

## Hypertension among University Students: A Global and Regional Perspective Review

Priya Mahalakshmi J, Sona Valsaraj \*, Noufal K P and Sudheesh. M

*Mahe Institute of Dental Sciences and Hospital, Chalakkara, Mahe, Pondicherry, India.*

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### Abstract

High blood pressure is no longer a concern for older adults; it is now seen more often among college students. To highlight this growing issue, this review combines findings from Indian and global studies. A poor diet, lack of exercise, prolonged screen time, stress, poor sleep are major contributors. Alarming, even medical students have low awareness of the problem and its prevention methods.

Evidence shows that many young people remain undiagnosed and unsupported, especially in resource-limited countries. To address this, colleges should integrate regular screenings, health education, and stress management into students' lives. Early action can help prevent serious heart problems and reduce the long-term healthcare burden. This study aimed to emphasize these challenges and evaluate the nation's progress in addressing this critical health issue.

**Keywords:** Hypertension; Obesity; College Students; Stress

### 1. Introduction

High blood pressure, often referred to as the "silent killer," is becoming a major global health issue, as it is now appearing more frequently among younger people [1]. Globally, cardiovascular diseases (CVD) such as heart attacks and strokes, are the leading causes of death and illness. In India, they account for one-third of all fatalities, with uncontrolled blood pressure being a significant risk factor [2].

Hypertension is one of the most important health risks. It is well known to cause serious heart problems and premature death worldwide. What makes it even more concerning is that raised blood pressure often starts at a young age and can quietly progress into full hypertension if not noticed early. High blood pressure is no longer just an issue for older adults—it's increasingly showing up in younger people, especially university students. Busy academic schedules, stress, lifestyle changes, and low health awareness are some of the major reasons for this trend. Medical student, with their long study hours, academic stress, lack of exercise, and irregular eating habits, may also be at risk for this problem.

It may be quite harmful to have high blood pressure as a child. This raises the risk of heart problems later in life and places additional pressure on healthcare systems. The situation is worsened by the fact that many children are unaware of the risk factors or fail to take steps to lessen them. While hypertension is a growing problem globally, there is a significant lack of information regarding young adults' understanding of its risk factors [3]. Developing effective preventive health strategies for hypertension requires a clear understanding of the awareness levels within specific populations regarding its risk factors. [4]. This review combines the most recent information on the prevalence, etiology, and knowledge of hypertension among university students, with a focus on medical undergraduates and is intended to help improve wellness initiatives on campus and also public health campaigns

\*Corresponding author: Sona Valsaraj.

## 2. Methodology

This review was conducted to identify relevant epidemiological and clinical studies examining the prevalence and determinants of hypertension and pre-hypertension among college students. Articles were sourced through a comprehensive search on Google Scholar using keywords such as “hypertension”, “pre-hypertension”, “college students”, and “blood pressure risk factors.”

## 3. Discussion

Studies conducted across India have highlighted this growing issue. Research from different parts of India has shown how common pre-hypertension and hypertension are among medical students. BMI, waist-hip ratio, and truncal obesity are consistently linked to elevated blood pressure. A clear link between higher blood pressure and measures such as body mass index (BMI) and waist-hip ratio was shown in a study from Andhra Pradesh [1]. Logaraj et al. [5] and Lahole et al. [6] also emphasized these associations in Indian cohorts.

Excessive salt and junk food intake were found to be the significant contributors to elevated blood pressure. A study of medical students in Kolkata found that hypertension was significantly associated with lifestyle factors such as excess salt and junk food consumption and levels of physical activity [7]. Similarly, other researchers have highlighted the critical need for early health checks to detect pre-hypertension and implement preventive measures [8].

In South India, a significant correlation between obesity and hypertension was identified among undergraduate medical students [9], while similar patterns were found in pre-university students from Udupi Taluk, reinforcing the role of obesity in early onset hypertension [10], pointing to the impact of lifestyle choices. Another study from Udupi district reported a significant number of young adults aged 20–30 years to be pre-hypertensive, suggesting the early onset of cardiovascular risk [11].

A study from Kerala showed that the most widespread health risks, including hypertension, for students were a lack of exercise, eating junk food, and consuming too much salt [12]. A study from Odisha also pointed out that lifestyle-related behaviors were strongly linked to hypertension among medical students [13].

In a study from central Uttar Pradesh, students not only had a notable prevalence of hypertension but also lacked proper awareness of the condition [14]. More recent findings from Central India highlighted stress as a key contributor to pre-hypertension among university students. Chaurasia et al. [15] linked poor sleep and high stress levels to elevated BP, whereas Kale et al. [16] found that stress was directly associated with pre-hypertension.

