Original Article

A Study on Prevalence of Hypertension and Its Associated Risk Factors Among School Going Adolescents of Banda District

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Abstract

Context: Hypertension is increasingly recognized as a major health concern affecting adolescents, with its prevalence in India ranging from 1% to 24%. This condition, commonly linked to obesity, serves as a key risk factor for cardiovascular diseases, which remain the leading cause of deaths globally.

Aims: This study aimed to assess the prevalence of hypertension and identify associated risk factors among school-going adolescents in Banda district, Uttar Pradesh.

Settings and Design: A cross-sectional study design was used, involving 384 adolescents aged 13–18 years from rural and urban schools.

Methods and Material: Data collection included a semi-structured questionnaire, and statistical analysis explored the relationships between dietary habits, physical activity, sleep duration, and blood pressure categories.

Statistical analysis used: The data collected were entered in a Micro-Soft Excel worksheet, and then data were transferred to Statistical Package for Social Science (SPSS) software used to analyse the data.

Results: The study revealed that 74.48% of participants had normal blood pressure, while 13.28% were prehypertensive and 12.24% hypertensive. Socioeconomic status showed a significant association with hypertension, while family type did not. Daily breakfast consumption and regular intake of green leafy vegetables were linked to lower hypertension rates, while frequent soft drink intake increased risk.

Conclusions: This study highlights the importance of modifiable lifestyle factors in managing adolescent hypertension, emphasizing dietary habits and physical activity as protective measures.

Key-words: Obesity, Hypertension, Adolescents.

Key Messages: Modifiable lifestyle factors, such as balanced nutrition and regular physical activity, play a crucial role in preventing adolescent hypertension.

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Introduction

As the prevalence of hypertension is pursue to leap up, it has emerged as a significant health issue affecting not only adults but also children and adolescents.[1,2] Several studies in India have identified that the prevalence of hypertension among adolescents ranges from 1% to 24%, with this percentage increasing to 26% among obese adolescents.[3,4] Obesity often leads to high blood pressure, which is a major risk factor for heart diseases. These cardiovascular diseases are, in fact, the leading cause of deaths worldwide. Simply put, obesity doesn't just stop at weight issues—it triggers a chain reaction, starting with high BP and leading to more severe heart-related problems.[5] Identifying cardiovascular risk factors like hypertension and obesity early on is crucial for public health. By catching these conditions early, we can take steps to stop the serious impacts of heart conditions later in life or grave outcomes of cardiac disorders in adulthood. This proactive approach not only helps individuals maintain a healthier lifestyle but also alleviates the broader socio-economic burden associated with heart-related illnesses. Prioritizing early detection and intervention empowers us to create a healthier future for everyone.[6] High blood pressure (BP) and obesity among adolescents, along with their associated health issues such as dyslipidemia, abnormal plasma glucose levels, and metabolic disorders, have seen a significant increase over the past two decades globally due to rapid socioeconomic, nutritional and epidemiological transitions. Early detection of these cardiovascular risk factors is crucial for public health as it can potentially prevent adverse cardiovascular events in adulthood.[7]

Need for the study: There is limited data on the prevalence of hypertension among school-going adolescents, particularly in rural areas like Banda district. Most existing research focuses on adults, neglecting the early identification of risk factors in younger populations. Region-specific studies linking lifestyle, dietary habits, and socio-demographic factors to adolescent hypertension are lacking. Awareness about hypertension in adolescents remains low among students, parents, and school staff. School-based screening programs are insufficient, leading to underdiagnosis of pre-hypertensive and hypertensive cases. Early detection is crucial to prevent long-term complications, yet research in underdeveloped regions is scarce. Cultural and environmental factors unique to Banda may influence adolescent health behaviours and require localized investigation. This study is essential to inform local health policies and design effective school-based interventions for cardiovascular risk reduction among adolescents.

Aim: A study on prevalence of hypertension and its associated risk factors among school going adolescents of Banda district

Objective

To estimate the prevalence of hypertension in adolescents.

To determine the Risk factors associated with hypertension in adolescents.

Material and methods

Study Type and Study Design This was a community-based, cross-sectional study conducted in Banda district, Uttar Pradesh.

