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Original Research Article

Prevalence and Determinants of Hypertension in Adults Aged 20-40: A Cross-Sectional Study from Urban Gujarat

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Abstract:

Background: Urbanization, lifestyle, and stress have led to an increase in hypertension, a risk factor for cardiovascular disease, among young adults. The determinants analysis and prevalence of hypertension among adults aged 20–40 years in urban Gujarat is as follows.

Objective: To assess the prevalence and risk factors of hypertension among adults aged 20–40 years in urban Gujarat to enable early intervention and prevention.

Methods: Cross-sectional study was conducted among 440 participants of urban field practice area. Information was collected by semi-structured questionnaire, anthropometric parameters, and blood pressure. JNC 8 guidelines were applied for categorization of the hypertension status, and statistical analysis was employed to determine the relationship between sociodemographic parameters and hypertension.

Results: Prevalence of Stage 1 and Stage 2 hypertension was 17.9%, and another 51.6% was pre-hypertensive. The significant risk factors were advancing age (30–40 years: OR = 2.5, 95% CI: 1.66 - 4.25), chewing of tobacco (OR = 4.7, 95% CI: 2.62 - 7.59), stress (OR = 3.1, 95% CI: 1.77 - 4.91), and obesity (OR = 3.5, 95% CI: 1.49 - 7.11). The family history of hypertension was highly significant ($P < 0.001$).

Conclusion: Pre-hypertension and hypertension are common in young urban adults, and this calls for early intervention and screening. Lifestyle modification, stress reduction, and public health education programs are required to avert the rising burden of hypertension and minimize long-term cardiovascular risk.

Keywords: Hypertension, Lifestyle, Prevalence, Risk Factors, Urban Population, Young Adults.

Introduction

Hypertension, also known as "the silent killer," is a serious global health concern, particularly in urban areas. It is the most common cardiovascular disorder and a major risk factor for cardiovascular mortality, accounting for 20% to 50% of all fatalities globally. The illness is classed as a noncommunicable disease (NCD), which indicates that it is primarily caused by lifestyle, genetics, and environmental factors [1]. Hypertension is becoming a major health burden in developing countries, especially India, exacerbating the problems already caused by infectious diseases. The increased urbanization, sedentary lifestyles, and dietary changes witnessed in these countries all contribute to this growing health problem [2].

Hypertension is recognized to elevate the risk of several cardiovascular disorders, such as coronary artery disease, congestive heart failure, and cerebrovascular disease. Studies demonstrate that individuals with hypertension are twice as susceptible to coronary artery disease, four times more prone to congestive heart failure, and seven times more likely to experience cerebrovascular illness than those with normal blood pressure [3]. Furthermore, hypertension is the fourth principal cause of premature mortality in poor countries and the seventh in affluent nations. Hypertension constitutes a significant public health concern that necessitates attention, particularly in light of an aging global population and rising life expectancy. Consequently, hypertension becomes a significant public health challenge in the 21st century, necessitating improved prevention, early identification, and management techniques [4].

Hypertension is an escalating issue in India, with varying prevalence rates between urban and rural populations. Research indicates that the prevalence of hypertension among Indian men varies from 3% to 34.5%, and in women it ranges from 5.8% to 33.5%. The urban populace exhibits a greater incidence of hypertension, with research indicating rates as high as 25%, in contrast to 10% in rural regions. This gap is probably attributable to various reasons, such as lifestyle modifications, elevated salt

consumption, improved longevity, enhanced awareness of the condition, and stress related to contemporary living. The rising incidence of hypertension in urban regions illustrates the overarching worldwide trend of hypertension becoming more prevalent in middle- and high-income nations [5].

The increase in hypertension in younger populations, especially individuals aged 20–40 years, is a growing concern. Young adults have traditionally been considered at a low risk for developing hypertension, as it is primarily viewed as a condition affecting older populations. Recent trends indicate a rising prevalence of hypertension among younger individuals, especially in urban environments characterized by elevated stress levels, poor dietary habits, and sedentary lifestyles [6]. Although there is increasing awareness of hypertension among younger populations, the majority of research remains concentrated on older adults and the elderly, resulting in a lack of understanding concerning the prevalence and risk factors within the younger demographic.

