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Original Research Article

Cross-sectional observational study of occurrence and correlation of the risk-factors of hypertension among medical students in Ahmedabad, Gujarat

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ABSTRACT

Background: The aim of this study was to determine the occurrence of hypertension in students of a medical college associated with a tertiary care teaching hospital and identify the risk factors in this group.
Methods: Participants answered a structured questionnaire and underwent a physical screening. Automated (Omron HEM-7121J) sphygmomanometers were used to measure blood pressures. Standardised digital weighing scales were used to measure weight. Standardised stadiometers were used to measure height. Hypertension grades were defined under the European Society of Cardiology (ESC)/European Society of Hypertension (ESH) 2023 guidelines. Appropriate statistical analysis was performed to test the correlation and significance of the risk factors of hypertension.
Results: The sample of this study comprised of 247 students out of which 52.6% were females and 47.4% were males. This study found the occurrence of hypertension to be 13.4%. Furthermore, a significant association was found between hypertension and various risk factors like body mass index (BMI), dietary salt intake, physical activity, duration of sleep per night, habit of smoking, alcohol consumption and family history of hypertension.
Conclusions: This study highlights the occurrence of hypertension among medical students, providing valuable insight for targeting intervention programs at this early stage. By incorporating education on hypertension occurrence and its risks into the educational curriculum, these programs can effectively address the issue within this population.

Keywords: Community health, Gujarat, Hypertension, Medical students, Risk factors

INTRODUCTION

Hypertension is a major contributor to the global burden of disease, affecting over 1 billion people and leading to approximately 9.4 million deaths annually. It doubles the risk of cardiovascular conditions such as coronary heart disease (CHD), congestive heart failure (CHF), ischemic and haemorrhagic stroke, renal failure and peripheral arterial disease (PAD). Hypertension is frequently linked with other cardiovascular risk factors. Despite the effectiveness of antihypertensive treatment in reducing the risks of cardiovascular and renal diseases, a significant portion of those with hypertension remain either untreated or inadequately treated.[1]

According to blood pressure measurements from the National Family Health Survey (NFHS-5, 2019-21), conducted by the Ministry of Health and Family Welfare (MoHFW), Government of India, 21.3% of women aged 15 years and older have hypertension or are taking medication to control blood pressure. Among them, 12.4% have mildly elevated blood pressure and 5.2% have moderately or severely elevated blood pressure.

In comparison, the prevalence of hypertension is higher among men aged 15 years and older, with 24% affected. This includes 15.7% with mildly elevated blood pressure and 5.7% with moderately or severely elevated blood pressure.[2]

Based on the ESC/ESH 2023 guidelines, hypertension was classified under normal, high normal, grade 1 hypertension, grade 2 hypertension, grade 3 hypertension & isolated systolic hypertension. Normal is a systolic pressure of 120-129 mmHg and/or diastolic pressure of 80-84 mmHg; high normal is a systolic pressure of 130-139 mmHg and/or diastolic pressure of 85-89 mmHg; grade 1 hypertension is a systolic pressure of 140-159 mmHg and/or diastolic pressure of 90-99 mmHg; grade 2 hypertension is a systolic pressure of 160-179 mmHg and/or diastolic pressure of 100-109 mmHg; grade 3 hypertension is a systolic pressure of greater than or equal to 180 mmHg and/or diastolic pressure of greater than or equal to 110 mmHg; isolated systolic hypertension is a systolic pressure of greater than or equal to 140 mmHg and diastolic pressure of less than 90 mmHg. [3]

Modifiable risk factors for hypertension include physical inactivity, habit of smoking, excessive alcohol consumption, being overweight or obese and unhealthy dietary habits such as excessive salt intake, diet high in saturated fats and low intake of fruits and vegetables. Environmental factors, particularly air pollution, also contribute significantly to hypertension and related diseases. Non-modifiable risk factors include progressing age, family history of hypertension and the presence of co-existing conditions.[4]