BMI is considered a major predictor of hypertension, although the specific risks show gender variation, with obese women having higher odds of hypertension than men [17]. One of the research articles has strongly demonstrated that indices of abdominal obesity were significantly associated with hypertension [18]. Findings from Chennai also echo these concerns, showing that being overweight, obese, or having a family history of high blood pressure significantly raises the risk of pre-hypertension [5]. A two-year study among young medical students confirmed strong connections between body measurements and hypertension, highlighting the importance of promoting healthier habits and preventive care early in life [19].

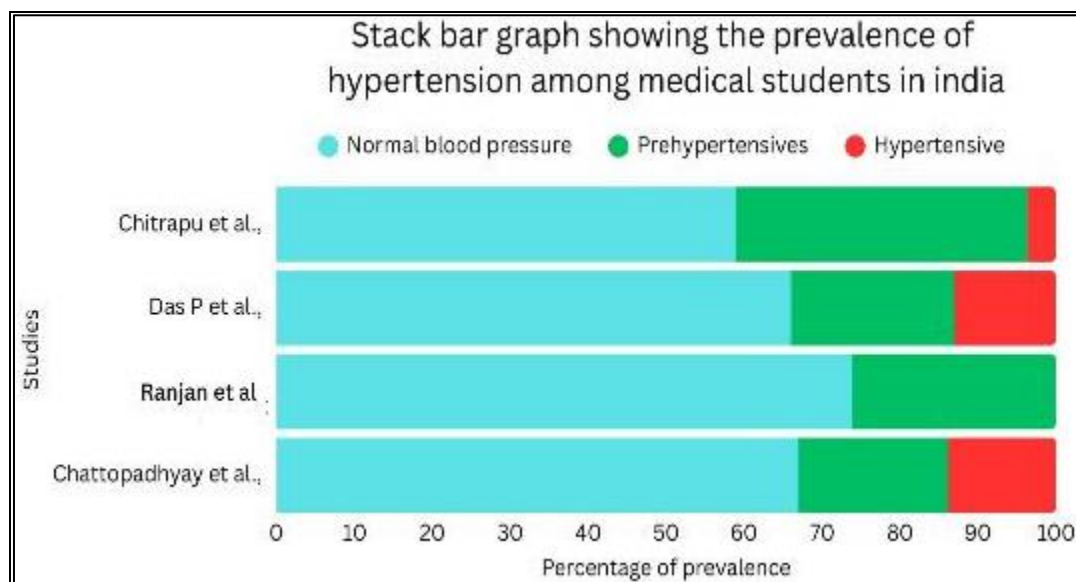
Similar trends are observed in other parts of the world, such as China, Africa, Southeast Asia [20, 21, 22, 23]. Somova et al. [21] investigated the impact of ethnicity on blood pressure in African students, while Jiang et al. [20] examined how daily activities and lifestyle changes could affect blood pressure in Chinese first-year college students.

Beyond individual studies, systematic reviews have reinforced the seriousness of this problem. A review of young adults identified common behavioral risk factors such as poor diet, inactivity, and stress, as major drivers of hypertension [24]. A study [25] confirmed a significant link between prehypertension, stress, and anxiety among university students. The study also concluded that this is an urgent issue requiring health programs to help students reduce their future risk of developing heart disease.

This trend is not unique to India; evidence from Vietnam also reported a significant prevalence of hypertension, reflecting the wider burden of the condition in low- and middle-income countries [26]. According to some studies, there are additional possible causes, such as exposure to particular environmental metals [27], in addition to lifestyle. In India, molecular studies have suggested that disruptions in metal ion metabolism may also play a role in the increasing prevalence of hypertension, adding a biological perspective to the problem [28].

In addition to this concern, Tripathy et al. [29] identified high rates of hypertension and pre-hypertension in Northern India. According to their study, a significant percentage of the population, particularly younger and otherwise healthy individuals, are either unaware that their blood pressure is high or are not receiving the treatment they require.

Experts have stressed that India must act quickly with effective prevention strategies, greater awareness, and improved access to treatment to reduce the long-term burden of hypertension [30]. Major trials and national health programs show that India still lacks programs for managing and controlling hypertension, even with increased awareness of the condition [31, 32, 33,34].