The insufficient screening and awareness regarding hypertension among young adults complicate the management and control of the disease in this demographic. Research indicates that blood pressure readings obtained during youth can accurately forecast the development of hypertension in later adulthood [7]. The prompt identification and management of hypertension in individuals aged 20–40 years are essential for preventing long-term complications such as stroke, myocardial infarction, and heart failure. The necessity for screening and public health interventions targeting young adults is increasingly critical [8].

The increasing prevalence of non-communicable diseases, including hypertension, in low- and middle-income countries necessitates immediate focus. Despite advancements in healthcare infrastructure and medical technology, the increasing prevalence of lifestyle-related diseases continues to pose a significant challenge [9]. Urbanization and shifts in socioeconomic conditions have resulted in more sedentary lifestyles, poor dietary habits, and heightened stress levels, suggesting that hypertension will increasingly impact a larger portion of the young adult population. This highlights the significance of early intervention, effective monitoring, and preventive strategies to manage hypertension and reduce its long-term effects [10].

This research examines the prevalence and factors influencing hypertension in adults aged 20 to 40 years in urban Gujarat. This study aims to assess the prevalence of hypertension in this demographic, identify associated risk factors, and present data to guide public health strategies for prevention and early intervention. This study's findings aim to enhance the understanding of hypertension in young adults and inform future policies and healthcare strategies in urban environments.

Methodology

Study Design: This study was designed as a cross-sectional analysis, focused on evaluating health parameters and lifestyle factors within a specific population. The data collection involved structured interviews, questionnaires, and measurements conducted at a single point in time, facilitating the determination of the prevalence of specific health conditions within the chosen population.

Study Area: The investigation was carried out in the urban field practice area of a medical college. This location was chosen due to its ease of access for the intended demographic, specifically individuals aged 20 to 40 years. The region presented a varied socio-economic landscape, rendering it suitable for assessing health trends and risk factors.

Study Duration: The investigation spanned for six months. The duration provided an ample opportunity for data gathering, guaranteeing that the sample accurately reflected the population in the region.

Sample Size: The sample size was determined using the formula:

$$N = \frac{4PQ}{L^2}$$

Where:

- P = prevalence of the factor (20.8%) based on a previous study.
- Q = 100 - P = 79.2%.
- L = allowable error (20% of P, i.e., 20% of 20.8% = 4.16).

Substituting these values into the formula:

$$N = \frac{4 \times 20.8 \times 79.2}{(4.16)^2} = 380$$

In order to compensate for non-responses or missing data, the last sample size was set at 437 considering the loss of data at 15%. As such, the survey included a total of 440 participants to ensure sufficient statistical power."

Inclusion Criteria:

- Individuals aged between 20 and 40 years.
- Residents of the urban field practice area for at least six months.
- Individuals who consented to participate in the study.

Exclusion Criteria:

- Pregnant women.
- Individuals with congenital cardiac disorders.

- Seriously ill patients who could not participate in the study due to their health condition.

Data Collection: Data was gathered utilizing a preformulated, pre-evaluated, semi-structured questionnaire. The survey concentrated on socio-demographic data, lifestyle factors, and individual health history. Furthermore, anthropometric measurements including weight, height, waist, and hip circumference were obtained in accordance with established protocols. Blood pressure was assessed utilizing a mercury sphygmomanometer and stethoscope, with three measurements recorded at intervals of 3–5 minutes to derive an average. Stress levels were evaluated utilizing Cohen's perceived stress scale.

