

Prevalence of Prehypertension among the Medical Students and its Correlation with Body Mass Index

Jolly Bhattacharjya¹, Bobbyjeet Goswami²

¹Assistant Professor, Department of Physiology, Jorhat Medical College and Hospital, Jorhat, Assam, India, ²Associate Professor, Department of Physiology, Jorhat Medical College and Hospital, Jorhat, Assam, India

Abstract

Introduction: Hypertension is a major risk factor for cardiovascular diseases (CVD), chronic renal diseases, cerebrovascular diseases, and many others. The root cause of hypertension may present since childhood. Obesity itself is a risk factor for CVD such as hypertension, dyslipidemia, and many other diseases. Early diagnosis of prehypertension can help to prevent a development of hypertension and other CVDs by adopting preventive measures such as lifestyle modification, yoga, and meditation.

Aim and Objectives: This study aims to measure the prevalence of prehypertension among the medical students of Jorhat Medical College and Hospital, Jorhat, Assam and also to find any correlation between body mass index (BMI) and prehypertension. So that preventive measures can be adopted by medical students to prevent the development of hypertension and other CVDs related to hypertension.

Materials and Methods: A total of 136 medical students were selected randomly for this study. Blood pressure (BP) was measured using standard mercury sphygmomanometer. Height and weight were measured using standard instruments.

Results: Out of 136 students, 62 were male and 74 were female. Overall, the prevalence of prehypertension was 68.38% which is again more in males (35.29%) than females (33.09%). We have also found a strong correlation between BMI and BP.

Conclusion: The prevalence of prehypertension among the medical students of Jorhat Medical College and Hospital is 68.38%, which is again more in male than female and there is a correlation between BMI and BP.

Key words: Body mass index, Medical students, Prehypertension

INTRODUCTION

Hypertension is a major risk factor for cerebrovascular disease, myocardial infarction, vascular disease, and chronic renal disease. Several studies supported that the roots of essential hypertension may extend back to childhood.¹ Obesity is an independent risk factor for cardiovascular disease (CVD) including hypertension, dyslipidemia, glucose intolerance, and impaired homeostasis.² The Joint National Commission 7 (JNC 7) on prevention, detection, evaluation and treatment of high blood pressure (BP),

released in May 2003, introduces the classification of BP. According to this systolic BP (SBP) <120 and diastolic BP (DBP) <80 is considered as normal and SBP 120-139 or DBP 80-89 is defined as prehypertension. Early identification of prehypertension plays an important role in identification of modifiable factors required for prevention of cardiovascular accidents.

Several research papers, meta-analyses, review articles, etc., have been published on the prevalence of prehypertension in several groups and its association with other cardiovascular risk factors and CVD and treatment benefits.³⁻⁸ Studies from India have given varied prevalence of prehypertension, ranging from 20% to 80%.⁹⁻¹⁵

There are not many studies reported from this part of the country which estimates the prevalence of prehypertension among medical students and hence this study was undertaken.

Access this article online



www.ijss-sn.com

Month of Submission : 08-2016
Month of Peer Review : 08-2016
Month of Acceptance : 09-2016
Month of Publishing : 10-2016

Corresponding Author: Dr. Jolly Bhattacharjya, Assistant Professor, Department of Physiology, Jorhat Medical College and Hospital, Jorhat, Assam, India. E-mail: jollybhattacharjya.jb@gmail.com

Aims and Objectives

To determine the prevalence of prehypertension among the medical college students of Jorhat Medical College and Hospital, Jorhat, Assam, and to study the association between prehypertension and body mass index (BMI).

MATERIALS AND METHODS

This study was conducted in the year of 2016 at the Department of Physiology of Jorhat Medical College, Jorhat, Assam, India.

The participants were interviewed, and information regarding age, sex, personal habits such as smoking, alcohol intake, exercise profile, and dietary habits were collected using questionnaire.

A written informed consent was obtained from all the participants who responded to the questionnaire survey. The study protocol was approved by the Institutional Ethics Committee before the start of the study.

