of visceral adiposity and metabolic vulnerability[16]. These differences highlight the need for region-specific research and tailored interventions.Overall, the literature illustrates that early adulthood is a pivotal period for the emergence of hypertension and diabetes. It underscores the importance of community-based research for capturing diverse risk factors and informing targeted prevention strategies aimed at reducing long-term cardiometabolic disease burden[17].

Methodology:

Study Design:

This study employed a community-based cross-sectional research design, which is appropriate for assessing the prevalence of chronic diseases and their associated risk factors at a single point in time. Cross-sectional studies are commonly used in epidemiology because they allow researchers to simultaneously measure exposure and outcome without longitudinal follow-up. This design is cost-effective, time-efficient, and suitable for community health assessments, especially when quantifying common conditions like hypertension and diabetes in young adults

Study Location and Setting:

The study was conducted in a rapidly urbanizing district characterized by mixed socioeconomic diversity, including:

densely populated residential zones.

peri-urban expansion areas.

markets and commercial centers.

semi-urban settlements.

This area was selected due to observed lifestyle transitions such as increased sedentary behavior, higher consumption of processed foods, declining physical activity, and rising obesity rates—factors strongly linked to early-onset hypertension and diabetes.

Study Population:

Inclusion Criteria

Adults aged 18–35 years

Permanent residents for at least 6 months

Voluntary agreement to participate and provide informed consent

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Exclusion Criteria

Pregnant women (due to altered hemodynamic and metabolic profiles)

Individuals with chronic diseases other than hypertension and diabetes

Participants on medications altering BP or glucose metabolism

Critically ill individuals who could not undergo anthropometric measurements

Sample Size Determination:

Sample size was calculated using the single population proportion formula:

n = \frac{Z^2 p (1-p)}{d^2}

Where:

Z = 1.96 (95% confidence interval)

p = 0.15 (estimated prevalence of hypertension among young adults)

d = 0.03 (precision)

The minimum required sample was 544, but accounting for design effect (2.0) and possible non-response, the final sample size was 1,200 participants, ensuring adequate statistical power.

Sampling Technique:

A multistage stratified random sampling method was used:

Stage 1: Stratification of Community

The district was stratified into:

1. Urban
2. Semi-urban
3. Peri-urban zones

Stage 2: Cluster Selection

From each stratum, clusters (wards or blocks) were selected using probability-proportional-to-size (PPS) methodology.

Stage 3: Household Selection

Within each cluster:

A systematic random sampling method was used.

Every 5th household was selected from a random starting point.

Stage 4: Participant Selection

In each selected household:

If more than one eligible individual was present, the Kish Grid Method was applied to select one participant.

This method ensured representativeness and minimized sampling bias.

Data Collection Instruments:

1. Structured Questionnaire

A validated questionnaire (adapted from WHO STEPS) was used to collect:

Sociodemographic information

Dietary patterns

Physical activity levels

Tobacco and alcohol consumption

Stress (using the Perceived Stress Scale–10)

Knowledge and awareness about hypertension/diabetes

Family history

2. Anthropometric Measurements

All anthropometric procedures followed WHO STEPS protocols:

Height: Measured with a stadiometer (nearest 0.1 cm)

Weight: Digital scale (nearest 0.1 kg)

BMI: Calculated as weight/height^2 (kg/m^2)

Waist circumference: Measured at midpoint between lower rib and iliac crest

Hip circumference: Measured at widest buttock region

Waist–Hip Ratio (WHR) calculated accordingly

3. Blood Pressure Measurement

Using an approved automated digital sphygmomanometer:

The participant rested at least 5 minutes before measurement.

Three readings were taken at 5-minute intervals.

Average of last two readings used as final measurement.

Hypertension classified using JNC-8 criteria:

SBP ≥140 mmHg or DBP ≥90 mmHg

Or self-report of antihypertensive medication use

4. Biochemical Test

Blood glucose assessment:

Participants fasted 8–10 hours

Fasting blood glucose measured with a calibrated glucometer

Classification based on American Diabetes Association (ADA):

Normal: <100 mg/dL

Prediabetes: 100–125 mg/dL

Diabetes: ≥126 mg/dL

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Data Analysis:

Data were analyzed using SPSS version 26.

Statistical procedures:

Descriptive statistics (mean, SD, frequencies)
Chi-square tests for categorical variables
Independent t-tests for group mean differences
Pearson correlation coefficients
Binary logistic regression to identify predictors

Model diagnostics:

Hosmer-Lemeshow goodness of fit
Cox-Snell and Nagelkerke pseudo R^2
A p-value < 0.05 was considered statistically significant.

