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A Cross-Sectional Study of Hypertension and Associated Factors in Young MBBS Students at a Tertiary Care Institute.

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ABSTRACT

Hypertension among young adults, including MBBS students, is a growing concern due to its silent progression and link to cardiovascular disorders. Limited research exists on hypertension prevalence and risk factors specifically among young MBBS students in India. This study assesses the prevalence of hypertension and its associated factors at a tertiary care institute in Mumbai, India. A cross-sectional study was conducted among 250 MBBS students aged 18 to 24, fulfilling eligibility criteria from a medical college. Blood pressure was recorded after a 10-minute complete relaxation of students, using the standard auscultatory method, and categorized according to JNC-VII guidelines. Various associated factors were recorded in a case study form, and logistic regression analysis was conducted to assess their association with hypertension. The study revealed significant rates of pre-hypertension (32.4%) and hypertension (25.2%), with 22% classified as Stage I and 3.2% as Stage II hypertensive. Notably, 53.6% of hypertensive individuals were unaware of their condition. Risk factors included alcohol/tobacco use (34.4%), abdominal obesity (47.6%), family history (46.8%), and unhealthy lifestyle habits. Statistically significant correlations were found between pulse rate (p-value=0.012; OR=1.292), waist-to-hip ratio (p-value=0.019; OR=0.459), alcohol/tobacco consumption (p-value<0.0001; OR=1.376), fast-food intake (p-value=0.04; OR=1.192) and hypertension. This study highlights the high prevalence of pre-hypertension and hypertension among young MBBS students in Mumbai, India, emphasizing the importance of early detection for preventive strategies. Regular blood pressure monitoring is crucial to reduce long-term cardiovascular risks. Spreading awareness of hypertension is necessary to lessen the burden of hypertension in MBBS students.

Keywords: Hypertension, Blood Pressure, Young Adults, Medical Students, Risk Factors

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INTRODUCTION

Hypertension, or high blood pressure, presents a substantial worldwide health hazard associated with cardiovascular ailments, strokes, and additional health issues. Described as a silent killer by the World Health Organization (WHO) [1], clinically, hypertension is characterized by persistently elevated blood pressure levels above 140/90 mmHg. The American Heart Association (AHA) defines hypertension as persistently elevated blood pressure, with systolic readings of 130 mmHg or higher and/or diastolic readings of 80 mmHg or higher [2]. Hypertension ranks among the top non-communicable diseases, contributing to 5.1% of total deaths, and is a high-risk factor for 15% of cardiovascular deaths nationwide [3]. In India, the National Family Health Survey (NFHS-4) highlighted that 1 in 10 young adults suffers from hypertension, half of whom are unaware of their condition [4]. Cardiovascular deaths attributable to hypertension are responsible for one-fifth of all deaths in India [5]. This emphasizes the need for regular monitoring and early intervention to prevent cardiac disease, stroke, and renal damage.

India, with its diverse and youthful population, witnesses many MBBS students transitioning into demanding medical education environments. The elevated blood pressure observed among young MBBS students may be attributed to several factors, such as hectic academic schedules, insufficient sleep, study-related stress, and the competitive pressures inherent in medical education. Lifestyle factors such as obesity, dependence on fast food (which leads to high salt intake), and alcohol/smoking addiction further exacerbate the risk of hypertension in this population.

Undoubtedly, hypertension correlates directly with increased Body Mass Index (BMI). Previous studies among medical students have demonstrated that the prevalence of systolic and diastolic blood pressure rises with increasing BMI [6-8]. A recent study on medical students highlighted significant stress levels among medical students, showing notable changes in systolic arterial pressure and pulse rate due to examination stress. These changes were observed 3 days before the start of exams compared to 5 months before the examinations [9]. Additionally, obesity has been linked to hypertension in medical students [10, 11]. Smoking and other addictions are recognized as hypertension risk factors. Das P et al. reported a significantly higher prevalence of hypertension (58.6%) among smokers compared to non-smokers (5.3%), based on tobacco smoking history among undergraduate medical students [12].

