



ASSOCIATION OF BMI WITH PREHYPERTENSION IN YOUNG ADULTS OF NAVI MUMBAI

Physiology

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ABSTRACT

OBJECTIVES- The study was done to determine the prevalence of Prehypertension in young adults.

MATERIAL AND METHODS- Hundred Volunteers having age between 18-25 years were included in this study. Out of 100 Volunteers, 50 Volunteers were male and 50 Volunteers were female. FOUR groups were made (Under weight, Normal weight, overweight, and obese) depending on BMI. The SBP, DBP were recorded with help of OMRON Automatic blood pressure monitor and mean arterial BP was calculated by using formula diastolic pressure +1/3 pulse pressure.

RESULTS- Prevalence of systolic prehypertension and diastolic prehypertension in all 100 sample size were 30% and 16% respectively. The prevalence of systolic and diastolic prehypertension in underweight group were 12.5% and 0% respectively, in Normal weight group 7.69% and 5.12% respectively, in Overweight group 41.67% and 33.33% respectively, in Obese group 39% systolic and 21.95% respectively.

CONCLUSION- Our results shows that prehypertension is very common in young adults. We found that overweight and obesity has the strongest association with prehypertension. This alert us about possible cardiovascular risks and precautions to be taken before it becomes too late.

KEYWORDS

Prehypertension, Body Mass Index (BMI), Cardiovascular Diseases (CVD), Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP).

INTRODUCTION:

Prevalence of prehypertension and hypertension is increasing in the developing countries and developed countries.^{1,2} These diseases are associated with an increased risk of morbidity and mortality from cardiovascular disease (CVD) and represent the single greatest preventable cause of death in humans.³ CVD will be the largest cause of death and disability by 2020 in India and also India may become the capital of heart diseases in near future because it is predicted that 2.6 million deaths will be in India due to coronary heart disease which is almost 54% of CVD related deaths in the world.^{4,5} The Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC7), introduced a new blood pressure (BP) category, "Prehypertension," defined as a systolic blood pressure (SBP) of 120 to 139 mm Hg and/or a diastolic blood pressure (DBP) of 80 to 89 mm Hg.² A primary risk factor for Prehypertension is being overweight (body mass index >23kg/m²). Other risk factors include a family history of hypertension, a sedentary lifestyle, eating high sodium foods, smoking, and excessive alcohol intake. Prehypertension doesn't cause symptoms. In fact, severe high blood pressure may also not cause symptoms. Prehypertension is a continuum to hypertension and is emerging as an important risk factor for cardiovascular disease.⁶ According to some studies, prehypertensive person is more than three times more likely to have a heart attack and 1.7 times more likely to have heart disease than a person with normal blood pressure.⁷ Obesity is a common phenomenon occurring in the young adults of today.

Obese persons are approximately 6 times as likely to develop heart disease as normal weighted persons. Overweight and obesity are known to be significant risk factors for hypertension.⁸

The World Health Report, 2002 "Reducing Risks, Promoting Healthy Life" has identified obesity as one of the ten leading risk factors, globally.⁹ The change in the Body Mass Index (BMI) from higher range to lower side is associated with decreased cardiovascular risk.¹⁰

The prevalence of hypertension and cardiovascular disease is rapidly increasing in India. Approximately 30% to 50% of the worldwide population is prehypertensive.^{11,12} Estimation of prevalence of prehypertension and its risk factors is important for designing strategies for the control and prevention of cardiovascular diseases.¹³ The study was done to find the association of BMI with prehypertension in young adults of Navi Mumbai.

MATERIALS AND METHODS:

The study was conducted in the Department of Physiology at MGM

Medical College & Hospital, Navi Mumbai. The study was conducted after getting approval from Institutional Ethical Committee. 100 volunteers were participated in this study having age range from 18-25 yrs. Procedure was explained and demonstrated to them and their informed written consent was taken. After that their BMI, SBP, DBP, and pulse rate were recorded. Four groups (underweight, normal weight, over weight and obese) were made on the basis of BMI according to new Indian guideline. Then comparison of SBP, DBP, mean arterial pressure, pulse pressure, and pulse rate among all four groups were done. Prevalence of prehypertension in all four groups was also found.

Inclusion criteria of subjects:-

The subjects who were non-smokers, non-alcoholic, non-diabetic, and having no evidence of illness and having perfect physical, mental and psychological well-being are included in the study.

Exclusion criteria of subjects:-

Subjects who were non cooperative or refused to provide the necessary information were excluded from the study. Those individuals who were already diagnosed as hypertensive and were taking medicine for any disorder were excluded from the study.

Methodology:-

Blood pressure: - Blood pressure and heart rate was measured by using OMRON Automatic blood pressure monitor (HEM- 8712). After a rest period of 5 minutes, systolic and diastolic pressures were recorded from right upper arm in lying position. The subjects arm was placed at the heart level. Two readings were taken at an interval of 5 minutes and average of these two readings was used for analysis.

Pulse pressure: -Pulse pressure is the difference between the systolic and diastolic blood pressure.

Mean Arterial pressure (MAP): - Mean Arterial pressure was calculated by using formula, diastolic pressure +1/3 pulse pressure.