Many individuals are unaware of having hypertension because the condition often presents asymptomatically. In young adults, hypertension serves as a precursor to cardiovascular disease. Early detection is critical to prevent the progression of the disorder. Hypertension independently raises the risk of cardiovascular disease, even after accounting for other cardiovascular risk factors such as total cholesterol, smoking, body mass index (BMI), and diabetes. Given that hypertension often goes undiagnosed and independently increases the risk of cardiovascular disease, it is important for young adults with modifiable risk factors to regularly monitor their blood pressure and adopt healthier behaviours.[5]

METHODS

This cross sectional, observational study was conducted for a period of seven weeks from third week of October 2024 to first week of December 2024 among students of first, second, third first and third final year batches at a medical college associated with a tertiary care teaching hospital in Ahmedabad, Gujarat. The study included MBBS students who were willing to participate. The study excluded all those participants who did not consent to be included or those who engaged in physical exercise just before the blood pressure measurements or used any tobacco substance 30 minutes prior to blood pressure measurement. Moreover, the study even excluded those participants who were already diagnosed cases of hypertension and taking antihypertensive medications.

According to NFHS-5 for Gujarat-Urban population, 3,697 (36.38%) out of 10,163 women surveyed were found to have elevated blood pressure; similarly, 621 (36.89%) out of 1,683 men surveyed were found to have elevated blood pressure.[2] Dividing 4,318 (total number of populations with elevated blood pressure) with 11,846 (total population surveyed), we get population proportion (p) for this population to be 36.45%.

To achieve a confidence level of 95% with a 5% margin of error and a 36.45% population proportion for this population, a target sample size of 250 students was derived by using Cochran's sample size formula.

Cochran's sample size formula-

$$n_0 = \frac{z^2 \times p \times (1-p)}{e^2}$$

e- desired level of precision, the margin of error;

p- the fraction of the population (as percentage) that displays the attribute;

z- the z-value extracted from z-table i.e. 1.96 for this case.

$$n_0 = \frac{1.96^2 \times 0.3645 \times (1-0.3645)}{0.05^2} = 355.94 \approx 356.$$

Cochran's modified formula for finite population-

$$n = \frac{n_0}{1 + \frac{n_0 - 1}{N}}$$

n_0- Cochran's sample size computed using formula for ideal sample size;

N- size of the population (800 students divided in 4 batches).

$$n = \frac{356}{1 + \frac{356-1}{800}} = 246.58 \approx 250.$$

Data collection

Participants were asked to fill out a detailed questionnaire prior to having their height, weight and blood pressure measured. Their readings were collected in a case report form.

The questionnaire queried about age; gender; MBBS batch; diet; dietary salt intake; consumption of soft

drinks, fast food, high glycaemic foods; physical exercise; duration of sleep per night; tobacco use; habit of smoking; alcohol consumption; history of diabetes, hypertension or cardiovascular disease and family history. They were also asked whether they felt depressed over the past 2 weeks.

Weight was measured using standardised digital weighing scales while following the weight measurement guidelines prescribed by WHO.[6] Height was measured using standardised stadiometers while following height measurement guidelines as described by WHO.[6]

BMI was calculated by dividing the weight (in kilograms) with the square of height (in meters) and categorised under staging given by WHO. [7]

$$\text{BMI} = \frac{\text{weight in kilograms}}{(\text{height in metres})^2}$$

Based on the nutritional status, participants were classified as underweight (BMI less than 18.5 kg/m^2); normal weight (BMI between 18.5-24.9 kg/m^2); pre-obese (BMI between 25-29.9 kg/m^2); obesity class I (BMI between 30-34.9 kg/m^2); obesity class II (BMI between 35-39.9 kg/m^2); obesity class III (BMI greater than 40 kg/m^2).[7]

Blood pressure was measured by two trained investigators using automated (Omron HEM-7121J) sphygmomanometers. Blood pressure measurement guidelines by American Heart Association (AHA) were followed.[8] Participants were asked to relax and sit in a chair with their feet flat on the floor and their back supported. Their arm was positioned on a table at the chest level during the measurement. A rest period of 15 minutes was provided before the first reading was taken. A total of three readings were recorded, with a 5-minute break between each reading. An average of all three readings was used for analytical purposes. To minimize the impact of white coat hypertension, we utilized automated blood pressure cuffs to alleviate clinician-participant anxiety and took multiple readings spaced out over time.