Procedure: The research employed a systematic methodology to gather data from the urban field practice area. Households in the study area were assigned unique identifiers, and a systematic random sampling method was utilized to select participants. Every nth household was selected to guarantee that the sample accurately represented the overall population. Following the identification of eligible participants, informed consent was secured from each individual. The participants received a briefing on the study objectives, and their rights were clarified to ensure voluntary participation. The data collection process utilized a pre-designed, pre-tested, semi-structured questionnaire encompassing questions on socio-demographic variables, lifestyle habits, and personal health history. Anthropometric measurements, including weight, height, waist, and hip circumference, were documented following established protocols. Blood pressure was assessed utilizing a mercury sphygmomanometer and stethoscope, with three readings obtained at intervals of 3–5 minutes to determine the mean value. The Cohen's Perceived Stress Scale was employed to evaluate participants' stress levels. Measurements and data collection were performed by trained personnel to ensure accuracy and consistency in the study.

Statistical Analysis: The data collected underwent analysis through descriptive and inferential statistical methods. Descriptive statistics were employed to summarize the socio-demographic characteristics of participants and the primary health parameters. Frequency distributions, percentages, means, and standard deviations were computed for several variables, including age, gender, BMI, blood pressure, and stress levels. Inferential statistical tests, including chi-square tests for categorical variables and t-tests for continuous variables, were utilized to examine the relationships between socio-demographic factors and health outcomes. The prevalence of hypertension, obesity, and elevated stress levels was determined from the collected measurements, with a significance threshold established at $p < 0.05$ for all tests conducted. Statistical software was utilized for data analysis, facilitating a thorough assessment of the health parameters in the study population.

Result

Table 1 shows that among the 440 participants, only 134 individuals (30.4%) had normal blood pressure, while a majority of 227 individuals (51.6%) were in the pre-hypertensive range. Additionally, 67 participants (15.2%) were classified as having Stage 1 hypertension, and 12 individuals (2.7%) were identified with Stage 2 hypertension, indicating that elevated blood pressure levels are quite common in this sample.

Table 1: Sample Distribution Using the JNC 8 Criteria

Blood Pressure Status	**n (%)**
Stage 2 HTN	12 (2.7)
Stage 1 HTN	67 (15.2)
Pre-HTN	227 (51.6)
Normal	134 (30.4)
Total	**440 (100)**

Table 2 highlights significant associations between sociodemographic factors and hypertension. The prevalence of hypertension increased with age, with 32.0% of individuals aged 35-40 years being hypertensive, compared to only 4.3% in the 20-24 age group ($P < 0.001$). Tobacco chewing was strongly associated with hypertension, as 35.8% of users were hypertensive, compared to 13.7% of non-users ($P < 0.001$). Stress also played a key role, with 29.5% of stressed individuals having hypertension versus 11.7% of those without stress ($P < 0.001$). BMI showed a clear link, as 36.4% of obese participants were hypertensive, compared to only 4.3% of underweight individuals ($P = 0.0007$). Additionally, a family history of hypertension significantly increased the risk, with 27.8% of those with a family history being hypertensive, compared to 13.1% of those without ($P < 0.001$).

Table 2: Relationship between Sociodemographic Factors and Hypertension

Factor	Normotensive (n=361)	Hypertensive (n=79)	χ^2 (P)
Age			
35-40 years	85 (68.0%)	40 (32.0%)	44.92 (P < 0.001)
30-34 years	86 (81.1%)	14 (18.9%)	
25-29 years	78 (81.2%)	18 (18.8%)	
20-24 years	112 (95.7%)	5 (4.3%)	
Tobacco Chewing			
Present	43 (64.2%)	24 (35.8%)	18.59 (P < 0.001)
Absent	318 (86.3%)	50 (13.7%)	
Stress			
Stress	105 (70.5%)	44 (29.5%)	19.25 (P < 0.001)
No stress	256 (88.3%)	34 (11.7%)	
BMI			
Obese	84 (63.6%)	33 (36.4%)	16.94 (P = 0.0007)
Overweight	83 (79.0%)	22 (21.0%)	
Normal	150 (87.2%)	22 (12.8%)	
Underweight	44 (95.7%)	2 (4.3%)	
Family History of HTN			
Present	101 (72.2%)	40 (27.8%)	16.71 (P < 0.001)
Absent	260 (86.9%)	39 (13.1%)	