Despite its importance, limited research specifically on hypertension among young MBBS students has been conducted. In India, studies on hypertension among MBBS/medical students have mainly been conducted in the Eastern (West Bengal, Odisha, Assam, Tripura), Southern (Karnataka, Andhra Pradesh), and Northern (Uttar Pradesh, Delhi) regions, with no such surveys in the Western States (Maharashtra, Gujarat). This cross-sectional study aims to fill this gap by comprehensively assessing the prevalence of hypertension among young MBBS students at a tertiary care institute in Mumbai, Maharashtra, India and raising awareness about hypertension in young adults.

Estimating the prevalence and risk factors of hypertension in young medical students is vital for early detection and intervention, potentially reducing its long-term impact and complications. Therefore, the primary objectives of this study were to identify these risk factors and epidemiological patterns to develop specialized cardiovascular health interventions. The knowledge gained from this study could influence broader research efforts and inspire comparable studies across the nation. With a global target to reduce hypertension prevalence by 25% by 2025 [13]. The secondary objectives of this study focused on assessing the prevalence of pre-hypertension and hypertension – stages I and II – among young MBBS students aged 18 to 24, investigating the relationship between hypertension and its associated risk factors in this population and deriving significant epidemiological conclusions from the gathered data. These findings could contribute to vital public health endeavors aimed at combating this epidemic.

METHODS

Study Design

This cross-sectional study was based on an epidemiological investigation among MBBS students at a medical college and tertiary care hospital in Western India's Mumbai city of Maharashtra. The Institutional Ethics Committee, registered under IEC Registration Nos.: CDSCO/ECR/1654/Inst/MH/2022

and NECRBHR/EC/NEW/INST/2021/2272, approved this study protocol. The approval number is – HBTMC/IEC/17-23/O/DT/093/24032023/2023.

Setting

Data collection was completed within 2 months, from May 16, 2023, to July 15, 2023. All investigations and procedures were performed in the Clinical Lab of the Department of Physiology at the medical college.

Participants

A comprehensive invitation message was carefully drafted, outlining the purpose, scope, and significance of the study. The message included details about the research, study objectives, eligibility criteria, the importance of participation, and the procedures involved. The research team collaborated with batch representatives of the 1st, 2nd, 3rd minor, and 3rd major MBBS batches to disseminate the invitation message through various channels, including WhatsApp groups, notice boards, and class announcements. All students who fulfilled the eligibility criteria were invited to voluntarily participate in this study with their written informed consent.

Using the universal sampling method, all students aged 18 to 24 years who were pursuing MBBS and met the eligibility criteria were included as the study population. A total of 250 students from across the medical college, who consented to participate with their written informed consent forms, were included in the study. The selection process aimed to ensure representation of young MBBS students from all academic batches and age groups, thus adequately representing the medical college's population.

To ensure a representative and balanced study report, minimize gender-related biases, and enhance the generalizability of the research findings, an approximately equal proportion of males and females were included in the total study size. Students suffering from any chronic systemic disorders of the pulmonary, renal, or endocrine systems, or having secondary causes of hypertension, were excluded. Additionally, students who did not fulfill the eligibility criteria or did not complete the informed consent and case study forms were also excluded from the study.

Variables

After explaining all the procedures and obtaining proper written informed consent for the study, students who wished to participate were included. Only after this step did the investigations and physical examinations begin. Students were advised to wear light clothing during the investigations. All participants were well-informed about having a sound sleep the previous night. Each participant was interviewed using a detailed case study form that had been designed before the commencement of data collection.

The case study form included general questions such as age, sex, height (in cm), weight (in kg), and BMI. The subject's height and weight were measured using a stadiometer and a standard weighing scale, respectively. BMI was calculated based on these measurements. According to WHO guidelines, BMI categories are defined as follows: Underweight, BMI less than 18.5; normal weight, BMI from 18.5 to 24.9; overweight, BMI from 25 to 29.9; and obesity, BMI greater than 30 [14].

Also, waist and hip circumferences were measured using measuring tape to calculate the Waist-to-Hip Ratio, which helps diagnose the presence or absence of obesity in the participant. Abdominal Obesity is defined as a waist-to-hip ratio of 0.90 or more in men and 0.85 or more in women. [15].

