PREVALENCE OF PREHYPERTENSION AND HYPERTENSION AMONG MEDICAL GRADUATES IN MANIPUR AND ITS ASSOCIATION WITH RISK FACTORS

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ABSTRACT

BACKGROUND

Hypertension is one of the common diseases associated with high morbidity and mortality. It is usually associated with various modifiable risk factors like stress, high salt intake, high calorie intake, cigarette smoking, sedentary lifestyle etc. and non-modifiable risk factors like genetic factor, gender and family history of cardiovascular disease. Early diagnosis and knowledge and identification of predisposing risk factors are important for effective treatment and control of hypertension.

The study aims to assess the prevalence of prehypertension and hypertension among the medical students and find out the association with its risk factors.

MATERIALS AND METHODS

This cross-sectional study was conducted in the undergraduate students studying in Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal. A pretested and prevalidated proforma was filled by the students after the purpose of the study was explained to them. This was followed by anthropometric measurements and blood pressure. The data was analysed using SPSS software version 22 by applying Chi-square test.

RESULTS

The study included 110 students, consisting of 64 males and 46 females. In our study, the prevalence of prehypertension was 8.2% and that of hypertension was 4.5%. Among the males 12.5% were found to be pre-hypertensive, while 4.7% were found to be hypertensive. Among the female participants 2.3% were found to be pre-hypertensive, while 4.3% were found to be hypertensive. There was a significant association between BMI and prehypertension and hypertension. Since the calculated sample size was too high and thereby not feasible to include in this limited period of study, we had to limit the sample size for convenience.

CONCLUSION

The prevalence of prehypertension is more among the students as compared to prevalence of hypertension and more so in males as compared to females. The early intervention can help in reducing the development of hypertension. No significant association was found with prevalence and risk factors.

KEY WORDS

Prehypertension, Hypertension, Prevalence, Body Mass Index, Medical Students.

HOW TO CITE THIS ARTICLE: Devi YA, Devi KR, Keisam A. Prevalence of prehypertension and hypertension among medical graduates in Manipur and its association with risk factors. J. Evolution Med. Dent. Sci. 2018;7(28):3183-3187, DOI: 10.14260/jemds/2018/716

BACKGROUND

The prevalence of Non-Communicable Disease (NCD) is increasing in both the developed and developing countries due to increased urbanisation, socio-economic development and changes in lifestyle of man. Cardiovascular Disease (CVD) is the leading NCD, which claimed 17.5 million lives in 2012 (46% of all NCD deaths).¹ Hypertension is one of the common health problems associated with high morbidity and mortality. It is one of the important risk factors for development of

cardiovascular diseases, stroke, nephropathy and retinal damage.² Hypertension is directly responsible for 57% of all stroke deaths and 24% of all Coronary Heart Disease (CHD) deaths in India.³ Hypertension is usually associated with various modifiable risk factors like age, stress, high salt intake, high calorie intake, cigarette smoking, sedentary lifestyle, obesity and other non-modifiable risk factors like genetic factor and family history of CVD. Knowledge and identification of various risk factors is important for primordial prevention to reduce the incidence of hypertension in the community and prevention of complications due to hypertension.^{4,5} Prehypertension was introduced by Joint National Commission 7 (JNC7) on Prevention, Detection, Evaluation and Treatment of High Blood Pressure. Prehypertension has been defined as person having systolic blood pressure of 120 - 139 or diastolic blood pressure of 80 - 90.⁶ Studies have shown increased risk of progression to hypertension from pre-hypertensive stage than from normotensive stage.⁷ Identification of pre-hypertensive helps in increasing awareness and early intervention to make lifestyle and dietary modification to

'Financial or Other Competing Interest': None.

Submission 20-06-2018, Peer Review 03-07-2018,

Acceptance 05-07-2018, Published 09-07-2018.