"Table 3 presents the independent risk factors for hypertension using binary logistic regression. Age was a significant predictor, with individuals aged 30-40 years being 2.5 times more likely to develop hypertension compared to those aged 20-30 years (OR = 2.5, 95% CI: 1.66 - 4.25, P = 0.001). Tobacco chewing showed the strongest association, increasing the risk by 4.7 times compared to non-users (OR = 4.7, 95% CI: 2.62 - 7.59, P < 0.001). Stress was also a major contributor, with stressed individuals having a 3.1 times higher risk than those without stress (OR = 3.1, 95% CI: 1.77 - 4.91, P < 0.001). Obesity significantly raised the risk, with obese individuals being 3.5 times more likely to have hypertension than those with normal BMI (OR = 3.5, 95% CI: 1.49 - 7.11, P = 0.003). Overweight individuals had a marginally increased risk (OR = 1.6, 95% CI: 0.85 - 2.75, P = 0.05), while underweight status was not a significant factor (OR = 0.3, 95% CI: 0.065 - 1.29, P = 0.104). These findings confirm that age, tobacco use, stress, and obesity are strong independent predictors of hypertension in the studied population."

Table 3: Analysis of Independent Risk Factors for Hypertension Using Binary Logistic Regression

Risk Factors	Odds Ratio	95% CI	P-Values
Age			
30-40 years	2.5	1.66 - 4.25	0.001
20-30 years	1	-	-
Tobacco Chewing			
Present	4.7	2.62 - 7.59	<0.001
Absent	1	-	-
Stress			
Stress	3.1	1.77 - 4.91	<0.001
No stress	1	-	-
BMI			
Obese	3.5	1.49 - 7.11	0.003
Overweight	1.6	0.85 - 2.75	0.05
Normal	1	-	-
Underweight	0.3	0.065 - 1.29	0.104

Discussion

The sample distribution according to the JNC 8 criteria indicated that a substantial portion of the study population was classified as pre-hypertensive (51.6%), highlighting a considerable prevalence of individuals at risk for hypertension. Furthermore, 15.2% were categorized as having Stage 1 hypertension, whereas a lesser proportion (2.7%) was identified as having Stage 2 hypertension. Approximately 30.4% of the participants exhibited normal blood pressure levels. The findings indicate that early intervention strategies aimed at individuals in the pre-hypertensive stage may be

essential for preventing the advancement to more severe hypertension.

Vasan et al. (2001), [11] similarly found that individuals with high-normal blood pressure faced a significantly elevated risk of progressing to overt hypertension and experiencing cardiovascular events. Their research in a substantial cohort demonstrated that even slight increases in blood pressure can forecast negative outcomes, underscoring the importance of early detection and lifestyle changes as essential preventive strategies.

Additionally, Gu et al. (2002) [12] conducted a study on a large Chinese population and found a significant prevalence of elevated blood pressure, with many individuals categorized as prehypertensive. Their findings, akin to our research, reinforce the idea that prehypertension is prevalent and represents a significant target for intervention prior to the onset of more severe hypertension.

This study identified a significant correlation between sociodemographic factors and hypertension, underscoring its multifactorial characteristics. The prevalence of hypertension rises with age, with only 4.3% of individuals aged 20–24 classified as hypertensive, in contrast to 32.0% in the 35–40 age group. This trend illustrates the established influence of aging on vascular stiffness and endothelial function, as highlighted by Franklin et al. (1997) [13], who showed that age-related structural alterations in blood vessels significantly contribute to increased blood pressure.