**Figure 1** Prevalence of hypertension in medical students shown by various studies

Not only is this a problem in India, but studies from Iran [35], Nigeria [36], Vietnam [37] and Portugal [38] have revealed the same trend among youth worldwide [39]. Research works not only from India but also from abroad paints a clear picture of the problem. Moussa et al. found that approximately 26.5% of Egyptian students had high blood pressure, often linked to stress, higher BMI, and family history [40]. Tadesse and Alemu highlighted similar concerns in Ethiopia [41]. These findings underscore that hypertension among students is a global issue, not confined to specific geographical locations.

This emphasizes the urgent need for action. Improved legislature, community health assessments, and education can go a long way in treating high blood pressure among Indian children. Despite current public health initiatives, hypertension remains a major health problem in the country and is a significant factor in the onset of cardiovascular diseases and stroke.

For years, experts sounded the alarm. To handle this growing problem, more than ten years ago, Mohan et al. proposed vigorous national programs and community engagement [42]. Although programs like the National Programme for Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) have been started, their efficacy differs across the country, highlighting the necessity for better preparation and increased supervision. Recently, Gupta et al. [43] looked into the situation and came to the conclusion that the same problems persist. They highlighted problems such as geographic differences, economic inequities, and insufficient access to preventive medical care. Research has demonstrated a positive association between hypertension and factors such as age, sex, economic status (per capita monthly income), and living situation (residence and type of family) [44].

**Table 1** Summary of the various studies mentioned in the article

S. No...	Author(s)	Study Objectives	Study Characteristics	Methodology	Results
1	Bhavani., et al. (2018)	To study pre-hypertension and its association with anthropometric indices	Undergraduate medical students in Andhra Pradesh, India	Cross-sectional study involving measurement of BP and anthropometric parameters	Found significant association between higher BMI and pre-hypertension among students.
2	Chattopadhyay ., et al. (2014)	To determine prevalence of hypertension and related risk factors	Undergraduate medical students in Kolkata	Cross-sectional survey with questionnaires and physical exams	Identified prevalence linked with sedentary lifestyle and dietary patterns.
3	Ranjan., et al. (2017)	To assess blood pressure, pre- and hypertension	Medical students from a university in India	Observational study with BP recordings	Reported notable prevalence of elevated blood pressure among students.
4	Logaraj., et al. (2016)	To find prevalence of pre-hypertension and its relation to CVD risk factors	Male undergraduate students in Chennai	Cross-sectional study with exams and questionnaires	High prevalence of pre-hypertension associated with obesity and stress.
5	Lahole., et al. (2022)	To explore anthropometric indices and hypertension	Young medical students	2-year cross-sectional study with measurements of BMI and BP	Positive correlation between BMI and hypertension.
6	Jiang., et al. (2021)	To assess prevalence and risk factors of hypertension	College freshmen across China	National survey with health check-ups and questionnaires	Increased hypertension prevalence linked to diet and inactivity.
7	Somova., et al. (1995)	Psychophysiological study of hypertension across races	Black, Indian, and White African students	Experimental study assessing stress and BP	Racial differences in hypertension patterns identified.
8	Zobo., et al. (2023)	Prevalence of hypertension and CVD risk factors	University students in Côte d'Ivoire	Cross-sectional survey with clinical exams	Poor diet and inactivity linked to high hypertension rates.
9	SantosoD., et al. (2013)	Prevalence of hypertension in school and college students	School and college students	Descriptive survey using BP measurements	Increased prevalence among adolescents and young adults.
10	Maral., et al. (2019)	Knowledge about hypertension risk factors	Young adult students	Questionnaire-based survey	Limited awareness on causes and prevention of hypertension.
11	Chenji, ., et al. (2018)	Analysis of obesity and high BP	Undergraduate students of a medical college in South India	Cross-sectional health parameter analysis	Obesity linked to high blood pressure.