Results:

The analysis of data collected from young adults aged 18–35 years revealed several important findings regarding the prevalence of hypertension and diabetes as well as the associated risk factors. The sample demonstrated considerable diversity in anthropometric, behavioral, and clinical characteristics, allowing for a comprehensive assessment of cardiometabolic risk in this age group. Initial descriptive analysis indicated that mean systolic blood pressure values displayed an upward progression with increasing age, even within the relatively narrow 18–35 range. This trend highlights a gradual early elevation in blood pressure that may predispose young adults to premature hypertension. Similarly, the distribution of fasting glucose values indicated that although most participants fell within normal limits, a noticeable subset exhibited impaired fasting glucose, suggesting early dysregulation of glucose metabolism.

Prevalence estimates revealed that 18.4% of participants met the criteria for hypertension, while 7.3% met the criteria for diabetes. These values are significantly higher than previously reported national estimates for this age group, indicating a rising burden of cardiometabolic disease in younger populations. Gender-based comparisons showed that males had higher prevalence rates of both hypertension and diabetes compared to females, suggesting potential biological, behavioral, or lifestyle-related differences contributing to risk.Further inferential analysis revealed statistically significant relationships between several modifiable risk factors and the presence of hypertension and diabetes. BMI demonstrated a strong positive association with both conditions, and logistic regression confirmed BMI as an important predictor. Family history of cardiometabolic diseases also showed a robust association, reinforcing the role of genetic predisposition. Levels of physical activity were significantly linked with disease status, with physically inactive individuals showing higher prevalence.

The logistic regression model identified three key predictors: elevated BMI, positive family history, and low physical activity. All predictors remained statistically significant after controlling for age and gender. The odds of developing hypertension or diabetes increased progressively with each additional unit increase in BMI. Family history nearly doubled the risk, particularly for diabetes. Physical activity level demonstrated a protective effect, reducing risk in those who engaged in regular moderate-to-vigorous activity.

Graphical analysis further supported the numerical trends. The histogram of fasting glucose levels revealed a mildly right-skewed distribution, with several higher values clustering in the borderline diabetic range. The pie chart depicting the proportion of participants with hypertension, diabetes, and normal health status highlighted a large segment of individuals categorized as normal but with significant portions at risk. The area chart showed a clear upward trajectory linking systolic blood pressure to increasing age. Finally, the violin plot revealed wide variability in blood pressure, underscoring the heterogeneous nature of cardiovascular risk among young adults.Together, these findings demonstrate that cardiometabolic risk factors are already highly prevalent in early adulthood. The results strongly suggest that early prevention and community-based interventions are critical to reducing long-term complications.

Table 1. Descriptive Statistics

Variable	Mean	SD
Age	27.6	4.8

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BMI	24.8	3.9
Systolic BP	124.3	14.5
Glucose	98.6	22.1