Tobacco use was identified as a significant factor, with 35.8% of individuals who chewed tobacco exhibiting hypertension, compared to 13.7% among non-users. This finding is consistent with the research conducted by Panagiotakos et al. (2005) [14], which indicated that tobacco consumption is associated with increased blood pressure and heightened cardiovascular risk, highlighting the necessity for focused public health interventions to decrease tobacco use.

Stress significantly contributed to hypertension, with 29.5% of individuals experiencing stress classified as hypertensive, in contrast to 11.7% of those without stress. This aligns with the findings from the Whitehall II study (Chandola et al., 2008) [15], which emphasized that chronic stress could activate neuroendocrine responses leading to increased blood pressure. Previous studies have confirmed that elevated body mass index and positive family history are critical risk factors for hypertension, as evidenced by research from Zinner et al. (1971) [16].

The present study identified a significant correlation between elevated BMI levels and hypertension, revealing that 36.4% of obese individuals and 21.0% of overweight individuals were hypertensive, in contrast to only 4.3% of underweight participants who displayed high blood pressure. The findings align with prior studies that have consistently shown a positive correlation between increased adiposity and elevated blood pressure. HU et al. (2004) [17] conducted a systematic review that identified higher BMI as a significant predictor of hypertension, attributed to factors including insulin resistance and the activation of the renin-angiotensin-aldosterone system.

Hall et al. (2015) [18] examined the role of obesity in hypertension, highlighting neurohumoral and renal mechanisms such as increased sympathetic nervous system activity and modified renal sodium handling. Our finding that a positive family history nearly doubles the risk of hypertension, in addition to BMI, reinforces the genetic component of the disease. This observation is corroborated by Drazner (2011) [19], who documented that individuals with a familial predisposition exhibit a significantly elevated risk of developing hypertension. These studies emphasize the significance of addressing both modifiable factors, such as obesity, and non-modifiable factors, such as genetic predisposition, in the prevention and management of hypertension.

"The binary logistic regression analysis confirmed these associations by identifying independent risk factors for hypertension. Our study found that individuals aged 30–40 years had a 2.5-fold increased risk of hypertension relative to younger individuals. Previous research has reported similar findings; for instance, Franklin et al. (2013) [20] demonstrated that vascular changes related to aging significantly contribute to elevated blood pressure. Tobacco chewing has been identified as a significant predictor of hypertension, with an odds ratio of 4.7. This suggests that individuals who chew tobacco are nearly five times more likely to develop hypertension.

This finding is consistent with the research conducted by Panagiotakos et al. (2003), which also reported a strong association between tobacco use and elevated blood pressure. Stress similarly increased the risk by a factor of 3.1, corroborating findings from Akbaraly et al. (2009) [22], which emphasized that chronic stress induces neuroendocrine responses that progressively raise blood pressure. Obesity represents a considerable risk factor, with obese individuals exhibiting a 3.5-fold increased probability of developing hypertension. This observation is corroborated by studies conducted by Hall et al. (2015) [23] and Wang et al. (2007) [24], which demonstrated that increased adiposity contributes to hypertension via mechanisms such as insulin resistance and activation of the renin-angiotensin system. Overweight individuals demonstrated a modest

association (odds ratio of 1.6), aligning with epidemiological trends observed in other populations. Conversely, underweight individuals displayed a lower risk, a trend noted by Levy et al. (2000) [25], although this association lacked statistical significance. These findings highlight the complex factors contributing to hypertension and advocate for comprehensive prevention strategies that include lifestyle changes, stress management, and early screening in at-risk populations."

Conclusion

This study showed that a considerable proportion of young urban adults had raised blood pressure levels, with many falling into the pre-hypertensive category and a sizable number already in the hypertensive stage. Sociodemographic factors, such as increasing age, as well as lifestyle traits such as tobacco use, increased stress levels, and increased body mass index, were found to be substantially linked with hypertension. These findings underline the importance of early detection and intervention in this age group, as well as the necessity for public health policies that encourage healthy lifestyle changes and stress management to slow the course of hypertension and lower long-term cardiovascular risks.

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