Section: Community Medicine

Original Research Article

A STUDY ON CORRELATION BETWEEN BLOOD PRESSURE AND OBESITY INDICES AMONG UNDER-GRADUATE MEDICAL STUDENTS OF A TEACHING HOSPITAL IN SOUTH INDIA: AN OBSERVATIONAL STUDY

Jyothi Conjeevaram[1], Shaik Khader Mohammad Ali[2], Rahul Conjeevaram[3], Sowjanya Tanikanti[3]

[1]*Professor and HOD, Department of Community Medicine, Narayana Medical College, Nellore, India.*
[2]*Assistant Professor, Department of Community Medicine, Narayana Medical College, Nellore, India.*
[3]*Assistant Professor, Department of General Medicine, Narayana Medical College, Nellore, India.*

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Corresponding Author:
Dr. Shaik Khader Mohammad Ali, Assistant Professor, Department of Community Medicine, Narayana Medical College, Nellore, India
Email: khadermohammadali001@gmail.com

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ABSTRACT

Background: Hypertension represents a major public health challenge world-wide, with evidence suggesting an increased risk of cardiovascular diseases and related mortality.India is undergoing both epidemiological and nutritional transition. Rapid urbanization and westernization often increase unhealthy lifestyle behaviours including sedentary lifestyle, and intake of energy-dense food. Studies in South India prompted us to investigate the association between BMI indices and obesity in our students in a tertiary teaching medical college.

Material and Methods: An observational Cross-Sectional study was conducted among Final MBBS Part-1 students of Narayana Medical College using convenient sampling method, Nellore after taking institutional ethics committee approval, for a period of 5 months from July to November with sample size of 250.

Results: Out of 253 students,about 8.7% of the study participants were prehypertensive and 3.2% of them had grade 1 hypertension (Figure 1). The proportion of students who were obese was 36.5% (n=92), while 17.5% were overweight (n=44) and9.9% (n=25) were underweight. Only 36.1% (n=91) were in the normal range (Figure 2).There was a statistically significant difference in the distribution of truncal obesity between male and female students (p=<0.006). 32.5% of the study participants had a positive family history of hypertension

Keywords: Correlation, Hypertension, Obesity, BMI, Waist Circumference.

INTRODUCTION

Hypertension represents a major public health challenge world-wide, with evidence suggesting an increased risk of cardiovascular diseases and related mortality.[1] Studies have shown that primary hypertension which was considered a disease of adulthood can be seen in younger individuals.[2] According to data obtained from National family health survey 5 (NFHS 5) from 2019 to 2021, prevalence of pre-hypertension in men from ages 15 – 19 and 20 – 24 was 37.8 and 50 respectively whereas the prevalence of hypertension was 4.6 and 8.7 respectively. The prevalence of pre-hypertension in women from the ages 15 – 19 and 20 – 24 was 22.9 and 28.7 respectively while the prevalence of hypertension in the same age groups were 3.3 and 4.7 respectively.[3]Body mass index (BMI) is the most commonly used measure of adiposity, however when used alone, it might not be the most consistent tool to predict cardiovascular(CV) and metabolic risk. This is because of its inability to differentiate between fat and lean mass. It can also not differentiate between visceral and subcutaneous fat.[4] Many studies have demonstrated that excessive truncal or android fat (abdominal or visceral fat) may be the driving force behind

increased cardiovascular disease (CVD) development[5,6]

India is undergoing both epidemiological and nutritional transition. Rapid urbanization and westernization often increase unhealthy lifestyle behaviours including sedentary lifestyle, and intake of energy-dense food. [7] A recent study conducted in Delhi, revealed that increasing waist circumference and waist hip ratio was significantly associated with risk of hypertension and dyslipidemia.[8]Similar study in north India with a sample size of 150, participants classified as overweight and obese had higher Systolic Blood Pressure(SBP), Diastolic Blood Pressure(DBP), Pulse Pressure (PP), and Mean Arterial Pressure (MAP) compared to those with normal BMI.[9] Most of the studies done in young adults in India to look for association between obesity and hypertension used BMI rather than waist circumference (WC) and waist hip ratio (WHR) which are better markers for abdominal or truncal fat. Also, the relative paucity on similar studies in South India prompted us to investigate the association between BMI indices and obesity in our students in a tertiary teaching medical college.