The data was analysed using Microsoft Excel and IBM SPSS v22 to calculate the association of risk factors and blood pressure categories. A Chi-square test was applied to evaluate the differences in the proportions of risk factors across various blood pressure categories. Differences were considered to be significant at p value less than 0.05.

Ethical consideration

Approval of the institutional review board was taken prior to starting the study. The purpose of this study and the protocol for obtaining physical measurements were explained to the participants. Consent was obtained from each participant, and they were assured confidentiality of their data.

RESULTS

Sample overview

Our sample constituted a total of 250 participants out of which 3 participants were reported to be known cases of hypertension currently on antihypertensive therapy. So, the final study sample size came out to be 247. Amongst those, 47.4% (117/247) were males while females formed 52.6% (130/247) of the sample.

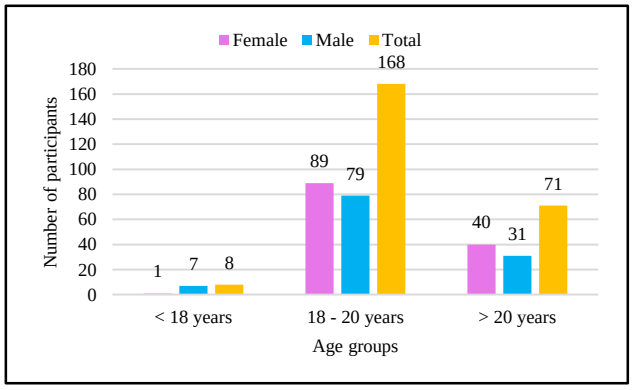

Figure 1: Age distribution of sample (n=247).

As depicted in Figure 1, majority i.e. 68% (168/247) of the participants were in the age group of 18-20 years while 3.2% (8/247) and 28.7% (71/247) were in the age group of less than 18 years and more than 20 years respectively. The mean age of the sample was found out to be 19.66 years with standard deviation being 1.284 and range being 17-22 years.

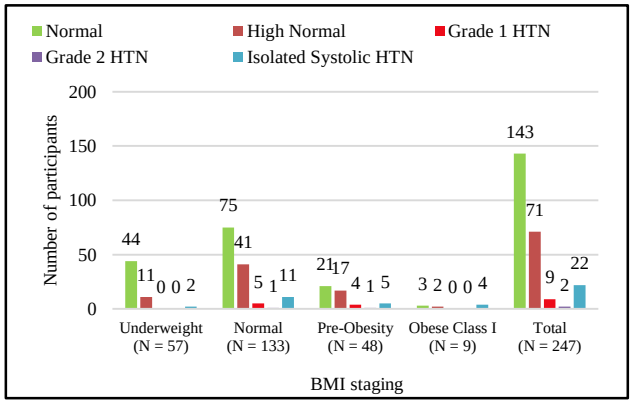

Figure 2: BMI staging of the sample and its correlation with HTN grading (n=247).

Figure 2 illustrates the BMI distribution of the sample and its correlation with HTN grading. Among the total participants, 23.07% (57/247) were underweight out of which 61.15% (36/57) were females and 36.84% (21/57) were males. Proportion of normal weight was 53.85%

(133/247) out of which 53.38% (71/133) were females and 46.62% (62/133) were males. Proportion of pre obesity was 19.43% (48/247) among which 43.75% (21/48) were females and 56.25% (27/48) were males. Proportion of obesity class I was 3.64% (9/247) out of which 22.22% (2/9) were females and rest 77.78% (7/9) were males.

Table 1: Association between hypertension and other variables.