Basal Blood Pressure was measured using auscultatory method with a standard manual mercury sphygmomanometer (Diamond Co.). An adult cuff was applied to the left arm, and a stethoscope was used after the subject transitioned from a lying to a sitting position, remaining relaxed for 10 minutes. Three readings were taken for each participant at 3-minute intervals, and the average of these readings was considered the final BP reading. The appearance and disappearance of Korotkoff sounds were used for systolic (SBP) and diastolic blood pressure (DBP) measurements, respectively. Simultaneously, the Pulse Rate was also recorded in beats per min (bpm).

The auscultatory method was chosen for its high accuracy and reliability in clinical settings, allowing direct listening to arterial blood flow sounds to obtain precise systolic and diastolic readings. However, potential measurement biases could arise from improper cuff application, incorrect stethoscope placement, or human error in interpreting Korotkoff sounds [16]. To minimize these biases, all measurements were performed by trained personnel following standardized procedures.

Some other vital questions were asked regarding associated factors of young adult hypertension, including – awareness of young adult hypertension, chest pain or breathlessness in the last 5 years, palpitations at rest, and history of hypertension. If yes, any medications or treatment taken or not. In addition to these, questions related to students' lifestyle conditions were asked, such as consumption of tobacco, alcohol, or smoking, and frequency of intake of fast foods per week.

For categorizing students based on their average basal blood pressure values, the Joint National Committee (JNC-VII) classification of blood pressure was utilized. According to this classification, normal blood pressure is defined as a systolic blood pressure (SBP) of less than 120 mmHg and a diastolic blood pressure (DBP) of less than 80 mmHg. Pre-hypertension is categorized by an SBP of 120-139 mmHg or a DBP of 80-89 mmHg. Stage I hypertension includes an SBP of 140-159 mmHg or a DBP of 90-99 mmHg. Stage II hypertension is identified by an SBP of 160 mmHg or higher, or a DBP of 100 mmHg or higher [17].

Data Sources/Measurement

The data filled into the case study form by the students were tabulated in a Microsoft Excel sheet. Statistical analysis was performed using SPSS Software for Windows to determine significant and non-significant p-values.

Bias

To ensure the completeness and accuracy of the data, several measures were taken: (1) Before commencing data analysis, each case study form was reviewed to confirm that all required fields were completed by the students; (2) any incomplete forms were returned to the students for completion before being included in the dataset. Consequently, there were no missing data or values for any of the variables, ensuring a robust dataset for analysis.

Study Size

The study size was determined based on power calculations to ensure sufficient statistical power using universal sampling method where all eligible students who consented to participate were included. This approach was chosen to maximize the representation of the target population.

Quantitative Variables

Quantitative variables in this study included age, height, weight, BMI, waist-to-hip ratio, basal blood pressure (systolic and diastolic), and pulse rate. These variables were systematically measured and recorded for each participant. The analysis of these variables involved calculating their means, standard deviations, and distributions to identify any significant associations between blood pressure and these factors.

Statistical Methods

To develop a multivariate logistic regression model, variables that showed statistically significant associations in the univariate analysis (p-value < 0.05) were included. This model aimed to estimate the odds of hypertension while adjusting for potential confounders and covariates. Adjusted odds ratios (OR) and 95% confidence intervals (CIs) were calculated for each variable to interpret their impact on the likelihood of hypertension. Model fit was assessed using the Hosmer-Lemeshow test and the area under the receiver operating characteristic (ROC) curve to ensure robustness.

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RESULTS

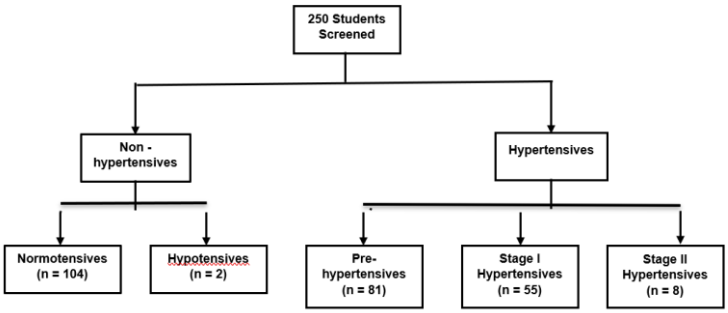
Demographics

A total of 250 students participated in the study. The sample consisted of 109 female participants (43.6%) and 141 male participants (56.4%). The mean age was 20.26±1.58 years for the study population, 20.31±1.63 years for men and 20.20±1.52 years for female students.

