Research Article

Correlation of body mass index, dietary habits, and family history with hypertension in adolescents

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Abstract

Background: The prevalence of hypertension has significantly increased among adolescents in India.

Objective: (1) To correlate the hypertension with body mass index (BMI), dietary habits, and family history of hypertension among adolescents. (2) To compare the prevalence of hypertension among men and women.

Materials and Methods: This study was conducted on 100 medical students, and their age, diet, family history of hypertension, weight, and height were recorded. BMI was calculated from height and weight. BMI was distributed by the criteria of the World Health Organization. Blood pressure was measured and classified as per the Seventh Report of the Joint National Committee, Geneva, Switzerland. The data were analyzed using χ^2-test to find association between hypertension and variables.

Result: On the basis of this study, we found that the percentage of prevalence of hypertension was higher among subjects having BMI of >25 kg/m^2, taking mixed diet, and having positive family history of hypertension as compared to those with BMI of <25 kg/m^2, taking vegetarian diet, and having negative family history of hypertension.

Conclusion: This study shows that increased prevalence of hypertension in adolescents is due to various factors such as higher BMI, dietary habits, and positive family history. So, early modification of these variables will help us to decrease prevalence of hypertension among adolescents.

KEY WORDS: Hypertension, body mass index, dietary habit, family history

Introduction

The prevalence of hypertension among adolescents is around 3.5% worldwide with somewhat higher rates of prehypertension. Obesity affects approximately 20% adolescents in the United States, and the prevalence of hypertension is much higher among obese adolescents compared with nonobese adolescents.[1] Similarly, nonvegetarian food increases mortality, and incidence rates of coronary disease events are indeed clearly lower in vegetarians.[2] Impairment in baroreflex sensitivity in hypertension is in part genetically determined and may be an important hereditary component in the pathogenesis of essential hypertension,[3] so the positive family history of hypertension also increases prevalence of hypertension among adolescents. Thus, we attempted to study the prevalence of hypertension in 100 medical students in Ahmedabad, Gujarat, India.

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Objective

This study aimed to correlate the hypertension with BMI, dietary habits, and family history of hypertension among adolescents and to compare the prevalence of hypertension in men and women.

Materials and Methods

This study was conducted on 100 medical students at Ahmedabad. Of 100 students, 45 were women and 55 were men with age group between 18 and 19 years. Students were informed about the study.

Those aged between 18 and 19 years and were definitely aware of their family history were included in this study. However, those aged above 19 years and below 18 years, were uncooperative, and were not aware of their family history of hypertension were excluded.

Age, diet, and family history of hypertension of the subjects were recorded. Weight and height were measured to calculate BMI. Using the BMI criteria of the World Health Organization,[4] the study subjects were categorized as underweight (BMI < 18.5 kg/m^2), normal (BMI = 18.5–24.9 kg/m^2), overweight (BMI = 25.0–29.9 kg/m^2), and obese (BMI > 30 kg/m^2). Blood pressure was measured using sphygmomanometer in supine position. Of three readings, the average reading was recorded for measurements. We classified blood pressure according to the Seventh Report of the Joint National Committee (JNC-VII) in which prehypertension has been described as systolic blood pressure (SBP) 120–139 mmHg or diastolic blood pressure (DBP) 80–89 mmHg and stage 1 hypertension as SBP 140–159 mmHg or DBP 90–99 mmHg.[5] The subjects were informed about the study. Dietary habit included that they were either on vegetarian or on mixed (vegetarian and nonvegetarian) diet. Family history included that they have either positive or negative family history of hypertension.

Statistical Analysis

Mean blood pressure was computed for weight, height, BMI, and blood pressure. The data were analyzed using χ^2-test to find association between hypertension and variables (BMI of <25 and >25, vegetarian and nonvegetarian diet, and/or no family history of hypertension). Those found to be significantly associated with hypertension ($P < 0.05$) were then entered in multiple logistic regression.

Results

Table 1 shows that according to JNC-VII criteria, 41% students fell into prehypertension whereas 24% into stage 1 hypertension category. Nineteen students had BMI of >25 kg/m^2; of which, 6 fell into prehypertension and 10 into stage 1 hypertension category. Total 31 students were taking mixed diet; of which, 12 fell into prehypertension and 12 into stage 1 hypertension category. Family history was found to be positive for hypertension among 44 students; of which, 20 fell into prehypertension and 13 into stage 1 hypertension category.

Because 24 subjects were in the stage 1 hypertension category, we clubbed the subjects of prehypertension and stage 1 hypertension categories into a single group for appropriate statistical analysis.

Table 2 shows the respective P-values and odds ratio for BMI, diet, and family history. All three variables were not found to be significant after the application of χ^2-test, but percentage of prevalence of hypertension was higher among subjects with BMI of >25 kg/m^2, taking mixed diet, and having positive family history of hypertension.

Table 3 shows comparison of men and women with different variables. Of 45 women and 55 men, 28 women and 37 men had hypertension, 4 women and 15 men had BMI of >25 kg/m^2, 10 women and 21 men were on mixed diet, and 18 women and 26 men had positive family history of hypertension.

