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Original Research Article

Prevalence and risk factors of hypertension among young medical students: An observational study

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Abstract

Background: Hypertension is a chronic disease which over the years can predispose to stroke, heart failure and chronic kidney disease. So, longer hypertension is present more adverse events are observed. This makes it important to diagnose and control hypertension at an early stage in life. Like most developing countries data on hypertension among young especially medical students are scarce in India. We aimed to determine the prevalence and risk factors of hypertension among young medical students of MGIMS Sevagram.

Methods: This cross-sectional study was conducted between August, 2010 and March 2013 in MGIMS Sevagram, Wardha Maharashtra, India. Total of 765 students, aged 17-35 years, were studied and their data using a WHO STEPS questionnaire, which included socio-demographic characteristics and risk factors of hypertension, were collected. Blood pressure and anthropometric measurements for obesity were performed using standardized protocols. Blood samples for fasting lipid profile were collected. Statistical analysis was done using STATA 13 software.

Results: The prevalence of hypertension was found to be 3.53% and 32.16% students had prehypertension. 41.12% of those already on treatment for hypertension had uncontrolled hypertension. After multivariate logistic regression analysis hypertension risk was significantly higher among alcoholics {OR-3.47 (95% CI 1.91-11.23)}, those with positive family history of hypertension {OR-3.47(95% CI 1.91-11.23)} those with abnormal waist circumference {OR-4.64 (95% CI 1.44-14.94)} and abnormal waist hip ratio {OR-3.64(95% CI 1.33-10.21)}.

Conclusion: This study has found a significant burden of hypertension and prehypertension among young medical students. Despite having adequate knowledge and access to management, large proportion of hypertensive medical students didn't have adequate blood pressure control.

Keywords: Hypertension, stroke, heart failure, chronic kidney disease.

1. Introduction

India, like developed countries, now is going through the phase of epidemiologic cycle where the proportion of individuals with chronic non-communicable diseases like hypertension increase rapidly.[1] Hypertension is associated with high mortality and morbidity affecting approximately a billion individuals worldwide. Mills *et al* have done a systematic analysis about hypertension in 90 countries and found that 31.1% of adult population of the world had hypertension; 28.5% of the population in high-income countries and 31.5% in low and middle-income countries. In Asia, the prevalence of hypertension is increasing, ranging between 15-35%, and hypertension and stroke occur at a relatively younger age in this population.[2] Prevalence of hypertension in India has been reported to be 29.2% by a systematic review and meta-analysis. Hypertension is increasing in India at an alarming rate.[3]

It has been suggested by studies that the blood pressure level in early years of life is associated with blood pressure later in life; hence those who have high blood pressure in young life are likely to have hypertension later on.[4] Studies have evaluated hypertension in the past but

in Indian scenario, data among young individuals especially among medical students, is still scarce. Knowledge about the presence of hypertension or its likelihood at young age can be utilized to prevent the dreaded consequences of hypertension. Hence this study was designed to determine the prevalence and associated risk factors of hypertension in young medical students of MGIMS Sevagram.

2. Materials and Methods

2.1 Study setting and design

This cross-sectional study was conducted in Mahatma Gandhi Institute of Medical Sciences, Sevagram, which is a 750 bedded rural based teaching hospital located in Wardha district of Maharashtra state in India. The study was done from August 1, 2010 to March 31, 2013.

2.2 Study subjects

All medical students who were enrolled in the college during the study period (included undergraduates, interns and postgraduates) were considered for study. Those who did not provide consent to participate in the study were excluded. During the study period, a total of 786 students were enrolled in the institute. We aimed at ≥95% coverage.