Prevalence of Hypertension

The key results of this research are demonstrated in a flow chart, as shown in Figure 1.

Figure 1: Flowchart illustrating the prevalence of hypertension among 250 young MBBS students.

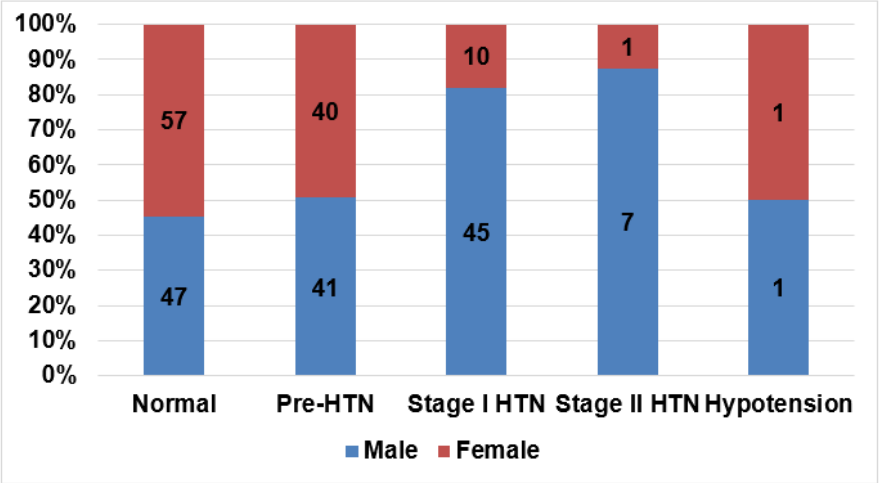


In this study, 41.6% (n = 104) of the participants had blood pressure levels within the normal range. Additionally, 32.4% (n = 81) of the sample fell into the pre-hypertensive category, suggesting slightly elevated blood pressure levels that require regular monitoring and some lifestyle modifications to prevent progression to stage I and stage II hypertension. Moreover, 22% (n = 55) of the sample were classified as stage I hypertensives, indicating moderately elevated blood pressure levels requiring further evaluation and management. A smaller subset of students, comprising 3.2% (n = 8) of the sample, exhibited stage II hypertension, characterized by significantly elevated blood pressure levels necessitating prompt medical intervention to reduce the associated risks.

Sex-wise Distribution of Average Blood Pressure

Among the 63 hypertensive students, 52 (82.5%) were males. The sex-wise distribution of average blood pressure is depicted in Figure 2.

Figure 2: Sex-wise distribution of Average Basal Blood Pressure.



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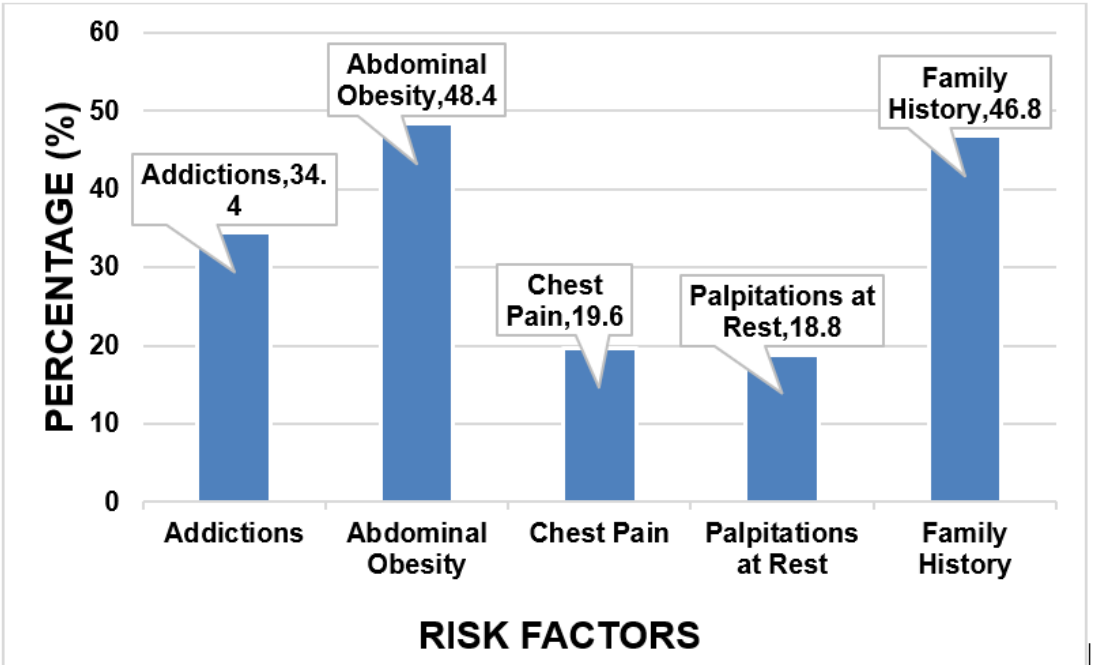
Association of Various Risk Factors with Hypertension