Grading of HTN	Normal		High normal		Grade 1 HTN		Grade 2 HTN		Isolated systolic HTN		Grand total		Chi-square test	P value
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
Gender														
Female	79	55.2	39	54.9	4	44.4	0	0.0	8	36.4	130	52.6	5.341	0.254
Male	64	44.8	32	45.1	5	55.6	2	100	14	63.6	117	47.4		
Age (in years)														
<18	6	4.2	1	1.4	0	0.0	0	0.0	1	4.5	8	3.2	4.712	0.788
18-20	101	70.6	48	67.6	6	66.7	1	50.0	12	54.5	168	68.0		
>20	36	25.2	22	31.0	3	33.3	1	50.0	9	40.9	71	28.7		
MBBS batch														
1st year	44	30.8	18	25.4	2	22.2	0	0.0	2	9.1	66	26.7	15.357	0.222
2nd year	38	26.6	17	23.9	1	11.1	1	50.0	7	31.8	64	25.9		
3rd 1st year	31	21.7	20	28.2	5	55.6	1	50.0	4	18.2	61	24.7		
3rd final year	30	21.0	16	22.5	1	11.1	0	0.0	9	40.9	56	22.7		
Body mass index (BMI)														
Underweight	44	30.8	11	15.5	0	0.0	0	0.0	2	9.1	57	23.1	30.779	0.002*
Normal weight	75	52.4	41	57.7	5	55.6	1	50.0	11	50.0	133	53.8		
Pre-obesity	21	14.7	17	23.9	4	44.4	1	50.0	5	22.7	48	19.4		
Obesity class I	3	2.1	2	2.8	0	0.0	0	0.0	4	18.2	9	3.6		
Diet														
Vegan	1	0.7	2	2.8	0	0.0	0	0.0	0	0.0	3	1.2	18.051	0.114
Vegetarian	116	81.1	49	69.0	6	66.7	2	100	11	50.0	184	74.5		
Eggetarian	11	7.7	7	9.9	1	11.1	0	0.0	2	9.1	21	8.5		
Non-vegetarian	15	10.5	13	18.3	2	22.2	0	0.0	9	40.9	39	15.8		
Dietary salt intake														
Less than normal	0	0.0	1	1.4	0	0.0	0	0.0	0	0.0	1	0.4	105.472	<0.001*
Normal	136	95.1	63	88.7	9	100	2	100	4	18.2	214	86.6		
More than normal	7	4.9	7	9.9	0	0.0	0	0.0	18	81.8	32	13.0		
Soft drinks														
Yes	15	10.5	3	4.2	0	0.0	0	0.0	4	18.2	22	8.9	5.767	0.217
No	128	89.5	68	95.8	9	100	2	100	18	81.8	225	91.1		
Fast food (e.g. pizza, burger, fries)														
Yes	22	15.4	11	15.5	3	33.3	0	0.0	7	31.8	43	17.4	5.775	0.217
No	121	84.6	60	84.5	6	66.7	2	100	15	68.2	204	82.6		
High glycemic foods (e.g. chips, cake, chocolate bars)														
Yes	34	23.8	23	32.4	1	11.1	0	0.0	10	45.5	68	27.5	7.371	0.118
No	109	76.2	48	67.6	8	88.9	2	100	12	54.5	179	72.5		
Physical exercise														
Yes	69	48.3	19	26.8	2	22.2	0	0.0	4	18.2	94	38.1	16.021	0.003*
No	74	51.7	52	73.2	7	77.8	2	100	18	81.8	153	61.9		
Duration of sleep per night														
Less than 6 hours	45	31.5	6	8.5	4	44.4	0	0.0	12	54.5	67	27.1	25.233	0.001*
6-8 hours	92	64.3	61	85.9	5	55.5	2	100	10	45.5	170	68.8		
More than 8 hours	6	4.2	4	5.6	0	0.0	0	0.0	0	0.0	10	4.0		
Tobacco use														
Yes	1	0.7	1	1.4	0	0.0	0	0.0	0	0.0	2	0.8	0.608	0.962
No	142	99.3	70	98.6	9	100	2	100	22	100	245	99.2		
Habit of smoking														
Yes	6	4.2	4	5.6	0	0.0	0	0.0	7	31.8	17	6.9	23.941	<0.001*
No	137	95.8	67	94.4	9	100	2	100	15	68.2	230	93.1		

Continued.