A total of 136 medical students of first to final year MBBS were selected randomly for this study. The students who are already diagnosed as hypertensive and under medication were excluded from this study.

Each participant's data were collected by questionnaire method, (which includes age, sex, family history) followed by anthropometric measurements, recording of BP.

BP was measured with a mercury sphygmomanometer, as per JNC 7 guidelines.¹⁶ Two measurements were obtained, and the average was taken as BP.

Weight and height were measured with standard instruments.¹⁷

Statistical Analysis

SPSS Version 16 was used for all data processing and analysis. A significant association between two variables were determined via sample *t*-tests and correlation tests, $P < 0.05$ was considered significant.

RESULTS

A total of 136 medical students were examined. Out of these, 74 (54.4%) were female and 62 (45.4%) were male. The overall prevalence of prehypertension among the whole group was 68.38% as 93 out of 136 students were prehypertensive while 43 (31.62%) were normotensive. Out of these 93 (68.38%), prehypertensive students 45 (33.09%) were female and 48 (35.29%) were male. This distribution of students according to BP and sex is showing in Table 1.

When the students in both groups (normotensive and prehypertensive) were categorized based on their BMI, an equal number of obese students are prehypertensives as normotensives ($P = NS$), as shown below. About 1.47% (2/43) of normotensives and 1.47% (2/93) of prehypertensives were obese. Most of the subjects were in the normal BMI category (Table 2).

However independent sample test, test of significance shows that there is a significant correlation (significant - 0.049) between BMI and BP. It is shown in Tables 3 and 4.

We have tried to correlate BMI and BP and it is seen that BMI is more strongly correlated index is more strongly correlated with DBP than SBP.

It is shown in Tables 5 and 6.

DISCUSSION

This study included 136 medical students from different socioeconomic background. Out of these, 74 (54.4%) were female and 62 (45.4%) were male. The overall prevalence of prehypertension in the entire group was

Table 1: Distribution of students according to sex and BP

| Sex | BP (%) | | Total |
|--------|--------------|-----------------|-----------|
| | Normotensive | Prehypertensive | |
| Female | 29 (21.32) | 45 (33.09) | 74 (54.4) |
| Male | 14 (10.29) | 48 (35.29) | 62 (45.4) |
| Total | 43 (31.62) | 93 (68.38) | 136 |

BP: Blood pressure

Table 2: The distribution of normotensive and prehypertensive students according to BMI categories

| BMI | BP (%) | | Total | P value |
|--------------|--------------|-----------------|-----------|---------|
| | Normotensive | Prehypertensive | | |
| Normal | 27 (19.85) | 71 (52.21) | 98 (72.1) | 0.07 |
| Obese | 2 (1.47) | 2 (1.47) | 4 (2.94) | |
| Over weight | 9 (6.62) | 12 (8.82) | 21 (15.4) | |
| Under weight | 5 (3.68) | 8 (5.82) | 13 (9.36) | |
| Total | 43 (31.62) | 93 (68.38) | 136 | |

BP: Blood pressure, BMI: Body mass index

Table 3: Group statistics

| BP | n | Mean | SD | SEM |
|-----------------|----|-------|-------|-------|
| BMI | | | | |
| Normotensive | 43 | 21.72 | 3.548 | 0.541 |
| Prehypertensive | 93 | 21.65 | 3.074 | 0.319 |

BP: Blood pressure, BMI: Body mass index, SD: Standard deviation, SEM: Standard error of mean

Table 4: Independent samples test

| BMI | Levene's test for equality of variances | | t-test for equality of means | | | | | | |
|-----------------------------|---|-------------|------------------------------|--------|--------------------------|-----------------|---------------------------|---|-------|
| | F | Significant | t | df | Significant (Two tailed) | Mean difference | Standard error difference | 95% confidence interval of the difference | |
| | | | | | | | | Lower | Upper |
| Equal variances assumed | 3.943 | 0.049 | 0.127 | 134 | 0.899 | 0.076 | 0.596 | -1.102 | 1.254 |
| Equal variances not assumed | | | 0.121 | 72.242 | 0.904 | 0.076 | 0.628 | -1.176 | 1.327 |