A significant correlation was found between hypertension and abdominal obesity, family history and addictions. Figure 3 illustrates that 34.4% of the sample reported the presence of alcohol, smoking, or both addictions, which are known to impact blood pressure directly as well as through indirect lifestyle factors such as stress or poor dietary choices. Nearly half of the participants (48.4%) exhibited abdominal obesity, a well-known risk factor for hypertension and cardiovascular disease, suggesting that excess abdominal fat may contribute to an increased likelihood of hypertension in this population. Furthermore, a notable percentage of participants (19.6%) reported experiencing chest pain, a symptom that may reflect underlying cardiovascular stress or compromised cardiac function associated with hypertension. In addition to chest pain, a considerable proportion of participants (18.8%) reported experiencing palpitations at rest, which can be an indicator of cardiovascular strain linked to high blood pressure. Almost half of the participants (46.8%) reported a family history of hypertension, which may increase their genetic predisposition to elevated blood pressure independently of other lifestyle factors.

Given the cross-sectional design of our study, these associations indicate patterns of directionality but cannot establish causation; it is not possible to determine whether these risk factors are causing hypertension or if individuals with hypertension are more likely to develop these conditions. Furthermore, potential confounding variables—such as dietary habits, physical activity levels, and stress—may influence the observed associations and should be considered when interpreting these findings. For example, individuals with poor dietary patterns or sedentary lifestyles may be more susceptible to both abdominal obesity and hypertension, while high stress levels could be associated with addiction behaviors and elevated blood pressure. Therefore, while our results highlight key associations between lifestyle factors, family history, and hypertension, further longitudinal research would be necessary to explore causative relationships.

Figure 3: Association of risk factors with hypertension.



Several statistically significant correlations between various variables (including pulse rate, waist-to-hip ratio, alcohol or smoking consumption, lack of awareness of young adult hypertension, and fast-food intake) and hypertension among young MBBS students were identified, as shown in Table 1.

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Table 1: Association between various variables and hypertension among young MBBS students (based on p-value, 95% CI and Odds Ratio).

Variables	p-value	95% Confidence Interval (CI)	Odds Ratio
Pulse Rate	0.012	0.661 to 2.524	1.292
Waist-to-Hip Ratio	0.019	0.256 to 0.825	0.459
Alcohol/Smoking Consumption	0.00	1.083 to 1.747	1.376
Lack of awareness of Young Adult HTN	0.046	0.731 to 2.107	1.241
Fast-food intake (per week)	0.004	0.729 to 1.936	1.192

Note: 95% Confidence Interval (CI) is calculated for continuous variables, and Odds Ratio is calculated for categorical variables. The calculation of Confidence Intervals provided a range within which the true population parameter is expected to fall with a 95% probability.

Clinically, even modest increase in pulse rate may signal heightened cardiovascular risk, suggesting that regular monitoring could be valuable for young adults. Lower waist-to-hip ratios appear protective against hypertension, indicating that reductions in central adiposity could benefit cardiovascular health in this population. The strong association between alcohol or smoking habits and hypertension further emphasizes the importance of targeting these modifiable lifestyle factors in early preventive interventions. Additionally, the higher prevalence of hypertension among students unaware of young adult hypertension highlights the need for education and awareness efforts to support early risk management. Furthermore, the impact of increased fast food intake in this population suggests that reduced consumption of fast foods could be beneficial in managing blood pressure and reducing hypertension risk.