Study Duration The study was carried out from January 2025 to March 2025.

Study Population and Setting The study focused on school-going adolescents aged 13–18 years from rural and urban schools to ensure diverse representation. Banda district consists of eight towns and eight community development blocks.

Sample Size Calculation The sample size was calculated based on the prevalence of hypertension (7.2%). Using the formula: [n = \frac{{Z^2pq}} {{d^2}}] where p = 7.2%, q = 92.8%, d = 3% (absolute precision), and Z = 1.96 (for 95% confidence interval), the sample size was estimated to be 285. To enhance the robustness of the analysis, 384 participants were included, with 192 from rural schools and 192 from urban schools.

Sampling Technique: From a list of 185 schools provided by the Basic Shiksha Adhikari, one public and one private school were randomly selected from both urban and rural areas, totaling four schools. Systematic random sampling with probability proportional to size was used to select students from classes 9 to 12. A total of 96 students were selected from each school,

maintaining a ratio of 2 boys to 1 girl (16 boys and 8 girls per class). If the required sample size was not met in a school, another school was randomly selected to meet the quota. Adolescents (aged 13-18 years) with SBP and DBP levels lower than 90th percentile were considered normotensive, and subjects with BP level of 120/80 mm Hg or above, or average systolic blood pressure (SBP) or diastolic blood pressure (DBP) levels greater than equal to 90th percentile, but less than the 95th percentile, were classified as pre hypertensive. Study participants were classified as hypertensive if their SBP or DBP or both were equal to or more than the 95th percentile for age, sex, and height. Those adolescent whose BP was on higher side were followed up after 2 weeks and if the BP remains high after following then they were Counselled and then referred to physician for proper management.

Data Collection: Participants were informed about the study's purpose, and informed consent was obtained from both students and guardians. Data was collected using a semi-structured questionnaire focusing on health indicators, including hypertension.

Ethical Approval: Ethical clearance was obtained from the Institutional Ethics Committee of RDMC, Banda (IEC/RDMC/Cert/16; Date: 24/08/2023).

Results

Most individuals are categorized as normal (74.48%), while 13.28% are pre-hypertensive, and 12.24% are hypertensive. This highlights a predominance of normal blood pressure levels within the population.

Figure 1: **Prevalence of Blood Pressure Categories in the study Population**

In our study Hypertension is significantly associated with socioeconomic status (p=0.0071), with higher rates in lower classes. Nuclear families showed higher prevalence (14.24%) compared to joint (8.47%) and third-generation families (0%), though family type association isn't statistically significant (p=0.244).

Table 1: Dietary and Lifestyle Patterns in Relation to Hypertension Status

Table 1-The study found significant dietary and lifestyle patterns associated with hypertension among adolescents. Adolescents who ate breakfast daily had the lowest prevalence of hypertension (6.41%) compared to those eating breakfast fewer than three days a week, where hypertension prevalence was higher at 17.30%. This association was statistically significant with a p-value of 0.013. Participants consuming 2–3 meals per day showed a hypertension prevalence of 12.75%, while those consuming fewer than two meals per day had a prevalence of 40%, though this association was not statistically significant (p-value = 0.08). Regular consumption of green leafy vegetables was inversely associated with hypertension. Adolescents consuming vegetables 1–2 days per week had a hypertension prevalence of 12.76%, whereas those who never consumed them had a higher prevalence of 26.19%. This association was statistically significant with a p-value of 0.028. Adolescents who never consumed soft drinks had the lowest prevalence of hypertension (6.38%), while those consuming soft drinks 1–3 days per week showed a prevalence of 16.43%. This association was also statistically significant, with a p-value of 0.019.