Grading of HTN	Normal		High normal		Grade 1 HTN		Grade 2 HTN		Isolated systolic HTN		Grand total		Chi-square	P value
Alcohol consumption														
Yes	16	11.2	15	21.1	1	11.1	0	0.0	8	36.4	40	16.2	11.065	0.026*
No	127	88.8	56	78.9	8	88.9	2	100	14	63.6	207	83.8		
Felt depressed														
Yes	34	23.8	18	25.4	1	11.1	0	0.0	2	9.1	55	22.3	4.005	0.405
No	109	76.2	53	74.6	8	88.9	2	100	20	90.9	192	77.7		
Family history of hypertension														
Yes	29	20.3	19	26.8	6	66.7	1	50.0	13	59.1	68	27.5	22.188	<0.001*
No	114	79.7	52	73.2	3	33.3	1	50.0	9	40.9	179	72.5		
Family history of cardiovascular disease														
Yes	11	7.7	6	8.5	0	0.0	1	50.0	0	0.0	18	7.3	8.014	0.091
No	132	92.3	65	91.5	9	100	1	50.0	22	100	229	92.7		
Family history of type 2 diabetes mellitus														
Yes	30	21.0	17	23.9	2	22.2	1	50.0	6	27.3	56	22.7	1.418	0.841
No	113	79.0	54	76.1	7	77.8	1	50.0	16	72.7	191	77.3		
Note: *(p value <0.05), Significant. Abbreviations: No. (Number), HTN (Hypertension)														

Among the 247 students who were part of the study, 143 participants representing 57.89% were within the normal range of blood pressure. This study found out a 28.74% (71/247), 3.64% (9/247), 0.81% (2/247) and 8.91% (22/247) occurrence of high normal, grade 1 hypertension, grade 2 hypertension and isolated systolic hypertension respectively. No cases of grade 3 hypertension were found in our sample.

Association between hypertension and other variables

Neither gender nor age were found to be significant risk factors. In our study population BMI and dietary salt intake were found to be significantly associated with hypertension with p-value less than 0.05. In contrast, diet and consumption of soft drinks, fast food and high glycaemic food did not show any significance. With a p value of less than 0.05, physical exercise and duration of sleep showed a positive association with elevated blood pressure. Alcohol consumption and habit of smoking were found to be significant risk factors of hypertension with p-value less than 0.05. Depression was found out to be a non-significant risk factor in this group. While positive family history of hypertension was found to be a significant risk factor, family history of cardiovascular disease and type 2 diabetes mellitus did not show any association with hypertension in this study population.

Univariate analysis of modifiable and non-modifiable risk factors across different grades of hypertension revealed a statistically significant association in BMI [χ^2 (12, n=247) =30.779, p=0.002]; dietary salt intake [χ^2 (8, n=247) =105.472, p<0.001]; physical exercise [χ^2 (4, n=247) =16.021, p=0.003]; duration of sleep per night [χ^2 (8, n=247) =25.233, p=0.001]; habit of smoking [χ^2 (4, n=247) =23.941, p<0.001]; alcohol consumption [χ^2 (4, n=247) =11.065, p=0.026]; family history of hypertension [χ^2 (4, n=247) =22.188, p<0.001].

DISCUSSION

Hypertension was traditionally considered to be a chronic condition primarily affecting the elderly; however, it is now evident that its incidence among youth is becoming a growing concern.[9] After analysing data of the 247 participants and studying the 2023 ESC/ESH grading of hypertension, it was found out that 13.4% of our sample had either grade I, grade II or isolated systolic hypertension while 57.9% were normotensive. 28.7% of participants were in the high normal category of hypertension. This corresponds to the already existing literature of a 11.3% age adjusted prevalence of hypertension among persons aged between 15-49 years in India.[10]

The present study findings reported a positive association between hypertension and its various risk factors. It was found that students who sleep for less than 6 hours per night are at a considerable risk of developing high normal, grade I, grade II or isolated systolic hypertension. In our sample 27.12% students were having a sleep of less than 6 hours per night. An existing study carried out in Pittsburgh in 20 young adults reported a significant interaction between lack of sleep and elevated blood pressure (p=0.02), with insufficient sleep contributing to increased blood pressure levels.[11]