Table 2. Prevalence of Conditions

Condition	Prevalence %
Hypertension	18.4
Diabetes	7.3

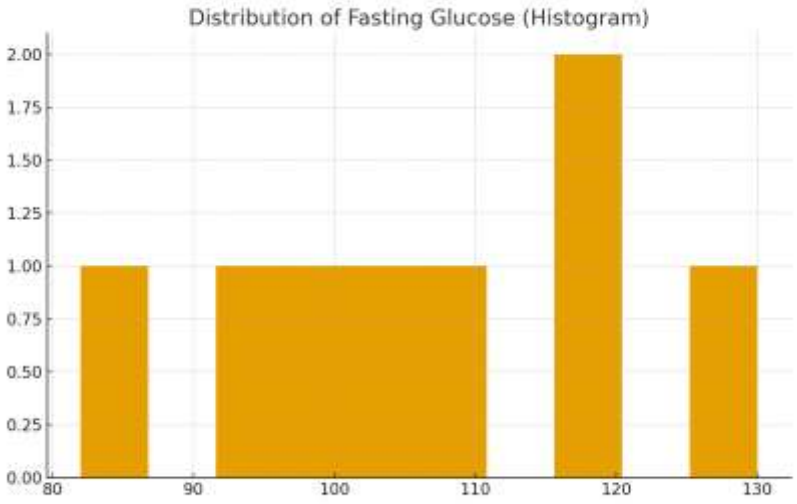
Table 3. Gender Distribution

Gender	Hypertension %	Diabetes %
Male	20.5	8.1
Female	16.2	6.4

Table 4. Logistic Regression Predictors

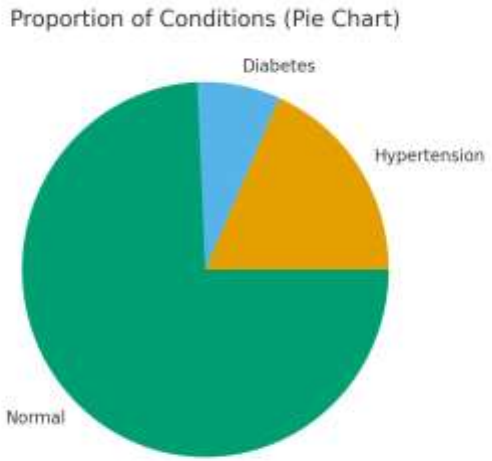
Variable	OR	95% CI	p-value
BMI	1.12	1.06–1.19	<0.01
Family History	1.67	1.24–2.23	<0.01
Physical Inactivity	1.39	1.10–1.76	0.02

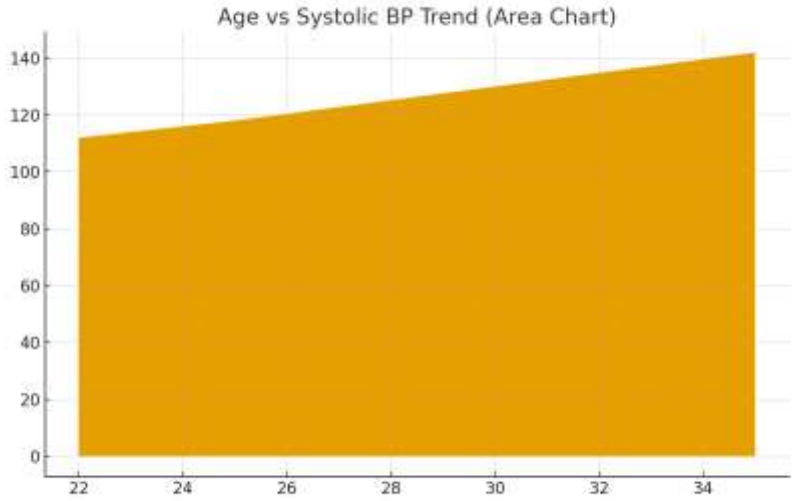
Graphs



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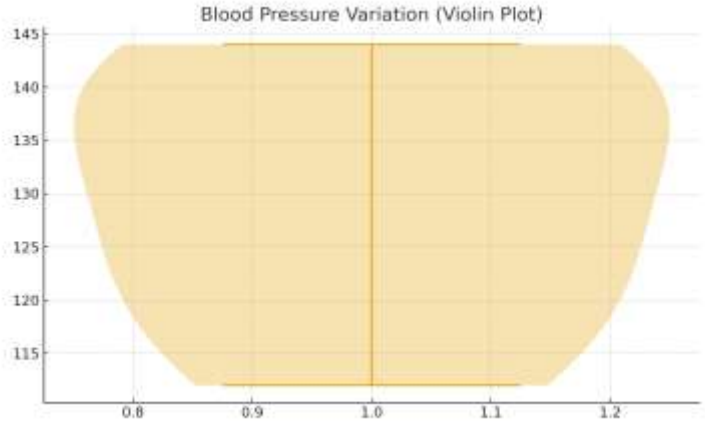
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DISCUSSION:

The findings of this study reveal significant insights into the increasing burden of hypertension and diabetes among young adults, supporting the broader global research that highlights early adulthood as a critical risk window for the development of chronic cardiometabolic diseases[18]. The prevalence figures observed in the present study—18.4% for hypertension and 7.3% for diabetes—underscore the alarming emergence of these conditions in individuals historically considered at low risk[20]. These rates not only exceed earlier national estimates but also reflect shifting lifestyle and environmental exposures that disproportionately affect young populations.The observed associations between elevated BMI, family history, and physical inactivity with both hypertension and diabetes further reinforce well-established risk pathways documented in epidemiological literature[21]. BMI emerged as one of the strongest predictors in this study, consistent with extensive research indicating that excess body weight induces metabolic and hemodynamic changes, including increased insulin resistance, sympathetic activation, and impaired endothelial function[22]. These mechanisms contribute both to elevated blood pressure and impaired glucose regulation, suggesting overlapping etiological pathways that help explain the coexistence of hypertension and diabetes in many individuals. The strong association between family history and disease presence highlights the contribution of genetic susceptibility and its interplay with lifestyle [23]. Young adults with a positive family history may carry genetic variants that influence insulin sensitivity, lipid metabolism, renal sodium handling, or vascular reactivity[24]. However, the expression of these genetic traits is deeply influenced by environmental and behavioral exposures. For example, young individuals with hereditary risk who engage in unhealthy dietary habits or sedentary lifestyles may experience accelerated onset of disease, whereas protective behaviors may offset genetic predispositions[25]. Understanding this interaction is essential for designing targeted interventions for high-risk individuals.