Table 4 shows the percentage of prevalence of hypertension among men and women with BMI of >25 kg/m^2.

Table 1: Values of different variables with respect to different stages of hypertension

Number (100)	Normal	Pre-HT	Stage I HT
N	35	41	24
Blood pressure (mmHg), mean ± SD			
SBP	112.16 ± 3.81	125.29 ± 5.67	144.36 ± 5.94
DBP	72.20 ± 5.61	82.06 ± 3.09	91.18 ± 2.28
BMI (*n*), kg/m^2			
<25	32	35	14
>25	3	6	10
Diet (*n*)			
Vegetarian	28	29	12
Mixed	7	12	12
Family history (*n*)			
Positive	11	20	13
Negative	24	21	11

HT, hypertension; SBP, systolic blood pressure; DBP, diastolic blood pressure.

Table 2: Respective *P*-values and unadjusted odds ratio for different variables

Variable	Code	HT (*n* and %)	Unadjusted OR (95% CI)	*P*-value
BMI (kg/m^2)	<25 = 0	(*n* = 81) 49 (60.49%)	1	0.06
	>25 = 1	(*n* = 19) 16 (84.25%)	3.48	
Diet	Veg = 0	(*n* = 69) 41 (59.42%)	1	0.1
	Mixed = 1	(*n* = 31) 24 (77.41%)	2.34	
Family history	–ve = 0	(*n* = 56) 32 (57.14%)	1	0.07
	+ve = 1	(*n* = 44) 33 (75.00%)	0.44	

HT, hypertension; OR, odds ratio; CI, confidence interval.
P-value <0.05 is significant.

Table 3: Comparison of male and female with different variables

Variable	Male (n = 55)	Female (n = 45)
Normal/HT		
Normal	18	17
HT	37	28
BMI (kg/m^2)		
<25	40	41
>25	15	4
Diet		
Vegetarian	34	35
Mixed	21	10
Family history		
Positive	26	18
Negative	29	22

HT, hypertension; BMI, body mass index.

Table 4: Comparison of BMI among male and female with hypertension

BMI > 25 kg/m^2 (n = 19)	Male (n = 15) & %	Female (n = 4) & %
Hypertension	12 (80)	3 (75)

Table 5: Comparison of mixed diet among male and female with hypertension

Mixed diet	Male (n = 21) & %	Female (n = 10) & %
Hypertension	17 (80.95)	7 (70)

Table 6: Comparison of positive family history among male and female with hypertension

Positive history	Male (n = 26) & %	Female (n = 18) & %
Hypertension	20 (76.92)	13 (72.22)

Of 19 subjects with BMI of > 25 kg/m^2, 15 were men and 4 were women. Of 15 men and 4 women, 12 men (80%) and 3 women (75%) had hypertension.

Table 5 shows the percentage of prevalence of hypertension among men and women taking mixed diet. Of 21 men and 10 women taking mixed diet, 17 men (80.95%) and 7 women (70%) had hypertension.

Table 6 shows the percentage of prevalence of hypertension among men and women with positive family history of hypertension. Of 26 men and 18 women with positive family history of hypertension, 20 men (76.92%) and 13 women (72.22%) had hypertension.

Discussion

In this study, majority of students were from upper middle and middle classes. They had altered eating habits and increased fat contents in diet.[6] Moreover, most of them left physical exercise and outdoor sports during school life to get admission in medical branch and led sedentary lifestyle with an addition of mental stress to get through the competitive medical exam.[7] These are also contributory factors for increasing BMI and hypertension among adolescents. In this study, of 19 subjects with BMI of >25 kg/m^2, 16 had hypertension. A study by Singh et al.[8] also showed increased prevalence of hypertension with obesity.

According to this study, 31 subjects were taking mixed diet; of which 24 (77.41%) had hypertension. Animal fats (largely saturated) raise low-density lipoprotein (LDL) cholesterol and increase the risk.[9] A vegetarian diet usually provides a low intake of saturated fat and cholesterol and a high intake of dietary fiber and many health-promoting photochemicals. As a result of these factors, vegetarians typically have lower BMI, serum total and LDL cholesterol levels, and blood pressure; reduced rates of death from ischemic heart disease; and decreased incidence of hypertension.[10]

Family history of hypertension also contributes to the development of hypertension. In this study, 44 students had positive family history of hypertension; of which 33 (75%) had hypertension. BP/SP-1 could reside on human chromosome 17q in a region that also contains the angiotensin I-converting enzyme (ACE) gene. This encodes a key enzyme of the renin–angiotensin system[9] and is therefore a candidate gene for hypertension.[11] Furthermore, impairment in baroreflex sensitivity in hypertension is in part genetically determined and may be an important hereditary component in the pathogenesis of essential hypertension.[3] Higher levels of angiotensinogen, cortisol, and 18-OH corticosterone seen in the offspring of parents with high blood pressure may also lead to abnormalities of glucocorticoid metabolism and the renin–angiotensin system.[12]

Conclusion

This study shows that the increased prevalence of hypertension among adolescents is attributed to various factors such as higher BMI, dietary habits, and positive family history of hypertension. Thus, early modification of these variables will help us to decrease the prevalence of hypertension among adolescents.

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