Furthermore, in this study sample, tobacco use did not have a significant association with elevated blood pressure but a significant association of hypertension with habit of smoking (p less than 0.001) and alcohol consumption (p=0.026) was found. A study carried out in the United States among 18- to 30-year-old young adults also found a significant correlation (p less than 0.001) of hypertension with alcohol consumption.[12]

A study conducted in Malaysia on the high salt diet in young university adults and the correlation with blood

pressure found out that among the 28 participants aged between 18 to 25 years, there was a positive correlation between salt intake and systolic blood pressure, though it was not statistically significant (p=0.30).[13] This study however found out that high dietary salt intake had a statistically significant correlation with elevated blood pressure (p<0.001). This can be explained by the fact that high salt intake causes significant reduction in the endothelial Nitric Oxide (NO) which results in elevation of blood pressure.[14]

A similar study in which 558 MBBS students at a Government Medical College, Uttar Pradesh aged 17-21 years were surveyed, found out that gender was statistically significant where males showed a higher prevalence of hypertension (27.5%) than females (7.5%).[15] A study conducted by Chennuri et al involving 625 college going degree students of Telangana also noted an increasing prevalence of hypertension in males as compared to females.[16] However, in our study, though the occurrence of hypertension was apparently found to be higher in males (17.9%) than in females (9.2%), chi-square analysis reported no statistically significant association between gender and elevated blood pressure.

Compared to the prevalence of hypertension among college going students in Western India that was found out to be 4.8%, this study discovered that medical students have a 13.4% prevalence of hypertension.[17] We encourage more studies to be conducted in the future to find out whether medical studies are more prone to developing hypertension.

In a study conducted in Mexico, a significant correlation was found between hypertension and depression where 21 out of 23 depressed patients had their blood pressure poorly controlled.[18] Several studies also indicate that individuals with depression are at an increased risk of developing hypertension.[19] In contrary, our study did not find any significant association of hypertension with depression. A probable reason for this could be the social stigma attached with depression which could have resulted in fewer positive answers given by the participants.

Though this study reported no association between unhealthy dietary preferences and elevated blood pressure, it was observed that college going students were progressively adopting to nutritionally poor diets. Processed foods with high glycaemic index and deep-fried snacks are being increasingly preferred over healthier options. About 28% of the 247 students surveyed consumed these foods once or more than once daily.

Finally, this study revealed a higher prevalence of hypertension in students with positive family history of the disease. Family history was considered positive if any one or both the parents were hypertensive. A study conducted by Katulanda et al noted that presence of family history markedly increased the risk of developing hypertension.[20] This study did not find any positive association of elevated blood pressure with family history of cardiovascular disease and type 2 diabetes mellitus. This could be probably due to the young age of all the participants in this study, the disease might not have manifested.

The limitations of this study were- first, the study might have witnessed a subjective bias as the responses provided by the participants might not be completely true. Second, while we were able to take multiple blood pressure measurements of an individual, this alone is not sufficient to diagnose hypertension. A diagnosis should only be made after obtaining the average of two or more readings on at least two separate occasions.[21] Third, our sample location was mainly in Ahmedabad, a city in Western India. This may not fully represent the broader population of the country. Lastly this study only surveyed medical students of one medical college. Therefore, for these reasons, the findings of this study cannot be extrapolated to the larger population and more similar studies are required.

CONCLUSION

In this study, we have witnessed an upward trend of hypertension in medical students. Significant risk factors found in this study were mostly modifiable including high dietary salt intake, physical inactivity, lack of sleep, habit of smoking, alcohol consumption or high BMI; other non-modifiable risk factors included family history of hypertension. It is hence crucial to identify risk factors through regular screening, placing greater focus on encouraging and adopting healthy lifestyle habits.

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Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Kotchen TA. Hypertension. In: Loscalzo J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Jameson JL, eds. Harrison's principles of internal medicine. 21st edn. New York: McGraw Hill; 2022:2072-2087.
2. Government of India, National family health survey-5 (NFHS-5)- India districts factsheet data. Available from: https://www.data.gov.in/catalog/national-family-health-survey-5-nfhs-5-india-districts-factsheet-data. Accessed on 10 December 2024.
3. Williams B, Mancia G, Spiering W, Agabiti Rosei E, Azizi M, Burnier M, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension: The Task Force for the management of arterial hypertension of the European Society of Cardiology (ESC) and the European Society of Hypertension (ESH). Eur Heart J. 2018;39(33):3021-104.

