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Original Research Article

A Cross-Sectional Study to Determine Association of Body Mass Index and Body Roundedness Index with Blood Pressure in Young Adults

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ABSTRACT

Hypertension and high body-mass index have increased as risk factors to global burden of diseases. Young adults are predisposed to obesity and overweight during the passage from adolescence to adulthood. This study aims to determine association between BMI & BRI with blood pressure in young adults.

In our study Body Mass Index, as well as Body Roundedness Index shows a strong positive correlation with SBP, DBP & MAP in male and female participants which is statistically significant.

Keywords: Anthropometric Indices, BMI, BRI, Blood Pressure

INTRODUCTION

Hypertension and high body-mass index have increased as risk factors to global burden of diseases [1]. A study by ICMR conducted in 2015 showed that the prevalence rate of obesity varies from 11.8% - 31.3% and central obesity varies from 16.9% - 36.3% [2].

In past few decades, developing countries, especially those undergoing epidemiological transition, have observed an increasing trend of obesity and non-communicable diseases. Young adults are predisposed to obesity and overweight during the passage from adolescence to adult in developing countries as well as in developed countries [3].

BMI is widely used as an anthropometric measure of obesity due to its simplicity and ease of calculation. With increasing burden of obesity, especially central obesity, the limitations of BMI as an indicator of obesity are its inability to distinguish between lean body mass and fat mass, identifying the fat distribution (central or general), and its inequality in validity across gender, races and ethnicities, and age groups [4]. Therefore, measures of central obesity would provide more accurate screening tool for prediction of hypertension.

Adiposity influences blood pressure (BP) by activating the renin – angiotensin – aldosterone system and by increasing the sympathetic nervous system activity in the body [5]. In India, abdominal obesity is one of the major risk factors for cardiovascular disease (CVDs).

Body roundness Index (BRI) was developed as an index of central adiposity by Thomas et al. in 2013, to predict body fat, the percentage of visceral adipose tissue, and establish an initial impression of an individual's physical health [6], their study showing that BRI slightly improved predictions of percentage of body fat and percentage of visceral adipose tissue. Higher BRI indicates obesity. The

Hypertension is directly responsible for 57% of all stroke deaths and 24% of all coronary artery disease deaths in India [7]. The burden of hypertension has shown an increasing trend in younger population in some countries[8,9]. Hypertension is a risk factor for various cardiovascular diseases; therefore, this study aims to determine association between BMI & BRI with blood pressure in young adults.

MATERIAL AND METHODS

A cross-sectional study was conducted in 65 young adults (age 18-25 years) after obtaining ethical clearance.
Written informed consent was obtained from the participants. Participants with history cardiovascular disease, metabolic and neurological disorders, those taking drugs affecting cardio respiratory response and Subjects consuming alcohol and smokers were excluded from study. BP was measured in sitting position using mercury sphygmomanometer. Blood pressure was measured three times at 2 minutes intervals after 5 minutes of rest & mean of the three readings was used in analysis. Height was measured to the nearest 0.1 cm using a stadiometer. Weight was measured using weighing scale to the nearest 0.1 kg. Waist circumference was measured using a non-stretchable measure tape, at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest [10].
Body Roundedness Index was calculated by using the following formula [11]:

$$BRI = 364.2 - 365.5 \times \sqrt{1 - \left(\frac{(WC/2\pi)^2}{(0.5 \times height)^2}\right)}$$

Data was entered in Ms Excel for cleaning and was analyzed by in SPSS

RESULTS

Body Mass Index, as well as Body Roundedness Index shows a strong positive correlation with SBP, DBP & MAP in male and female participants which is statistically significant.

Table-1 Descriptive Statistics (Mean ± SD)

	Females	**Males**
N	28	37
Age (Years)	18.82 ± 0.72	18.92 ± 0.72
SBP (mmHg)	110.14 ± 7.54	119.78 ± 9.95
DBP (mmHg)	70.0 ± 7.40	77.89 ± 5.99
MAP (mmHg)	83.38 ± 7.08	91.85 ± 6.86
Weight (Kg)	53.40 ± 12.75	62.24 ± 12.34
Height (cm)	157.64 ± 7.28	170.79 ± 6.23
BMI (kg/m2)	21.51 ± 5.17	21.38 ± 4.40
Waist Circumference (cm)	77.39 ± 11.61	82.0 ± 12.11
BRI	3.32 ± 1.65	3.10 ± 1.39

Table 2-Correlation between BMI, BRI with BP

	BMI		**BRI**	
	Females	**Males**	**Females**	**Males**
	Correlation coefficient	Correlation coefficient	Correlation coefficient	Correlation coefficient
SBP	0.549**	0.572*	0.577*	0.523*
DBP	0.514**	0.423**	0.416**	0.283
MAP	0.554**	0.512*	0.495**	0.402**

*** p<0.001 ** p<0.05**

DISCUSSION

The correlation of BMI & BRI with blood pressure components was found to be statistically significant in both genders. The association between indices of adiposity and blood pressure can be explained by the increased sympathetic activity & activation of renin-angiotensin-aldosterone system in obesity [5]. Till date various studies have been conducted to study the association between BMI & blood pressure components [12,13,14,] with results similar to our study, showing a strong positive association. Xu et al. found that BRI was a superior indicator to associate with cardio-metabolic risk factors in Chinese adults [15.]

CONCLUSION

The BRI showed a predictive capacity and potential for early detection and evaluation of HTN, similar to BMI. Due to complexity in its formula as compared to BMI, BRI does not prove superiority over BMI as an index of obesity and prediction of early risk of cardiovascular death.

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