BMI: Body mass index

Table 5: Correlations Between BMI and SBP

| SBP | SBP | BMI |
|--------------------------|-------|-------|
| SBP | | |
| Pearson Correlation | 1 | 0.042 |
| Significant (two-tailed) | | 0.629 |
| N | 136 | 136 |
| BMI | | |
| Pearson correlation | 0.042 | 1 |
| Significant (two-tailed) | 0.629 | |
| N | 136 | 136 |

BMI: Body mass index, SBP: Systolic blood pressure

Table 6: Correlations Between BMI and DBP

| BMI | BMI | DBP |
|--------------------------|-------|-------|
| BMI | | |
| Pearson correlation | 1 | 0.112 |
| Significant (two-tailed) | | 0.194 |
| n | 136 | 136 |
| DBP | | |
| Pearson correlation | 0.112 | 1 |
| Significant (two-tailed) | 0.194 | |
| n | 136 | 136 |

BMI: Body mass index, DBP: Diastolic blood pressure

68.38%. The prevalence was more in boys than girls 48 (35.29%) and 45 (33.09%), respectively. The prevalence of prehypertension in this study is higher than the 21.7% prevalence reported from a study in a medical college in Puducherry.¹¹ A study of 100 medical students in Davangere showed a prevalence of prehypertension is 64%¹⁸ while two studies of 100 boys + girls and 150 girls in a medical college in Wardha showed a prevalence of prehypertension in 52% and 58%, respectively.^{19,20} The third study from a medical college in Dehradun among 400 students also revealed an overall prevalence of prehypertension of 58.75%.²¹ There was a significant association between excess weight and prehypertension in our study, similar to findings in other studies.^{14,18-20} A study from Israel concluded that BMI was the strongest predictor of prehypertension among males and females.²² A study among medical students in coastal Karnataka has found a significant correlation between prehypertension and BMI in boys¹⁴ while a study in Jamaica found a relation

to overweight/obesity and waist circumference among younger prehypertensives.²³

CONCLUSION

It can be concluded that in our study among healthy medical students prevalence of prehypertension is 93 (68.38%) which is again more in males than females. We have found a correlation between BMI and BP. There is more correlation between BMI and DBP than SBP. A lifestyle enhancement with yogic intervention in medical colleges may be the answer to reduce weight, BP, etc.

REFERENCES

1. Berenson GS, Wattigney WA, Bao W, Srinivasan SR, Radhakrishnamurthy B. Rationale to study the early natural history of heart disease: The Bogalusa Heart Study. *Am J Med Sci* 1995;310 Suppl 1:S22-8.
2. Ray S, Devi E, Sahu S, Rao EV. Evaluation of prolonged QT interval among uncomplicated obese young males. *Int J Med Pharm Sci* 2013;4:37-43.
3. Wang Y, Wang QJ. The prevalence of prehypertension and hypertension among US adults according to the new joint national committee guidelines: New challenges of the old problem. *Arch Intern Med* 2004;164:2126-34.
4. Greenlund KJ, Croft JB, Mensah GA. Prevalence of heart disease and stroke risk factors in persons with prehypertension in the United States, 1999-2000. *Arch Intern Med* 2004;164:2113-8.
5. Glasser SP, Judd S, Basile J, Lackland D, Halanych J, Cushman M, *et al.* Prehypertension, racial prevalence and its association with risk factors: Analysis of the reasons for geographic and racial differences in stroke (REGARDS) study. *Am J Hypertens* 2011;24:194-9.
6. Shen L, Ma H, Xiang MX, Wang JA. Meta-analysis of cohort studies of baseline prehypertension and risk of coronary heart disease. *Am J Cardiol* 2013;112:266-71.
7. Collier SR, Landram MJ. Treatment of prehypertension: Lifestyle and/or medication. *Vasc Health Risk Manag* 2012;8:613-9.
8. Guo X, Zhang X, Zheng L, Guo L, Li Z, Yu S, *et al.* Prehypertension is not associated with all-cause mortality: A systematic review and meta-analysis of prospective studies. *PLoS One* 2013;8:e61796.
9. National Nutrition Monitoring Bureau. Technical Report No. 25. Diet and Nutritional Status of Tribal Population and Prevalence of Hypertension among Adults - Report on Second Repeat Survey: National Institute of Nutrition. Hyderabad, India: National Nutrition Monitoring Bureau; 2009. p. 195.
10. Yadav S, Boddula R, Genitta G, Bhatia V, Bansal B, Kongara S, *et al.* Prevalence & risk factors of pre-hypertension & hypertension in an affluent north Indian population. *Indian J Med Res* 2008;128:712-20.
11. Asmathulla S, Rajagovindan D, Sathyapriya V, Pai B. Prevalence of prehypertension and its relationship to cardiovascular disease risk factors in Puducherry. *Indian J Physiol Pharmacol* 2011;55:343-50.