4. World Health Organization. Hypertension. Available at: https://www.who.int/news-room/fact-sheets/detail/hypertension. Accessed on 12 December 2024.
5. Huang Y, Wang S, Cai X, Mai W, Hu Y, Tang H, et al. Prehypertension and incidence of cardiovascular disease: a meta-analysis. BMC Med. 2013;11:1-9.
6. World Health Organization. STEPS Manual-STEPwise approach to NCD risk factor surveillance (STEPS). Available at: https://www.who.int/teams/noncommunicable-diseases/surveillance/systems-tools/steps. Accessed on 10 December 2024.
7. World Health Organization. A healthy lifestyle-WHO recommendations. Available at: https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who-recommendations. Accessed on 10 December 2024.
8. Muntner P, Shimbo D, Carey RM, Charleston JB, Gaillard T, Misra S, et al. Measurement of blood pressure in humans: a scientific statement from the American Heart Association. Hypertension. 2019;73(5):e35-66.
9. De Venecia T, Lu M, Figueredo VM. Hypertension in young adults. Postgrad Med. 2016;128(2):201-7.
10. Ghosh S, Kumar M. Prevalence and associated risk factors of hypertension among persons aged 15-49 in India: a cross-sectional study. BMJ Open. 2019;9(12):e029714.
11. Franzen PL, Gianaros PJ, Marsland AL, Hall MH, Siegle GJ, Dahl RE, et al. Cardiovascular reactivity to acute psychological stress following sleep deprivation. Psychosom Med. 2011;73(8):679-82.
12. Halanych JH, Safford MM, Kertesz SG, Pletcher MJ, Kim YI, Person SD, et al. Alcohol consumption in young adults and incident hypertension: 20-year follow-up from the Coronary Artery Risk Development in Young Adults Study. Am J Epidemiol. 2010;171(5):532-9.
13. Jia Jiet L, Soma RM. High salt diets in young university adults and the correlation with blood pressure, protein intake and fat free mass. Bioscience Horizons: Int J Student Res. 2017;10:hzx003.
14. Boegehold MA. The effect of high salt intake on endothelial function: reduced vascular nitric oxide in the absence of hypertension. J Vasc Res. 2013;50(6):458-67.
15. Midha T, Nigam S, Martolia DS, Kaur S. Prevalence and determinants of hypertension in MBBS students of Govt. Medical College, Kannauj, Uttar Pradesh. Indian J Forens Community Med. 2018;5(2):97-100.
16. Chennuri H, Goud KS, Bhavani KS. A cross-sectional study on prevalence of hypertension among college going degree students in urban Khammam, Telangana. Int J Community Med Public Health. 2021;8(3):1435-9.
17. Solanki R, Prajapati T, Shah H. The pattern of blood pressure distribution and analysis of influencing factors of pre (hypertension) among young adults: a cross-sectional survey in western India. Nat J Community Med. 2023;14(11):730-7.
18. Rubio-Guerra AF, Rodriguez-Lopez L, Vargas-Ayala G, Huerta-Ramirez S, Serna DC, Lozano-Nuevo JJ. Depression increases the risk for uncontrolled hypertension. Exp Clin Cardiol. 2013;18(1):10-2.
19. Meng L, Chen D, Yang Y, Zheng Y, Hui R. Depression increases the risk of hypertension incidence: a meta-analysis of prospective cohort studies. J Hypertens. 2012;30(5):842-51.
20. Ranasinghe P, Cooray DN, Jayawardena R, Katulanda P. The influence of family history of hypertension on disease prevalence and associated metabolic risk factors among Sri Lankan adults. BMC Public Health. 2015;15:1-9.
21. Whelton PK, Carey RM, Aronow WS, Casey DE, Collins KJ, Dennison Himmelfarb C, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol. 2018;71(19):e127-248.

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