



Association Between BMI and Blood Pressure of Adolescents from Mumbai City

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Abstract: Correlation of blood pressure was assessed with body fat percentage, total body muscle, energy and protein intake according to gender. As seen in Table 4, the systolic BP was significantly correlated with body fat percentage and total body muscle in both boys and girls ($p < 0.05$). As against this, diastolic BP was correlated with body fat percentage, total body muscle and dietary intake only in girls ($p < 0.05$). There was no correlation of systolic BP with dietary intake in either boys or girls ($p > 0.05$). There was also no correlation of diastolic BP with body fat percentage, total body muscle or dietary intake in boys ($p > 0.05$).

Key words: adolescent, nutritional requirements, alcohol and drug

Introduction: The word "adolescent" has its origin from the Latin word "adolescere" which means to grow or "grow to maturity". It is the time of profound biological, emotional, social and cognitive changes during which a child develops in to an adult. Adolescence is a period of rapid growth and maturation in human development. (Venkaiah, Damayanti and Vijayraghavan 2002). The physiological development during adolescence is divided in to three periods: early adolescence (11 to 14 years), middle adolescence (15 to 17 years), and late adolescence (18 to 21 years) (Stang 2002).

The adolescent years are associated with increased nutritional requirements since 50% of adult height and skeletal mass is gained (Haboubi and Sheikh 2009) during this stage. However, It is observed the adolescent struggles to strive for independence during this phase, leading to the development of health compromising eating behaviour such as excessive dieting, meal skipping, use of unconventional nutritional and non-nutritional supplements along with adoption of fad diets (Stang 2002) thus

leading to the development of various lifestyle diseases (hypertension, heart diseases, obesity, and diabetes as also conditions associated with smoking, alcohol and drug abuse etc leading to premature mortality). These appear to become ever more widespread as countries become more industrialized. Moreover, these are different from other diseases because they are potentially preventable and can be lowered with changes in diet, lifestyle, and environment (Bhadra M and Mukhopadhyaya A 2005). The present study aimed to assess the nutritional status and observe the association between Body mass index (BMI) and blood pressure (BP) of adolescents from Mumbai City.

Methods: Data was collected in 220 (115 girls and 105 boys) higher secondary students aged 18 years over a period of seven months. Anthropometry (height, weight), BP and heart rate were measured. BMI was calculated. Body composition was assessed using bioelectrical impedance (TANITA BC-605). Dietary energy and protein intake



was assessed using a 3 day diet recall. Percentage recommended dietary allowance was calculated.

Results: Table -1 presents the anthropometric status of the study population according to gender. As seen in Table 1, height, weight, total body muscle, systolic BP and diastolic BP were significantly higher in boys than in girls

($p < 0.05$). As against this, body fat percentage and heart rate were significantly higher in girls than in boys ($p < 0.05$) (Table 1). There was no significant difference in waist circumference, hip circumference and body mass index of boys and girls ($p > 0.05$) (Table 1).

Table 1:Anthropometric characteristics and blood pressure of the study group

Anthropometric characteristics and blood pressure	Boys (n=105) (Mean±SD)	Girls (n = 115) (Mean±SD)	P value
Height (cm)	168.3±6.9	155.4±6.5	0.001
Weight (kg)	56.6±13.4	47.6±11.6	0.001
Body Mass Index (kg/m ²)	20.0±4.5	19.5±4.5	0.385
Waist circumference (cm)	76.1±11.1	74.6±13.9	0.369
Hip circumference (cm)	90.8±9.3	90.8±12.4	0.999
Body fat (%)	13.9±7.1	26.9±14.5	0.001
Total body muscle (%)	45.1±8.5	33.1±4.8	0.001
Heart rate (beats/min)	81±18	85±16	0.049
Systolic BP (mmHg)	124±12	110±12	0.001
Diastolic BP (mmHg)	73±9	69±11	0.004

p-value (<0.05)

Table- 2 presents dietary intake of the study population according to gender. Dietary energy and protein intake was analyzed and percentage recommended dietary allowance was calculated. The percentage RDA energy intake was significantly higher in girls (65.5±22.9%)

as compared to boys (56.7±16.1%) ($p < 0.05$) whereas RDA protein intake was similar in both boys (62.2±24.6%) and girls (65.0±37.0%) ($p > 0.05$). There was no significant difference in other dietary parameters between the groups ($p > 0.05$).



Table 2: Dietary intake of the study group

Dietary intake	Boys (n=105) (Mean±SD)	Girls (n = 115) (Mean±SD)	P value
Energy (kcal/day)	1316±372	1245±435	0.196
Protein (g/day)	37.3±14.8	36.1±20.5	0.607
Percentage recommended intake energy	56.7±16.1	65.5±22.9	0.001
Percentage recommended intake protein	62.2±24.6	65.0±37.0	0.515

p-value (<0.05)

When association of BMI was assessed with blood pressure, body fat percentage and total body muscle for all the 220 children (Table-3), it was found that, there was a significant correlation of BMI with blood pressure [systolic ($r=0.386$; diastolic ($r=0.247$)], body fat ($r=0.394$) and muscle mass ($r=0.534$) ($p<0.05$), while the association of BMI with energy intake ($r=0.103$) or protein intake was non significant ($r=0.092$) ($p>0.05$).

Correlation of blood pressure was assessed with body fat percentage, total body muscle, energy and protein intake

according to gender. As seen in Table 4, the systolic BP was significantly correlated with body fat percentage and total body muscle in both boys and girls ($p<0.05$). As against this, diastolic BP was correlated with body fat percentage, total body muscle and dietary intake only in girls ($p<0.05$). There was no correlation of systolic BP with dietary intake in either boys or girls ($p>0.05$). There was also no correlation of diastolic BP with body fat percentage, total body muscle or dietary intake in boys ($p>0.05$).

Table 3: Correlation of BMI with blood pressure, body fat percentage, total body muscle and dietary intake

Parameters	Boys (n=105)	BMI Girls (n = 115)
	P value	P value
Systolic BP	0.417*	0.411*
Diastolic BP	0.101	0.373*
Body fat percentage	0.831*	0.287*
Total body muscle	0.681*	0.438*
Energy	0.070	0.124
Protein	0.052	0.121

p-value (<0.05)

Table -4:



Correlation of blood pressure with body fat percentage, total body muscle and dietary intake

Blood pressure, body fat percentage, total body muscle and dietary intake	Systolic BP		Diastolic BP	
	Boys (n=105) P value	Girls (n = 115) P value	Boys (n=105) P value	Girls (n = 115) P value
Body fat percentage	0.331*	0.293*	0.051	0.287*
Total body muscle	0.223*	0.521*	0.110	0.438*
Energy	0.123	0.061	0.020	0.205*
Protein	0.160	0.172	0.067	0.229*

p-value (<0.05)

Conclusion: The incidence of high blood pressure among adolescents and its association with body composition is a serious cause of concern and hence suitable strategies need to be developed and implemented in order to prevent life style diseases among the youth.

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