MATERIALS AND METHODS

An observational cross sectional study was conducted among Final MBBS Part-1 students of Narayana Medical College using convenient sampling method, Nellore after taking institutional ethics committee approval, for a period of 5 months from July to November with sample size of 250.

A Predesigned, Pretested, semi structured Questionnaire was administered to collect the data. All students who were willing to give consent and who were apparently healthy and free from chronic illness were chosen as study subjects. Students who were absent at three attempts of data collection and were not willing to give consent were excluded from the study.

Height was recorded using a platform height meter to the nearest centimeter, weight was recorded to the nearest kilogram; the same weighing machine was used throughout the period of study, and it was calibrated periodically. Body-mass index was calculated using the formula weight (in kg)/[height (meters)]^2 and classified on the basis of international obesity taskforce guidelines for Asians.[10] The measurement for waist circumference was taken according to WHO guidelines with a standard stretch resistant tape with the tape snug around the body.[11] The participants were then classified into increased metabolic risk or no metabolic risk based on WHO gender specific cut off points.[11]

BP of all patients were measured with mercury sphygmomanometers, with an appropriate cuff having a bladder that is 75%–100% and the width 35%–50% of the arm circumference. Patients were asked to refrain from taking coffee or tobacco at least half an hour before theprocedure. After resting for 5 minutes in a sitting position with their legs unfolded, back supported and having the arm supported at the level of the heart, three consecutive measurements were recorded in the left upper limb, and the mean BP was determined. The study population was classified into normotensive, pre hypertensive and hypertension stage 1 and 2 according to JNC classification.[12]

RESULTS

Out of 253 students, 115 (45.6%) were males and 137 (54.4%) were females. The mean age of the study participants was 21.36 ± 1.07 years. About 8.7% of the study participants were prehypertensive and 3.2% of them had grade 1 hypertension (Figure 1). The proportion of students who were obese was 36.5% (n=92), while 17.5% were overweight (n=44) and9.9% (n=25) were underweight. Only 36.1% (n=91) were in the normal range (Figure 2). The mean BMI was 23.98 ± 4.9 kg/m2 and there was no significant statistical difference between males and females (p=>0.05). Based on waist circumference measurements, 46% of females (n=63) and 40% of males (n=46) were found to have central obesity (Figure 3) accounting for an overall proportion of 43% among 252 study participants. The distribution of central obesity between male and female students was statistically significant (p=<0.001). Similarly, 13.9% (n=19) of the female participants and 24.3% (n=28) male participants had WHR greater than defined gender-specific cut-off values indicating truncal obesity. (Table 2) There was a statistically significant difference in the distribution of truncal obesity between male and female students (p=<0.006). 32.5% of the study participants had a positive family history of hypertension. Among the study subjects, the mean systolic blood pressure was found to be 114 mm Hg ± 13.2 mm Hg and mean diastolic BP was 73mm Hg ± 8.1. The mean systolic blood pressure among males was 122.23 ± 11.9 mm Hg and mean diastolic BP was 76.11 ± 8.1mm Hg).The mean systolic blood pressure among females was 107.2 ± 10 mm Hg and mean diastolic BP was 70.43 ± 7.1mm Hg. Mean systolic blood pressure was found to have significant positive correlation with mean DBP (r=0.739, p=<0.001), BMI (r=0.352, p=<0.001), waist circumference (r= 0.421, p=<0.001) and WHR (r=0.379, p= <0.001). Mean diastolic blood pressure was found to have significant positive correlation with mean SBP (r=0.739, p=<0.001), BMI (r=0.390, p=<0.001), waist circumference (r= 0.414, p=<0.001) and WHR (r=0.270, p= <0.001) (Table no 3). No significant association was seen between Family history of hypertension and SBP, DBP (p=>0.05).