12	Ismail, I.M., et al. (2016)	Prevalence of NCD risk factors	College students in Kerala	Structured interviews and clinical exams	Sedentary lifestyle and diet linked to hypertension.
13	Kini, S., et al. (2016)	Pre-hypertension among young adults	Adults aged 20–30 in coastal villages, Southern India	Community screening and surveys	High pre-hypertension rates found.
14	Patnaik., et al. (2015)	Risk factors associated with hypertension	Undergraduate medical students in Odisha	Analytical cross-sectional study	Lifestyle factors linked to elevated BP.
15	Saxena., et al. (2021)	Prevalence and knowledge of hypertension	Students of medical college in Uttar Pradesh	Structured questionnaire and BP checks	Moderate knowledge and significant prevalence observed.
16	Kale, P., et al. (2024)	Association of stress with prehypertension	University students in Central India	Cross-sectional study with stress inventories	Stress is a major contributor to prehypertension.
17	Parsekar., et al. (2015)	Association of obesity with high BP	Pre-university students in Udupi taluk	Observational study with anthropometric data	Obesity strongly associated with high BP.
18	Meher, M., et al. (2023)	Risk factors of hypertension in young adults	Young adults across India	Systematic review of existing studies	Identified lifestyle and genetic factors.
19	Meiqari., et al. (2019)	Prevalence of hypertension	Vietnam	Systematic review and meta-analysis	Urbanization linked to rising rates.
20	Singh., et al. (2016)	Molecular basis of hypertension	Focus on metal ions in India	Systematic review	Trace elements and genetics play a role
21	Mohan., et al. (2013)	Addressing hypertension in India	National population	Policy review and expert opinions	Advocated nationwide intervention strategies.
22	Pinto., et al.	Prevalence and risk factors	Global studies	Literature review compiling data	Diet, inactivity, and stress as key risk factors.
23	Mohammadi., et al. (2023)	Hypertension in Iran	Iranian population	Systematic review and meta-analysis	Lifestyle and aging linked to rising prevalence.
24	Song., et al. (2019)	Global prevalence in children	Children worldwide	Systematic review and meta-analysis	Urged early prevention.
25	Gupta., et al. (2024)	Recent studies on hypertension in India	Indian population	Review article	Rising prevalence and poor control rates.
26	Akinlua., et al. (2015)	Hypertension in Nigeria	Nigerian population	Systematic review	Urbanization and diet linked to rising rates.
27	Ramakrishnan., et al.	Hypertension control in India	National data	Campaign data collection	Low awareness and control rates observed.

28	Midha., et al. (2013)	Prevalence in India	Regional studies	Meta-analysis	Increasing trend in both rural and urban areas.
29	Kumar., et al. (2023)	Control status of hypertension	India-wide data	Meta-analysis	Poor control despite treatment access.
30	Koya., et al. (2024)	Control rate analysis	India	Meta-analysis	Modest improvements but insufficient nationwide control.
31	Tripathy., et al. (2017)	Prevalence of hypertension in North India	Adults across North India	Large cross-sectional STEPS survey	Alarming high rates reported.
32	Moussa., et al. (2016)	Comparative study of hypertension	University students	Comparative survey and clinical exams	Lifestyle-related risk factors observed.
33	Tadesse., et al. (2014)	Associated factors in Ethiopia	University students	Cross-sectional survey	Stress, diet, inactivity linked to hypertension.
34	Chaurasia., et al. (2024)	Sleep, stress, and BP trends	College students	Cross-sectional study with surveys and BP checks	Poor sleep and stress associated with increased BP.
35	Chowdhury., et al. (2020)	Trends in Bangladesh	Bangladesh population	Systematic review and meta-analysis	Urbanization and diet changes are linked to rise in blood pressure.
36	Mirzaei., et al. (2016)	Hypertension trends in Iran	Iranian population (1980–2012)	Systematic review	Aging and lifestyle changes increased prevalence.

#### 4. Conclusion

University students everywhere are now experiencing high blood pressure as a genuine problem, not just older adults. Research conducted in India and across the globe demonstrates that youngsters are becoming more susceptible to hypertension as a result of poor eating habits, insufficient physical activity, academic pressure, and inadequate sleep. Even more alarming is the fact that many pupils, including those in medical school, lack a thorough understanding of the risks involved and how to protect themselves.

This review clearly indicates that immediate action is required. Regular health check-ups, awareness campaigns, and stress relief activities must be incorporated into students' lives through collaboration among policymakers, healthcare practitioners, and colleges. Furthermore, it is critical to ensure that these services are easily accessible, particularly for students in areas where there are few healthcare alternatives.

Assisting children in controlling their blood pressure is a commitment to their future. We can help them prevent future major health problems by teaching them how to make better choices, providing them support, and identifying issues early on. Students may feel more confident in taking care of their health and developing behaviors that will benefit them throughout their lives if given the appropriate help and attention.

Taken together these studies highlight the difficulties in India's battle against high blood pressure and the necessity to prioritize better screening, education, and continued therapy. India needs better blood pressure monitoring and treatment systems, more successful health education, and legislation that lower the cost of healthcare.

The consistent findings across diverse populations call for the following:

- Routine Screening: Early detection through campus health programs.

- Lifestyle interventions: Promotion of physical activity, balanced diets, and stress management.
- Health Education: Enhancing awareness of risk factors and prevention strategies.
- Policy Action: National strategies targeting youth with tailored preventive measures.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

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