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DOI: 10.14260/jemds/2018/716

delay or even prevent progression to hypertension, thus reducing the burden of hypertension in the society.

The present study aims to find the prevalence of prehypertension and hypertension among the medical students who are from different socio-economic status, coming from both rural and urban areas of Manipur.

MATERIALS AND METHODS

This cross-sectional study was conducted on 200 students in which 110 students who satisfied the inclusion criteria was taken non-randomly by convenient sampling method who were studying in Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal, Manipur. The study population comprised of 64 males in age group of 19.61 ± 1.30 years and 46 females in age group of 19.73 ± 1.06 years. A pretested and prevalidated proforma was used to collect the various data including age, sex, family history of hypertension/diabetes, socio-economic status, sleep pattern, salt and calorie intake, smoking habits, alcohol consumption, physical activity, stress etc. Students were asked to fill up the proforma after the purpose of the study was explained to them and an informed written consent was obtained. The study was approved by the Ethical Committee of the college. This was followed by anthropometric measurements (height, weight, BMI) and blood pressure was recorded per WHO guidelines. Since the calculated sample size was too high and thereby not feasible to include in this limited period of study, we had to limit the sample size for convenience. Weight was measured by using a standard weighing machine without shoes to the nearest 0.5 kg and height was measured by using a height meter without shoes to the nearest 0.5 cm. Body Mass Index (BMI) was calculated using Quetelet index and WHO classification⁸ was used for interpretation of findings.

Subjects were classified according to their Body Mass Index (BMI) as:

1. Underweight: $< 18.5 \text{ kg/m}^2$
2. Normal Weight: $18.5 - 24.9 \text{ kg/m}^2$
3. Overweight: $25 - 29.9 \text{ kg/m}^2$
4. Obese: $\geq 30 \text{ kg/m}^2$

BP was recorded as per WHO guidelines. The criteria as per JNC 7 was followed for assessment of blood pressure.⁶ The sitting position was used for recording the blood pressure, which was measured by using a mercury sphygmomanometer. The systolic and diastolic pressure was measured 3 times and an average reading was recorded. As per JNC 7 guidelines, subjects were classified as-

Normotensive

(Systolic blood pressure (SBP) < 120 mmHg and diastolic blood pressure (DBP) < 80).

Pre-Hypertensive

SBP- $120 - 139$ mmHg or DBP $80 - 89$.

Hypertensive

SBP > 140 or DBP > 90 .

Statistical Analysis

- Data was analysed using SPSS version 22 by applying Chi-square test.
- $P < 0.05$ was considered statistically significant.

RESULTS

The study included 110 students, consisting of 64 males in age group 19.60 ± 1.30 years and 46 females in age group 19.74 ± 1.06 years. As shown in Table 1 out of the total study population 96 (87.3%) were normotensive, 9 (8.2%) were pre-hypertensive and 5 (4.5%) were hypertensive. Among the males 8 (12.5%) were found to be pre-hypertensive, while 3 (4.7%) were found to be hypertensive. Among the female participants 1 (2.3%) was found to be pre-hypertensive, while 2 (4.3%) were found to be hypertensive. In our study, the prevalence of prehypertension and hypertension was more in male students. A significant association was found between BMI and prevalence of prehypertension and hypertension, ($p = 0.008$) (Table 2). As shown in Table 2 in the present study 1 (1.04%) of normotensives was overweight, while 4 (4.16%) were obese (BMI $\geq 30 \text{ kg/m}^2$); 1 (11.1%) of pre-hypertensive was overweight (BMI: $25.0 - 29.9 \text{ kg/m}^2$) and 8 (88.9%) were with BMI between $18.5 - 24.9 \text{ kg/m}^2$ (Normal category). Among the hypertensive, 1 (20%) of hypertensive was with BMI in normal range and 1 ((20%) was overweight and 1 (20%) was obese. Prevalence of overweight among the participants were 2.7% and obesity was 4.5%.