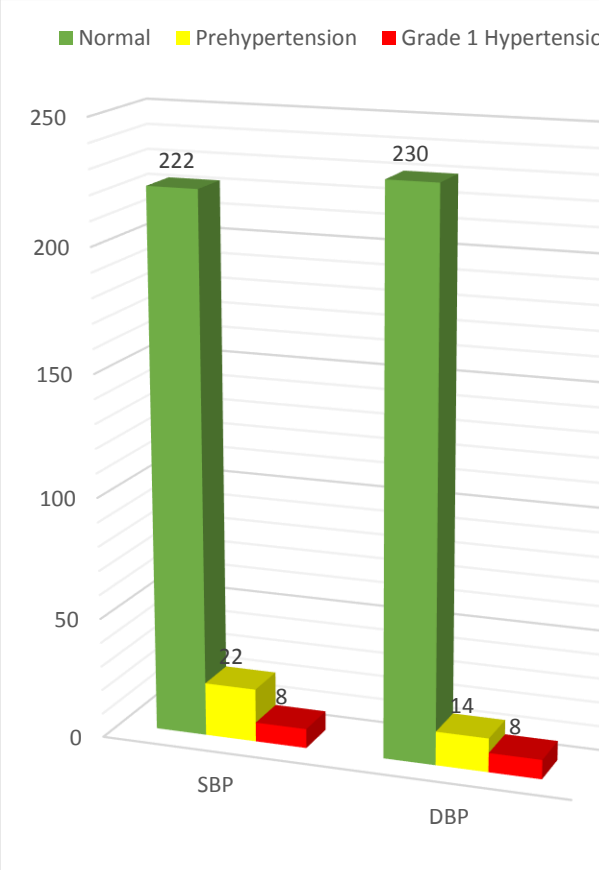

Figure 1: Bar diagram showing distribution of study participants according to Blood Pressure (n=252)

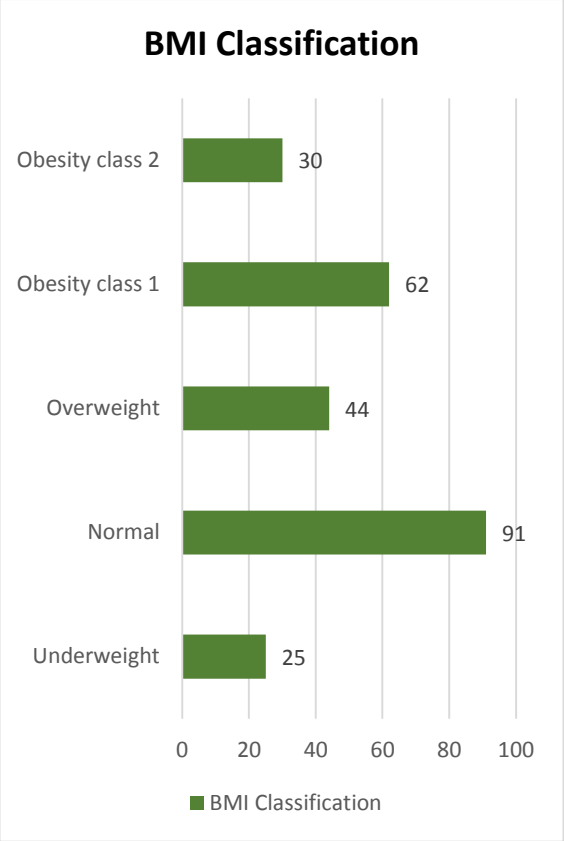

Figure 2: Bar diagram showing distribution of study participants according to BMI(n=252)

Table 1: Distribution of study participants according to waist hip ratio. (n=250)

Waist hip ratio		Frequency	Percent
Male	**<0.90**	**87**	**75.7%**
	>0.90	**28**	**24.3%**
	Total	**115**	**100%**
Female	**<0.85**	**120**	**87.6%**
	>0.85	**17**	**12.4%**
	Total	**137**	**100%**

The mean waist circumference of the study participants was 84.150 with standard deviation of 13.08 while hip circumference mean was 101.875 with standard deviation of 12.146.

Table 2: Correlation between different variables of the study(n=252)

Variable		Waist circumference	BMI	WHR
Mean SBP	**Pearson Correlation**	**0.421**	**0.352**	**0.379**
	P value	**0.0001**	**0.0001**	**0.0001**
Mean DBP	**Pearson Correlation**	**0.414**	**0.390**	**0.270**
	P value	**0.0001**	**0.0001**	**0.0001**

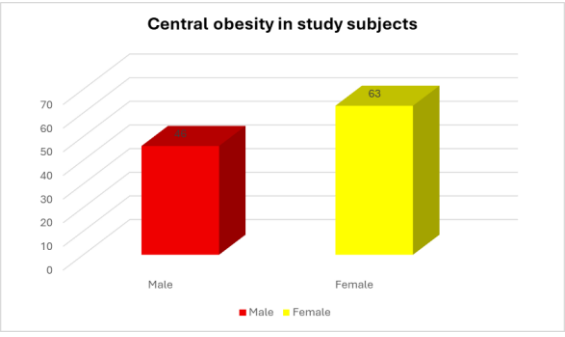

Figure 3: Bar diagram showing distribution of central obesity in study subjects. (n=252)