The frequency of intake of fast foods per week varied among students. For better understanding, students were divided into five groups – 0 times/week, 1 to 2 times/week, 3 to 4 times/week, 5 to 6 times/week, and 7 times/week and above. Among those not consuming fast foods, 11 students were classified as pre-hypertensive, 9 as stage I hypertensive, and 2 as stage II hypertensive. In the group consuming fast food 1 to 2 times per week, 33 students were pre-hypertensive, 24 were stage I and 3 were stage II hypertensive. In those students who were consuming fast food 3 to 4 times per week, 19 were pre-hypertensive, 10 were stage I and 2 were stage II hypertensive. Among those consuming fast food 5 to 6 times per week, 7 were pre-hypertensive, 9 were stage I and 1 was stage II hypertensive. Finally, among those consuming fast food 7 times and above per week, 9 each fell into the pre-hypertension and stage I hypertension categories, with none in stage II hypertension. In our study, the association between hypertension and the frequency of fast food intake showed a p-value of 0.004.

DISCUSSION

A total of 250 young MBBS students who fulfilled the eligibility criteria were included in this study. It was observed that the prevalence of pre-hypertension was 32.4% and the prevalence of hypertension was 25.2%, of which 22% were classified as stage I hypertension and 3.2% as stage II hypertension. These results correlate with recent Indian studies across various states, which have depicted significant prevalence rates of pre-hypertension and hypertension among medical college students. Only a few recent studies have categorized hypertension into pre-hypertension (120-139/80-89 mmHg) and hypertension (≥140/90 mmHg). The comparison of these studies with the findings of this research is depicted in Table 2.

Similar prevalence rates of Pre-hypertension compared to the current study were reported by Reshi A et al. (33.30%) and Chitrapu RV et al. (37.40%). In contrast, older studies indicated a higher prevalence of Pre-hypertension than hypertension. For instance, Das P et al. reported 21% Pre-hypertension compared to 11% Stage I HTN and 2% Stage II HTN. Studies by Patnaik A et al., Bhattacharjya et al., and Kulkarni MM et al. highlighted significantly higher Pre-hypertension prevalence (around 64% to 68.3%) compared to hypertension prevalence (around 3% only). This contrast with the current study could be attributed to an increase in hypertension cases rather than pre-hypertension cases due to increased stress among students and changes in lifestyle habits. Nevertheless, Chitrapu RV et al. (37.40%) and Ranjan DP et al. (26.10%) showed similarities in the prevalence of pre-hypertension with the current study (32.40%).

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Table 2: Comparison of Prevalence Rates of Pre-Hypertension and Hypertension Among Young Adults and MBBS Students in India: Recent and Older Studies.

Study Name	Prevalence		
	Pre-HTN	HTN	Uncategorized HTN
Recent Studies			
Current Study	32.40%	25.2% (Stage I – 22%, Stage II – 3.2%); 36.8% Males, 0.1% Females	57.6% (32.4% Pre-HTN, 22% Stage I & 3.2% Stage II HTN); 36.8% Males, 0.1% Females
Karnataka Study (Reshi A et al.) [19]	33.30%	12.50%	-
Krishnamoorthy et al [4].	-	-	13.80%
Southern India Study (Prasad et al.) [18]	-	-	11.90%
Uttar Pradesh Study (Saxena S et al.) [20]	-	-	17.20%
Eastern India Study (Mukhopadhay et al.) [21]	-	-	21.20%
Uttar Pradesh (Marimuthu Y et al.) [22]	-	-	10.80%
Older Studies (2011-2017)			
West Bengal (Das P et al.) [12]	21%	11% (Stage I), 2% (Stage II)	-
Odisha Study (Patnaik A et al.) [23]	64%	3%	-
Assam Study (Bhattacharjya et al.) [24]	68.30%	-	-
Andhra Pradesh Study (Chitrapu RV et al.) [25]	37.40%	3.63%	-
Karnataka Study (Ranjan DP et al.) [26]	26.10%	-	-
Devangere Study (Kulkarni MM et al.) [27]	67%	3%	-

Legend: Pre-HTN: Pre-Hypertension, HTN: Hypertension, Stage I: Stage I Hypertension, Stage II: Stage II Hypertension, Uncategorized HTN: Hypertension not categorized into specific stages.