2.3 Study procedure

The WHO STEPS approach was used to assess the prevalence of hypertension and it's associates.[5] Data related to age, gender, physical activity, history of smoking or alcohol, past history of hypertension and the family history of hypertension were recorded. Then physical examination was done to measure blood pressure and anthropometric measurements like height, weight, waist circumference, hip circumference, waist/hip ratio were taken. Blood samples were analyzed for Lipid profile including serum total cholesterol, LDL-C, HDL-C and triglycerides. Blood pressure was recorded in right arm in sitting position using the standard protocol. Three readings were taken using mercury type of BP apparatus and the average of the last two readings was used as the BP of the subject. Hypertensive subjects were defined as those with systolic blood pressure (SBP) equal to or more than 140 mmHg and/or diastolic blood pressure (DBP) equal to or more than 90 mmHg or those being treated for hypertension. Those with SBP of 120-139 mmHg and/or DBP of 80-89mm Hg were classified as prehypertensives.[6] Waist circumference (WC) cut off for defining obesity for Asians was used, hence WC of ≥90 cm for males and ≥80 cm for females were considered cut off points for defining an abdominal obesity. Waist-hip ratio cut off used were 0.9 for males and 0.8 for females.[7,8]

2.4 Statistical analysis

We used statistical software STATA version 13 for statistical analysis. The magnitude of hypertension was expressed in percentage. Chi-square test was used to calculate the unadjusted odds ratio (ORs) along with 95% CIs to assess the strength of association between independent variables (age, sex, smoking and alcohol and family history of HTN etc. and dependent variables (Hypertension). After univariate analysis, multivariate logistic regression analysis was performed to derive the final model. $P<0.05$ was considered as significant.

2.5 Ethical Issues

The study was started after clearance from the institutional ethics committee. All the students were explained the study procedures and objectives, before enrolling. Only those who gave written consent were included in the study.

3. Results

Total enrolled students were 765students and 21students who did not give consent were excluded from the study. All the study subjects were of age between 17 and 35 years with a mean of 21.8 years (SD=9.05). Table 1 describes the baseline characteristics of the study subjects with respect to their clinical and biochemical parameters.

Table 1: Baseline characteristics of the study subjects

Age (completed years)		
<25	460	60.13%
≥25	305	39.87%
Sex		
Males	444	58.1
Females	321	41.9
History of Smoking		
Present	105	13.73%
Absent	660	86.27%
History of Alcohol consumption		
Present	93	12.16%
Absent	672	87.84%
Family history of hypertension		
Present	222	29.02%
Absent	543	70.98%
Physical activity		
Vigorous	66	8.63
Non Vigorous	699	91.37
Waist circumference		
Abnormal	146	19.08
Normal	619	80.92
Waist hip ratio		
Abnormal	183	23.92
Normal	582	76.18
Triglycerides (mg/dl)		
>150mg/dl	125	16.34
<150mg/dl	640	83.66
HDL cholesterol (mg/dl)		
Abnormal	334	44.97
Normal	421	55.03
LDL cholesterol (mg/dl)		
>130mg/dl	39	5.10
<130mg/dl	726	94.90
Total cholesterol (mg/dl)		
>200mg/dl	30	3.92
<200mg/dl	735	96.08

3.1 Burden of hypertension

The prevalence of hypertension was found to be 3.53% and 32.16% students had prehypertension. 41.12% of those already on treatment for hypertension had uncontrolled hypertension.

3.2 Associations with hypertension

On univariate analysis, Odds of hypertension were significantly higher in male students{OR-3.13(95% CI 1.17-8.74, smokers {OR-1.66(95% CI 1.24-6.94)}, alcoholics{OR-2.74(95% CI 1.14-6.84)}, those with positive family history of hypertension{OR-3.5(95% CI 1.58-7.75)}, those with obesity as defined by abnormal waist circumference{OR-2.77(95% CI 1.23-6.23)}, waist-hip ratio {OR-2.51(95% CI 1.19-5.73) and hyper-triglyceridemia {OR-2.26(95% CI 1.26-5.56)}. (Table 2)