Table 3 shows the prevalence of various risk factors in the study population. Association between various risk factors was insignificant, but significant association with irregular sleep pattern with daytime somnolence ($p = 0.034$) was observed. Table 4 shows the presence of risk factors expressed as percentage. Most of the students are having a sedentary lifestyle with high intake of junk foods, all contributing to increase in blood pressure.

Category of Hypertension	Male (n=64)	Female (n=46)	Total (n=110)	P value
Normal	53 (82.8%)	43 (93.5%)	96 (87.3%)	0.160
Pre hypertension	8 (12.5%)	1(2.3%)	9 (8.2%)	
Hypertension	3 (4.7%)	2(4.3%)	5 (4.5%)	

Table 1. Distribution of Blood Pressure among the Subjects

BMI	Normotensive	Pre-hypertensive	Hypertensive	Total	P value
Under-weight	25 (26.04%)	0 (0%)	2 (40%)	27 (24.5%)	0.008
Normal	66 (68.8%)	8 (88.9%)	1 (20%)	75 (68.3%)	
Over-weight	1 (1.04%)	1 (11.1%)	1 (20%)	3 (2.7%)	
Obese	4 (4.16%)	0 (0%)	1 (20%)	5 (4.5%)	

Table 2. Association between Blood Pressure and (Body Mass Index) BMI

Risk Factor		Normotensive	Pre-Hypertensive	Hypertensive	P value
Irregular sleep pattern with daytime somnolence	Yes	30 (90.9%)	0 (0.0%)	3 (9.1%)	0.034*
	No	66 (85.7%)	9 (11.7%)	2 (2.6%)	
Stress present	Yes	15 (88.2%)	2 (11.8%)	0 (0.0%)	0.692
	No	81 (87.1%)	7 (7.5%)	5 (5.4%)	
Salt intake	Often	22 (84.6%)	3 (11.5%)	1 (3.8%)	0.756
	Occasional	37 (92.5%)	2 (5%)	1 (2.5%)	
	Rarely	37 (84.1%)	4 (9.1%)	3 (6.8%)	
Diet	Non-Vegetarian	85 (85.9%)	9 (9.1%)	5 (5.1%)	0.760
	Vegetarian	11 (100%)	0 (0.0%)	0 (0.0%)	
Intake of high calorie diet/fast food	Rarely	28 (90.3%)	2 (6.5%)	1 (3.2%)	0.983
	Occasional	51 (85.0%)	6 (10.0%)	3 (5.0%)	
	Often	17 (89.5%)	1 (5.3%)	1 (5.3%)	
Rarely do exercise	Yes	66 (84.6%)	7 (9.0%)	5 (6.4%)	0.602
	No	24 (92.3%)	2 (7.7%)	0 (0.0%)	
F/H of Cardiovascular Disease (CVD)	Yes	17 (89.5%)	1 (5.3%)	1 (5.3%)	0.837
	No	78 (88.6%)	7 (8%)	3 (3.4%)	
F/H of DM	Yes	16 (88.9%)	2 (11.1%)	0 (0.0%)	0.708
	No	80 (87%)	7 (7.6%)	5 (5.4%)	

Table 3. Prevalence of Risk Factors among the Subjects

*P < 0.05.

Risk Factor Present	Total (n=110)	(%)
Irregular sleep pattern with daytime somnolence	33	30
Stress present	17	15.45
Salt intake	26	23.64
Non-vegetarian diet	99	90
Intake of high calorie diet/ fast food	19	17.27
Rarely do exercise	78	70.91
F/H of Cardiovascular Disease (CVD)	19	16.36
F/H of DM	18	17.27

Table 4. Prevalence of Risk Factor (%) among the Subjects

DISCUSSION

In our study, the total prevalence of Prehypertension was 8.2% and Hypertension was 4.5%. Among the males 12.5% were pre-hypertensive, while 4.7% were hypertensive. Among the females 2.3% were pre-hypertensive, while 4.3% were hypertensive. The prevalence of prehypertension was low in our study population as compared to other studies in different parts of India, where they found prevalence ranging from 20% to 80%.⁹⁻¹⁴ In a study by Kumar Avadesh et al