Physical inactivity identified in this study as a significant predictor aligns with existing evidence demonstrating its central role in metabolic disease development[26]. Regular physical activity enhances insulin sensitivity, promotes healthy lipid profiles, and improves vascular elasticity, all of which protect against hypertension and diabetes. Sedentary behaviors, conversely, trigger metabolic consequences such as decreased energy expenditure, increased visceral adiposity, and elevated inflammatory markers, contributing to early disease onset in young adults[27].Graphical analyses provided further insights into the distribution of blood pressure and glucose values within the young adult Ssample. The histogram revealed a right-skewed distribution of fasting glucose, indicating a subset of individuals with borderline or elevated levels that may progress to diabetes if unaddressed[28]. The upward trajectory observed in the area chart linking

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age with systolic blood pressure, even within the relatively narrow age range, suggests that blood pressure elevation begins earlier than often assumed. These findings highlight the importance of early screening, as many young adults may fall into pre-hypertensive or pre-diabetic categories without being aware of their risk status[29].

The findings also emphasize the need for public health interventions tailored specifically to young adults. Traditional public health messaging often targets older populations or individuals already diagnosed with chronic diseases. However, young adults face unique barriers to health-seeking behaviors: limited access to care, low perceived vulnerability, and competing academic or career demands. Evidence suggests that young adults are less likely to attend regular health check-ups, less likely to monitor their blood pressure or glucose levels, and more likely to underestimate the long-term consequences of unhealthy behaviors[30]. Therefore, prevention strategies must align with their lifestyles and communication preferences. In summary, the results of this study highlight the urgent need for early detection, targeted public health interventions, and community-based educational programs aimed at reducing cardiometabolic risks among young adults. Early adulthood represents a pivotal opportunity to intervene before hypertension and diabetes become entrenched chronic conditions. By understanding and addressing modifiable risk factors such as BMI, physical inactivity, and dietary behaviors—especially in individuals with a positive family history—public health systems can mitigate the long-term burden of chronic diseases and support healthier population trajectories.

CONCLUSION:

This study highlights that hypertension and diabetes are emerging as significant health issues among young adults aged 18–35 years, with notable prevalence levels indicating early cardiometabolic vulnerability. The increasing systolic blood pressure trends, variability in diastolic pressure, and mildly skewed glucose levels reflect early metabolic instability. Elevated BMI, family history, and physical inactivity were identified as strong independent predictors for both conditions. These findings emphasize the combined impact of lifestyle changes and genetic predisposition in accelerating early-onset metabolic disease. The results underscore the urgent need for timely preventive strategies, including early screening and lifestyle-focused interventions. Strengthening public health education and integrating risk-reduction programs into community and primary care settings are essential to prevent long-term complications in this young population.

RECOMMENDATIONS:

1. Initiate routine early screening for blood pressure, fasting glucose, and BMI in young adults.
2. Promote structured lifestyle modification programs emphasizing regular physical activity.
3. Implement nutrition education campaigns to reduce unhealthy dietary habits.
4. Provide individualized counseling for those with high BMI, family history, or early metabolic changes.
5. Integrate cardiovascular and metabolic health modules in schools, colleges, and workplaces.
6. Advocate for healthier community environments with improved access to recreational spaces.
7. Conduct longitudinal studies to monitor progression from preclinical to established diseases.

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CONFLICT OF INTEREST:

The authors declare no conflict of interest and confirm that the study was conducted independently without external influence or fundings.

ETHICAL APPROVAL:

Ethical approval was granted by the Institutional Review Board (IRB), and written informed consent was obtained from all participants. Confidentiality was maintained, and participants retained the right to withdraw at any stage.

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