Table 2: Correlates of hypertension

Correlates of Hypertension	Univariate analysis		Multivariate analysis	
	OR (95% CI)	P value	OR (95% CI)	P value
Age				
≥ 25 years <25 years	2.11 (0.96-4.66) 1	0.6	2.17 (0.84- 5.56) 1	0.09
Gender				
Male Female	3.13 (1.17-8.74) 1	0.01	1.76 (0.54-5.69) 1	0.33
Alcohol intake				
Present Absent	2.74 (1.14-6.84) 1	0.01	3.47 (1.91-11.23) 1	0.02
Smoking				
Present Absent	1.86 (1.24-6.94) 1	0.01	1.66 (0.89- 4.78) 1	0.3
Family h/o hypertension				
Present Absent	3.5 (1.58-7.75) 1	0.001	3.11 (1.30-7.47) 1	0.02
Waist circumference				
Abnormal Normal	2.77 (1.23-6.23) 1	0.01	4.64 (1.44-14.94) 1	0.01
Waist hip ratio				
Abnormal Normal	2.51(1.19-5.73) 1	0.01	3.64 (1.33-10.21) 1	0.01
Physical activity				
Non vigorous Vigorous	1.97 (0.66-5.94) 1	0.2	3.47 (0.91-13.23) 1	0.09
Serum triglyceride				
≥ 150mg/dl < 150mg/dl	2.26 (1.26-5.56) 1	0.03	1.47 (0.51- 4.20) 1	0.51
Serum total cholesterol				
≥ 200mg/dl < 200mg/dl	1.09 (0.12-7.74) 1	1.0	1.19 (.09-15.25) 1	0.82
Serum LDL cholesterol				
≥ 130mg/dl < 130mg/dl	1.07 (0.09-5.43) 1	1.0	0.40 (0.02-5.38) 1	0.45
Serum HDL cholesterol				
Abnormal Normal	1.38 (0.64-2.95) 1	0.45	1.04 (0.41-2.58) 1	0.90

Multivariate logistic regression analysis revealed that hypertension risk was significantly higher among alcoholics {OR-3.47 (95% CI 1.91-11.23)}, those with positive family history {OR-3.47(95% CI 1.91-11.23)} those with abnormal waist circumference {OR-4.64 (95% CI 1.44-14.94)} and abnormal waist-hip ratio {OR-3.64(95% CI 1.33-10.21)}. (Table-2)

4. Discussion

We found that the prevalence of hypertension in the students of MGIMS Sevagram was 3.52%. A high proportion of students i.e. 32.16% were prehypertensive and more than 40% of those with hypertension did not have their BP under control despite drug therapy. After multivariate analysis, we found a statistically significant increased risk of hypertension with intake of alcohol, with positive family history of hypertension and obesity defined by increased waist circumference or increased waist-hip ratio. No significant association was found between hypertension and increasing age, gender, smoking, physical activity, hypertriglyceridemia, hypercholesterolemia, high LDL-C and abnormal HDL-C.

The prevalence of hypertension in this study was found to be 3.52%. Dores *et al* have found a prevalence of 24.9% in university students aged 18-25 years. Kayima *et al* studied a population aged 24-40years and found that the prevalence of hypertension was 15%.[9] Two large surveys NHANES and Add Health have found that the prevalence of hypertension in adults aged 24-32 years was 4% and 19% respectively.[10, 11] Meshram *et al* through a study in Kerala have reported a prevalence of 31% and 15% among young (20-29 years of age) males and females respectively.[12] A study done in Andhra Pradesh state of India among medical students have found a prevalence of hypertension to be 3.65%.[13] These observations reveal varied prevalence of hypertension, but the burden of hypertension is significant in younger age of life.