Table 2: Physical Activity and Sleep Patterns in Relation to Hypertension Status

Table 2- explores the relationship between physical activity, sleep duration, and blood pressure categories (Non-Hypertensive, Hypertensive, Normal, and Prehypertensive). The analysis uses chi-squared tests to evaluate statistical significance. Physical activity is categorized by the frequency of engagement (60 minutes per day). Participants who engage in physical activity 4-6 days per week show the lowest rates of hypertension and prehypertension, with 86.54% being non-hypertensive. Those who never exercise or exercise only 1-3 days per week show higher rates of hypertension and prehypertension. This variable is statistically significant, with a p-value of 0.04, $X^2 = 6.40$, and df = 2, indicating that regular physical activity may help prevent hypertension. Sleep duration is assessed across three categories: less than 6 hours, 6-8 hours, and more than 8 hours per day. Participants sleeping 6-8 hours per day form the majority and exhibit a relatively balanced distribution across the blood pressure categories. Those sleeping fewer than 6 hours or more than 8 hours show slightly higher rates of hypertension. However, this variable does not reach statistical significance, with a p-value

of 0.08, $X^2 = 4.83$, and df = 2. The findings emphasize the role of regular physical activity in reducing hypertension risk and suggest a potential, though not statistically significant, link between optimal sleep duration (6-8 hours) and healthy blood pressure levels. These insights can be integrated into health promotion strategies for managing and preventing hypertension.

Discussion

Our study found that 12.24% of adolescents have moderate hypertension, which is higher than the 7.2% reported by **Satapathy Manjita Minarva et al. (2025)[8]** but lower than the 18.9% found by **M V Sumna et al. (2023)[9]**. These differences show how blood pressure levels vary across regions and between urban and rural areas. Pre-hypertension levels in this study (13.28%) are also higher than **Satapathy et al.'s findings (5.3%),** suggesting that factors specific to different populations affect blood pressure trends.our study's findings regarding the significant association between green leafy vegetable consumption and hypertension prevalence are consistent with existing research, including the studies by **Fadnis P. Vidya et al. (2020)[10]** and **Bagudai Satyajit et al. (2014)[11].** These studies collectively highlight the importance of incorporating green leafy vegetables into the diet as a potential strategy for hypertension prevention and management. Our study found notable association between physical activity and hypertension, with individuals active 1-3 days per week experiencing higher hypertension rates (15.49%) compared to those active 4-6 days per week (3.85%). This observation aligns with findings from a study by **Kumar et al. (2020)[12]** which analyze a notable "relationship" between "screen time" and physical activity among middle school children in Tamil Nadu, India. However, the association between physical activity and hypertension in our study contrasts with general health guidelines that typically associate regular physical activity with reduced hypertension risk. In examining these results in the context of existing literature, the study by **Satapathy Manjita Minarva et al. (2025)[8]** he study "sheds light on the effects of consuming soft drinks" on "health and behaviour." It reveals that "frequent consumption of carbonated soft drinks" is linked to "various health risk behaviours." These findings underscore the importance of "reducing soft drink intake" to promote "better health outcomes" and encourage "healthier lifestyle choices." including increased energy intake, which can lead to weight gain and obesity. This aligns with our observation that frequent consumption of carbonated soft drinks is linked to higher hypertension rates.

Conclusion

This study highlights the influence of dietary habits, physical activity, and sleep duration on adolescent blood pressure levels. Regular breakfast consumption and increased intake of green leafy vegetables were associated with lower rates of hypertension and prehypertension, while limited consumption of soft drinks further showed protective benefits. Consistent physical activity contributed significantly to better blood pressure regulation, with adolescents exercising 4–6 days per week having the lowest hypertension prevalence. Although sleep duration demonstrated a minor relationship, maintaining an optimal range could support cardiovascular health.

Limitations: This study was limited by its cross-sectional design, which prevents establishing causal relationships. The sample was restricted to school-going adolescents, excluding out-of-school youth who may have different risk profiles. Self-reported dietary and physical activity data may be subject to recall bias. Additionally, regional factors specific to Banda district may limit the generalizability of findings to other areas.

Recommendation

The study emphasizes the importance of modifiable lifestyle factors in managing hypertension among adolescents. Daily breakfast consumption and regular intake of green leafy vegetables were associated with lower rates of hypertension and prehypertension, while limiting the consumption of carbonated soft drinks could provide additional benefits. Consistent physical activity, particularly 4-6 days a week, significantly reduced the prevalence of elevated blood pressure levels, underscoring its protective effect against hypertension. Addressing socioeconomic disparities and promoting healthy lifestyle choices could play a crucial role in reducing hypertension risk in this age group.

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Conflicts of interest: There are no conflicts of interest

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