Recent studies have often not categorized hypertension into specific stages (Pre-HTN, Stage I and II). For instance, studies by Krishnamoorthy et al., Prasad et al., Saxena S et al., Mukhopadhyay et al., and Marimuthu Y et al. reported uncategorized HTN prevalences of 13.80%, 11.90%, 17.2%, 21.20%, and 10.80%, respectively. This trend is evident in Table 2, where the emphasis is on uncategorized HTN in recent studies compared to the more detailed categorization found in older studies.

In our study, 36.8% male students were hypertensive, while only 0.1% female students were hypertensive. This finding is similar to the study of Saxena S et al [20]. Male students may be more affected due to various reasons like smoking or alcohol addictions and the influence of testosterone hormone. Our study revealed that 53.6% (134) of young adult hypertensive individuals were unaware of their condition, which is similar to the previous study of Krishnamoorthy et al [4], where a significant portion of individuals were unaware of their hypertensive condition, highlighting the critical need for early detection and prevention strategies by healthcare professionals to reduce cardiovascular disease risks later in life.

The differences in pre-hypertension and hypertension prevalence among MBBS students in India stem from interconnected factors. Socioeconomic status influences access to healthcare and awareness. Dietary habits, with high salt, fat, and refined carbohydrate intake, pose greater risks. In our study, a notable association was observed between the frequency of fast-food consumption and the prevalence of hypertension, underscoring the role of dietary habits in contributing to elevated blood pressure levels.

Similarly, Rivera N et al. reported that higher intake of ultra-processed foods, particularly sugar-sweetened beverages and red and processed meats, was associated with an increased risk of developing hypertension in middle-aged adults [28]. Lifestyle factors like physical activity and stress vary between urban and rural areas. Differences could also arise from geographical region and living arrangements (hostel or home). Access to healthcare, cultural practices, genetic predispositions, environmental factors, and climate also play roles. Academic pressure and regional healthcare policies further impact these rates. Addressing these factors through tailored public health strategies is essential.

Family history is a well-established risk factor for hypertension, as shown in this study, with 46.8% of students reporting familial predisposition. Similar findings were reported by Esha Shrestha et al., where out of 200 students, 95 had a family history of hypertension, accounting for 47.5% of the total students [6]. Thus, this highlights the importance of early identification and screening for individuals with a familial history of hypertension to enable targeted preventive measures and early intervention strategies. Furthermore, older adults (over 30 or 40 years of age) found to be hypertensive should also alert their family members so that early detection and prevention can be incorporated on time.

Alcohol and tobacco use have long been recognized as modifiable risk factors for hypertension due to their effects on blood pressure regulation [29, 30]. The study revealed that 34.4% of students were addicted to alcohol, smoking, or both. This highlights the significance of various targeted interventions and de-addiction support programs to address these modifiable risk factors.

Among the hypertensive students in our study, 47.6% of students had abdominal obesity. It emphasizes the importance of promoting healthy weight management and reducing central adiposity among students. This finding correlates with previous studies, as shown in Table 3.

Table 3: Prevalence of Abdominal Obesity and BMI categories among medical students in different studies.

Study Name	Prevalence of Obesity	
Current Study	47.6%	
Khurram R et al [10].	39%	
	BMI Categories	
	Overweight	**Obese**
Current Study	20%	1.6%
Esha S et al [6].	22%	6%

Based on BMI, as shown in Table 3, it was found that 20% of students were overweight and 1.6% were obese. This study did not find a correlation between BMI and hypertension whereas, Bhattacharjya J et al. found a strong correlation between BMI and blood pressure [24]. This discrepancy could be due to the voluntary participation of students in this study, which may have affected the reporting of a strong correlation between BMI and hypertension. A report by Marimuthu Y et al. also showed that the BMI of medical students had increased to 31.7% from 11.3% in a time interval of 13 Years [22].