Heart rate: -Heart rate was recorded by using OMRON Automatic blood pressure monitor.

Body weight: - Body weight was measured with help of the standardized electronic Omron digital body weighing scale (HN-283) after removing heavy warm clothing, belts and shoes. While measuring the weight each subject was made to stand still and upright with weight evenly distributed between two feet.

Height: -Participant's heights was measured from the top of the head to the bottom of the feet with help of a fixed stadiometer in the standing position with the shoulders in relaxed position and arms hanging freely. While measuring the height, subject's shoes were removed.

Body Mass Index (BMI):-The Body Mass Index was calculated by using formula, "weight in kilograms divided by the square of the height in meters. On bases of BMI, obesity is classified as follows as per new Indian guideline.

- Under weight - <18kg/m²
- Healthy weight - 18.5-22.9kg/m²
- Over weight - 23 -24.9kg/m²
- Obese - >25kg/m²

Statistical analysis:

In present study, all data collected were statistically analyzed using ANOVA and Tukey HSD. The data was presented using descriptive statistics such as mean, standard deviation. Further, comparison among underweight, healthy weight, over weight and obese groups was done. All 'p' value of less than 0.05 was considered to be significant.

RESULTS:-

Table 1:- Shows comparison of Mean ± SD of BMI, SBP, DBP, HR, Mean arterial blood pressure, pulse pressure of participants of Under Weight, Healthy Weight, Over Weight and Obese groups.

	Under Weight N=8	Healthy Weight N=39	Over Weight N=12	Obese N=41	P- Values
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	
Body Mass Index (BMI)	16.91±0.41	20.52±1.34	23.82±0.51	28.94±3.78	0.001
Systolic Blood Pressure	105±8.53	111.03±12.26	117.5±11.58	120±13.58	0.001
Diastolic Blood Pressure	67±9.54	68.18±7.0	71.58±7.15	73.39±8.63	0.018
Heart Rate (HR)	74.13±6.44	74.9±10.0	76.33±7.34	76.56±11.07	0.848
Mean arterial blood pressure	79.66±7.29	82.46±7.85	86.88±8.13	88.93±9.55	0.002
Pulse pressure	38±11.97	42.85±9.91	45.92±7.54	46.62±9.47	0.079

The average MBI of participates in underweight group, healthy weight Overweight, and Obese is 16.91±0.41, 20.52±1.34, 23.82±0.51, 28.94±3.78 respectively. There is significant difference in BMI among these groups.

With increasing BMI, in each group, SBP, DBP and Mean arterial blood pressure increases significantly.

With increasing BMI, in each group, heart rate and pulse pressure increases but difference is not significant.

Table 2:- Shows prevalence of Prehypertension in different groups (BMI).

Groups of participants	Number of participants	Prevalence of SBP prehypertension		Prevalence DBP prehypertension	
		number	%	number	%
Underweight	8	1	12.5 %	0	0
Normal weight	39	3	7.69%	2	5.12%
Over weight	12	5	41.67%	4	33.33%
Obese	41	16	39%	9	21.95%

Prevalence of SBP and DBP prehypertension in Underweight group is 12.5% and 0% respectively.

Prevalence of SBP and DBP prehypertension in normal weight group is 7.69% and 5.12% respectively.

Prevalence of SBP and DBP prehypertension in over weight group is 41.67% and 33.33% respectively

Prevalence of SBP and DBP prehypertension in obese group is 39% and 21.95% respectively

DISCUSSION:-

This research was done to find the effect of increasing BMI of young adult of Navi Mumbai on their blood pressure and heart rate, and in this study prevalence of prehypertension in different BMI groups was also found.

Robinson and Brucerin 1939 found that prehypertensive individuals are more likely to be overweight and obese.¹⁴Our study shows similar findings (table 1,2)

Grotto et al in 2006 found that body mass index is the strongest predictor of prehypertension among both males and female.¹⁵Our study also shows the similar finding. (Table 1, 2)

P.Chhabra et al, 2006, observed that students with BMI more than 25 were more likely to have elevated blood pressure.¹⁶ Our study shows similar findings(Table 1,2)

M. Behjati et al in 2006 noted strong association of elevated blood pressure with elevated BMI.¹⁷ Our study also shows the similar finding. (Table 1, 2)

Jiang H et al in 1994, stated that both systolic and diastolic blood pressure were positively related to the body mass index.¹⁸Our study shows similar findings(Table 1,2)

Jiang X et al in 1995 found positive correlation between BMI and hyper dynamic Circulation that is increased Pulse Pressure and Heart Rate.¹⁹ Our study shows similar findings (Table 1, 2)

Mario V et al in 1997 found similar heart rate in the lean and obese subjects but diastolic blood pressure was significantly higher in obese subjects compared with the lean subjects.²⁰Our study shows similar findings(Table 1,2)

CONCLUSION:

- With increasing BMI in young adult SBP, DBP and Mean arterial blood pressure increases significantly.
- Prevalence of prehypertension is more in participants of obese and overweight groups as compare to participants of normal weight and underweight groups.

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