(2014), the prevalence of hypertension was found to be 21.4% in males and 7.7% in females among medical students.⁵ Chitrapu et al (2016) observed prevalence of prehypertension in the study sample around 37.45%, while 3.63% were hypertensive.¹⁵ Studies in Manipur in various rural and urban areas have found lower prevalence as compared to other studies done in India. In a cross-sectional study of school going children in age group 5 - 15 years of age, the prevalence of prehypertension and hypertension were 17.5% and 15.3% respectively.¹⁶ Sathish Kumar et al, in their study found the prevalence of hypertension among age group of ≥ 25 years in 2 urban communities of Imphal to be 37%.¹⁷ Studies in rural area of Manipur found prevalence of hypertension and prehypertension to be 25% and 14.3% respectively.¹⁸ Studies have shown prevalence of hypertension among different Muslim populations of Manipur to be 18.16%.¹⁹ Among the north-eastern states of India Manipur has different climatic condition, different dietary habits and cultural practices. These factors may be responsible for the relatively lower prevalence as compared with rest of India. In our study, the prevalence of hypertension is 4.5%. Studies among medical students have found relatively lesser prevalence of hypertension among the students. Srivastava AK et al reported a prevalence of 10.5% in their study.²⁰ Chhabra P et al reported lesser than 10% prevalence of hypertension.²¹ Chitrapu RV et al found 3.63% of the study population were hypertensive.¹⁵ Kumar Avadesh did not find any hypertension among the study group.⁵ Studies conducted in different parts and communities and tribes of India reported higher prevalence of hypertension. Vimala A et al reported 47%,² Tripathy JP et al²² found 40.1% prevalence, study by Sathya Prakash Manimunda et al²³ found prevalence of 50.5% of hypertension among the aboriginal Nicobarese tribe. Studies in different urban and rural population of Manipur reported higher prevalence than the present study, Sathish Kumar et al¹⁷ (37%), Himadri Bhattacharya et al¹⁸ (25%) and Ahsana Shah et al¹⁹ (18.16%).

This lower prevalence among the students may be due to higher awareness and higher education level among the students. Changing dietary habits and sedentary lifestyle with stressful environment may contribute to rise in blood pressure among the students. In our study, a significant association between BMI and prehypertension and hypertension ($p = 0.008$) was found, while association between other variables was not significant. Similar to our study, studies have observed that elevated BMI contributes to high blood pressure in their study population.²⁴ Kulkarni MM et al¹³ and Setty SS et al¹¹ in their study found positive correlation between prehypertension and BMI. Contrary to our findings, studies have observed that there was no association between elevated BMI and hypertension.^{25,26} Though significant association was not found in our study with various risk factors. Other studies have shown high prevalence of cardiovascular risk factors among medical students.²⁷⁻²⁹ In our study, significant association ($p = 0.034$) was found between irregular sleep pattern and prehypertensive and hypertensive state. Similar to our study, studies have found significant association of disturbed sleep with hypertension.^{29,30} Sleep alters autonomic nervous system function and other physiologic events that influence Blood Pressure. Sleep disorders like insomnia and

obstructive sleep apnoea could affect body's ability to regulate stress hormones leading to high blood pressure.

CONCLUSION

In the present study, the prevalence of prehypertension is more among the students as compared to prevalence of hypertension and more so in males as compared to females. The early intervention can help in reducing the progression to hypertension. One important way of preventing prehypertension and hypertension would be to educate and bring awareness among the masses and stress on the importance of lifestyle modification and maintaining a healthy lifestyle right from the beginning and thus helping in reduction of overall prevalence of non-communicable disease in the community.

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