In our study, we found that 32.16% of students were prehypertensive. Various other studies have reported a similar high prevalence of prehypertension in young population. A study done among medical students by Chitrapu *et al* found that 37.45% of students had prehypertension.[13] A study done in Uganda has reported that 41% of young adults had prehypertension.[9] Kini *et al* found that 45.2% (95% CI = 42.4, 48.0) of young adults aged 20-30 years were hypertensive.[14]. In Kerala, Vimala *et al* found that 52.52% of individuals aged less than 30 years were prehypertensive.[15] Meshram *et al* through a study done in Kerala have reported a prevalence of prehypertension to be 37%.[12] Mungreiphy *et al* have found prehypertension to be present in 54% of males and 10% of females.[16] These findings suggest a significantly large proportion of young adults are prehypertensive and have a risk for the development of hypertension later on in life.

We found that despite being medical students and having full access to health care facilities, nearly 41.2% did not have their hypertension under control. As per a multi-country study, control of hypertension has been poor even in developed countries. The study found that in England

only 27%; in the USA 53% and in Canada 66% had hypertension under control with therapy.[17] Anchala *et al* have reported that the hypertension control rate was only 10.7% in rural population and 20.2% in urban Indian population.[3] Gowerva *et al* have reported that in their study population, 67.2% of hypertensive subjects did not have the blood pressure under control.[18] Deepa *et al* have reported that the blood pressure was under control only in 21% of the Indian population studied.[19] This is an alarming finding as, despite proper knowledge about hypertension pathophysiology and treatment along with full access to medical facilities, hypertension control is very poor in medical students. If this much large proportion of young medical students were not able to control their blood pressure then some significant underlying factors are likely to be responsible for this phenomenon. Hence, there is a need to find out that reason which can help in establishing hypertension control in similar patient population.

The present study did not show a statistically significant increased risk of hypertension with increasing age (OR-2.6, CI 0.96-4.6). Other studies have however shown that there is increased risk of hypertension with increasing age.[3,9,20,21] The probable reason for this variation is that the age groups may not be actual representatives of significant age difference so as to impact the hypertension risk. We found that on univariate analysis the males (OR-3.13, CI 1.17-8.74, P<0.05) had increased risk of hypertension but on multivariate regression analysis no statistically significant association was demonstrated between gender difference and hypertension (OR-1.76, CI 0.54-5.69, P=0.33). However other studies have shown an increased risk of hypertension among males as compared with females.[9,20] The reason for this variation is probably the difference in the population characteristics of other studies and present studies.

There was increased risk of hypertension among those who were used to take alcohol (OR-2.74, CI 1.14-6.84, P=0.01) or were smokers (OR-1.86, CI 1.24-6.94, P=0.01), but on multivariate regression smoking (OR-1.66 CI 0.89- 4.78, P=0.3) lost significance while alcohol (OR-3.47, CI 1.91-11.23, P=0.02) showed statistically significant increased risk of hypertension. A study done by Jugal Kishor *et al*, did not find an increased risk of hypertension in smokers.[22] Other studies have found an increased risk of hypertension with smoking as well as alcohol.[3, 23, 24] Positive family history of hypertension proved to be significant risk factor for hypertension even after multivariate regression (OR-3.11, CI 1.30-7.47, P=0.02). Other studies have also shown a similar association of increased risk of hypertension among those with positive family history.[25,26] In this study, we found that obesity as defined by abnormal waist circumference (OR-4.64 CI 1.44-14.94, P=0.01) or waist-hip ratio (OR-3.64, CI 1.33-10.21, P=0.01), showed significantly increased the risk of hypertension. Other studies have also demonstrated similar trends.[27-30]

5. Conclusion and recommendation

This study has found a significant burden of hypertension among young medical students. What is even more important is that a large proportion of young students have prehypertension and the control of hypertension is poor. Although being a medical student, gives an opportunity to have adequate knowledge about hypertension and also access to proper diagnosis and treatment, despite this, there is some unknown factor which is responsible for poor hypertension control. One possible factor can be the stress of hectic schedule; a medical student has to go through during his training especially at residency level. This requires further studies to determine the likely reason and for planning of appropriate strategies so as to prevent the dangerous nonreversible consequences of hypertension.

Competing interest

The authors declare that they have no competing interest.

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