DISCUSSION

In the present study females outnumbered males and the male to female ratio was 1:1.19 with the mean age of study participants being 21.36± 1.07 years.The demographic characteristics of the current study was comparable to the studies conducted byBinod kumarsingh et.al, and Mukhopadhyay S et.al,in variioustertiary care centersacross India.[13,14]In the current study 54% of the study participants had a BMI exceeding 24 kg/m², of which 36.5% were obese and 17.5% were overweight. The mean BMI was 23.98 ± 4.9 kg/m2

and there was no significant statistical difference between males and females. In a study conducted by Abdul aziz et.alonly 21.2% of the study population was overweight/obese (BMI>24KG/m^2).[15] Similarly in studies conducted by Binod kumarsinghetal. and Nimisha etal., the percentage of study population who were overweight/Obese was 27.1% and 30.1% respectively. [14,16] The disparity in BMI might be attributed to the fact that this study was conducted in a private medical college where the students might spend more money consuming highly processed, calorie dense foods.

Based on waist circumference, the overall prevalence of central obesity among the 252 study participants in the current studywas 43%, with rates of 46% in females and 40% in males.The distribution of central obesity between male and female students was statistically significant (p=<0.001). Waist hip ratio (WHR) was greater than gender specific cut off values indicating truncal obesity in 13.9% of female participants and 24.3% of male participants. The difference in distribution of truncal obesity in males and females was statistically significant. The distribution of central obesity between male and female students was statistically significant (p=<0.001). In a study by Binod Kumar Singh et alit was found that based on waist circumference measurements, 25.2% of females and 32.1% of male were found to have increased metabolic risk and 26.4% of the study participants had WHR greater than defined gender-specific cut-off values indicating increased metabolic risk.[14]

Of the 252 participants in our study, 8.7% were pre-hypertensive and 3.2% had grade 1 hypertension. In a similar study conducted by Rashmi Kashyap et al,pre- hypertension was present in 23.4% of the students and none of the students had hypertension.[17] In another study done by Nimisha v et al. in undergraduate medical students from Karnataka, 36.4% of the students had blood pressure over 120/80 mm of Hg.[16]

In our study, the mean systolic blood pressure was found to be 114 mm Hg ± 13.2 mm Hg and mean diastolic BP was 73mm Hg ± 8.1. Mean systolic blood pressure was found to have significant positive correlation with BMI (r=0.352, p=<0.001), waist circumference (r= 0.421, p=<0.001) and WHR (r=0.379, p= <0.001) and Mean diastolic blood pressure was found to have significant positive correlation with BMI (r=0.390, p=<0.001), waist circumference (r= 0.414, p=<0.001) and WHR (r=0.270, p= <0.001).The results were comparable to the findings from the study done by Binod kumarsingh et al. where the mean systolic blood pressure was 125.50 ± 13.64 mm Hg and mean diastolic BP was 82.15 ± 6.77 mm Hg. Mean systolic blood pressure was found to have significant positive correlation with age (r=0.231, p=0.041), BMI (r=0.631, p=0.002), and waist circumference (r=0.497, p<0.001). Mean diastolic blood pressure was positively correlated with positive family history of hypertension (r=0.522, p<0.001), BMI (r=0.474, p=0.001) and Waist circumference (r=0.276, p=0.03).[14]Similarlyin the study by Nimisha v et al, SBP showed statistically significant positive correlation with BMI (r=0.436, p=0.001), WC (r=0.498, p=0.001), and Waist Hip Ratio (r=0.417, p=0.001).[16]

CONCLUSION

It has been observed in our study that there is an increasing prevalence of overweight and obesity among this generation of adolescent and young adults. The metabolic burden of overweight and obesity is reflected as an increased incidence of pre-hypertension and hypertension. Control of obesity centres around weight reduction which can achieved through a combination of practicing a healthy diet and regular physical activity. This can be ensured by implementing regular and compulsory physical education classes at both school and college level. Care must be taken to inculcate good dietary habits right from childhood.

Limitation

This is a single center study, and so results cannot be generalized to the general population. A study in the community settings can be planned for generalization of results.

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