Bhattacharjya and Goswami: Prehypertension among the Medical Students and its Correlation with BMI

12. Mahmood SE, Husain AS. Prevalence of prehypertension and hypertension in rural Bareilly. *Natl J Med Res* 2012;2:291-4.
13. Ray S, Kulkarni B, Sreenivas A. Prevalence of prehypertension in young military adults & its association with overweight & dyslipidaemia. *Indian J Med Res* 2011;134:162-7.
14. Setty SS, Naik A. Prevalence of prehypertension amongst medical students in coastal Karnataka. *J Evol Med Dent Sci* 2012;1:975-80.
15. Sharma A, Grover N, Kaushik S, Bhardwaj R, Sankhyan N. Prevalence of hypertension among schoolchildren in Shimla. *Indian Pediatr* 2010;47:873-6.
16. Chobanian AV, Bakris GL, Black HR, Cushman WC, Green LA, Izzo JL Jr, *et al.* The seventh report of the joint national committee on prevention, detection, evaluation, and treatment of high blood pressure. *JAMA* 2003;289:2560-72.
17. Hanlon P, Byers M, Walker BR, Summerton C. Environmental and nutritional factors in disease. In: Boon NA, Collidge NR, Walker BR, editors. *Davidson's Principles of Internal Medicine*. 20th ed. London: Churchill Livingstone; 2006. p. 93-127.
18. Kulkarni MM, Hemagiri K, Malavika, Patil RS. Prehypertension and associated factors among medical students of SSIMS & RC, Davangere – A cross-sectional study. *J Indian Med Assoc* 2011;109:733-4, 736.
19. Kotpalliwar MK, Wanjari A, Acharya S. Prevalence of prehypertension in young healthy individuals and its associated risk factors. *Indian J Med Healthc* 2013;2:242-8.
20. Chaudhry K, Diwan SK, Mahajan SN. Prehypertension in young females, where do they stand? *Indian Heart J* 2012;64:280-3.
21. Kumar H, Uniyal N, Bawa S, Kumar S. Prevalence of prehypertension in students of tertiary care (medical) institute of North India. *Int J Med Sci Public Health* 2014;3:212-4.
22. Grotto I, Grossman E, Huerta M, Sharabi Y. Prevalence of prehypertension and associated cardiovascular risk profiles among young Israeli adults. *Hypertension* 2006;48:254-9.
23. Ferguson TS, Younger NO, Tulloch-Reid MK, Lawrence Wright MB, Ward EM, Ashley DE, *et al.* Prevalence of prehypertension and its relationship to risk factors for cardiovascular disease in Jamaica: Analysis from a cross sectional survey. *BMC Cardiovasc Disord* 2008;8:20.

How to cite this article: Bhattacharjya J, Goswami B. Prevalence of Prehypertension among the Medical Students and its Correlation with Body Mass Index. *Int J Sci Stud* 2016;4(7):13-16.

Source of Support: Nil, **Conflict of Interest:** None declared.