This study revealed the importance of regular blood pressure monitoring, starting from 18 years of age, when symptoms of hypertension may not be readily apparent. However, if MBBS students experience symptoms such as headache, chest pain, or palpitations, these are often attributed to study pressures, lack of sleep, or gastric distress, rather than being considered potential indicators of hypertension or pre-hypertension. Mok D et al. found 2.4 times higher prevalence of stage II hypertension in pre-clinical medical students compared to age matched other young students [31]. Regular blood pressure monitoring is crucial for this cohort (medical students).

Clinical Significance

The clinical significance of this study on hypertension and pre-hypertension among young MBBS students is multifaceted, with both immediate and long-term implications for individual health, clinical practice, and public health strategies. Identifying 32.4% pre-hypertension and 25.2% hypertension (with 22% stage I and 3.2% stage II hypertension) among students suggests that hypertension is a significant concern even in young, presumably healthy individuals. Early detection is crucial for initiating lifestyle modifications and medical interventions to prevent progression to more severe cardiovascular diseases.

The study identifies several modifiable risk factors among participants, such as alcohol and smoking use (34.4%) and abdominal obesity (47.6%). Addressing these through targeted interventions, such as lifestyle counselling and promoting healthy habits, can significantly reduce hypertension. With 46.8% of students reporting a family history of hypertension, early identification and preventive measures, including regular monitoring and lifestyle interventions, are crucial. Addressing hypertension within this group not only improves their health outcomes but also promotes the adoption of healthy behaviours they can advocate to their future patients. Incorporating stress management techniques, such as exercise, yoga, and meditation, into the medical curriculum can help students manage stress levels and reduce hypertension risk. The high prevalence of hypertension in a young, educated population indicates a need for broader public health strategies, including public awareness campaigns, school and college-based screening programs, and community health initiatives. These findings highlight the need for policy interventions to promote healthier lifestyles among young adults.

Limitations

This study has certain limitations. Firstly, the findings cannot be generalized beyond the specific population of young MBBS students at the studied tertiary care institute. In our study of 250 students, participation was voluntary, resulting in a sample population skewed towards individuals aged 19 to 21 years, thereby causing uneven demographic distribution. Its cross-sectional design restricts establishing causal relationships, offering only a snapshot of hypertension prevalence and associated factors at a specific point in time. As such, while associations are observed, the findings should be interpreted with caution, as causality cannot be inferred from this study. Consequently, it is impossible to determine the temporal sequence between exposure and outcome, and whether identified risk factors are causes or effects of hypertension remains undetermined.

Additionally, the etiology of hypertension was unknown. Lack of understanding about etiological factors makes it challenging to develop targeted interventions or preventive measures. Moreover, the study's participants were exclusively MBBS students, limiting representation of the broader young adult population. The findings were further influenced by unique characteristics of MBBS students, such as high academic stress, hectic schedules, and specific lifestyle habits inherent to medical students, which may not be representative of the general young adult population.

Furthermore, the study was conducted at a single tertiary care institute, which restricts external validity. The findings may not be applicable to students from different geographical locations, varied socio-economic backgrounds, or attending different types of educational institutions. The homogeneity of the study sample also limits generalizing the results to other settings and populations.

Additionally, the study lacked follow-up of students diagnosed as pre-hypertensive and hypertensive, thereby preventing examination of changes in hypertension prevalence and associated factors over their academic and professional journey. Moreover, the self-reported nature of certain data, such as lifestyle habits and awareness of hypertension, may have introduced response bias, potentially leading to inaccuracies in the data reported by participants.

Future Research

Considering one of the limitations of this study is its cross-sectional design, future research endeavors should prioritize longitudinal studies to understand the progression of hypertension and the effectiveness of interventions over time. Furthermore, investigating the broader applicability of these findings across diverse populations beyond medical students can guide the development of more generalized interventions.

CONCLUSION

This study of 250 MBBS students at a Mumbai tertiary care institute found high rates of pre-hypertension (32.4%) and hypertension (25.2%). The findings underscore the need to address modifiable risk factors, promote awareness, and implement early detection and intervention. These results impact clinical practice, public health policy, and research. Routine blood pressure screenings and targeted interventions for risk factors like alcohol, smoking, and obesity are crucial for mitigating hypertension among young adults in high-stress environments like medical colleges.

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