IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 17, Issue 7 Ver. 2 (July. 2018), PP 04-10
www.iosrjournals.org

Between Body Mass Index And Blood Pressure: Study Among Medical Students In West Bengal

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Abstract: *The awareness that adult hypertension has its origin in childhood has raised interest on screening for elevated blood pressure (BP) in adolescent. Blood pressure is found to be increased among population having high BMI. Both are risk factors for many noncommunicable diseases like ischemic heart disease (IHD), cardiovascular disease (CVA), diabetes mellitus (DM) and certain cancers which lead to morbidity and mortality of the patients. The objective of the study was to establish relationship between Blood pressure and BMI among medical students of West Bengal. Total 99 students of 1st year MBBS students having age between 17-24 years were selected using random sampling method. Written consent of all the students was obtained. Parameters used in the study were height, weight, Body mass index (BMI), Systolic and Diastolic Blood Pressure. Height and weight were measured using Stadiometer and weighing scale respectively. BP was recorded by Mercury Sphygmomanometer. BMI was calculated by Height and Weight. Almost 26% of participants had BMI ≥25 kg/m^2 i.e. either overweight or obese. Major participants of this group had either systolic or diastolic or both types of hypertension. Odds ratio (5.381) showed that overweight and obese subjects are more likely to have hypertension than those with normal BMI. There was a significant positive correlation between BMI and both systolic and Diastolic Blood pressure. Hence, an increase in BMI positively influences BP among adolescent population.*

Key Words: *Blood pressure, Body mass index, Cardiovascular accident, Diabetes mellitus, Ischaemic heart disease.*

Date of Submission: 24-06-2018 Date Of Acceptance: 09-07-2018

I. Introduction

Prevalence of overweight and obesity are increasing across the world. BP is found to be increased among population having higher BMI. Both are risk factors for many non-communicable diseases like IHD, CVA, type II DM and certain cancers which lead to morbidity and mortality of the patients. It has been observed that causes of overweight and obesity are multifaceted. Some factors seem to play a significant role, such as consuming too much calories coupled not physical exercising enough to burn the excess calories, a combination that easily results in becoming overweight. India in a process of rapid economic development and modernization with changing lifestyle factors has an increasing trend of hypertension, especially among the urban population.[1] The awareness that adult hypertension has its origin in childhood has raised interest on screening for elevated blood pressure in adolescent and it has been found that obesity in youth is a growing epidemic worldwide. Children and adolescents who are obese are likely to be obese as adults[2] and are consequently more at risk for adult health problems such as heart disease, type II diabetes, stroke, numerous type of cancer and osteoarthritis.[3]

II. Materials And Methods

A cross-sectional study was conducted in Bankura Sammilani Medical College, Bankura during the period January 2017-April, 2017 among 99 healthy first professional MBBS students (both male and female) of this institution, belonged to the age group of 17 to 24 years. Random sampling was done to obtain study participants.

Inclusion criteria: Asymptomatic healthy subjects who had given consent voluntarily to take part in the study.
Exclusion criteria: Known hypertension, diabetes and ill health.
Instruments were used: Mercury Sphygmomanometer, Stethoscope, Weighing Machine, Measuring steel Tape, Stadiometer.

Parameters under consideration were: Height, Weight, thus BMI was calculated, Systolic and Diastolic Blood pressure.
BMI <18.5 kg/m^2 was considered Underweight. Within 18.5-24.9 kg/m^2 was considered Healthy. Within 25-29.9 kg/m^2 was considered overweight and ≥30 kg/m^2 was categorized as Obesity.[4]

Height was measured in standing position using a Stadiometer. Weight was measured using a weighing Scale. Blood pressure was recorded from the left and right upper arm in sitting position using Mercury Sphygmomanometer using a cuff of appropriate size, after a period of at least 10 minutes. The mean of the two readings was used for the study.

Statistical analysis: Data were codified in MS excel sheet and relevant statistical analyses were done by statistical software package (SPSS ver. 20). The level $p < 0.05$ was considered as the cutoff value or significance. By Shapiro-Wilks' test, it was found that the data were not normally distributed and hence nonparametric tests were mandate for analysis.

III. Results

Table- 1: Descriptive statistics of different parameters:

Parameters	Minimum	Maximum	Mean	SE of Mean	SD	Variance
Age (years)	17	24	19.34	0.106	1.051	1.105
BMI (kg/ m^2)	15.873	42.719	23.267	0.444	4.418	19.515
SBP (mm of Hg)	96	160	120.75	1.349	13.421	180.129
DBP (mm of Hg)	66	110	79.70	0.847	8.424	70.968

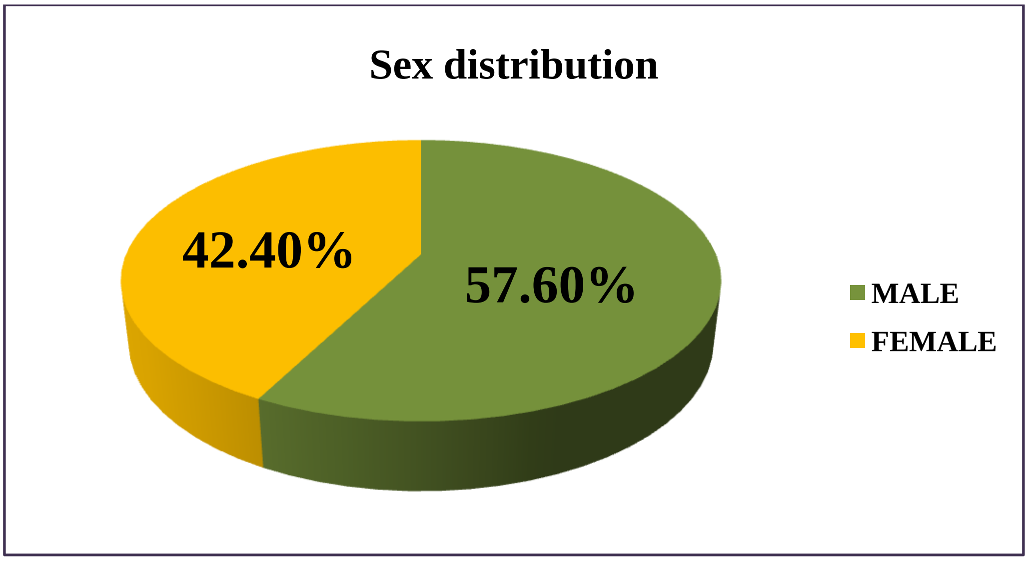

Figure-1: Gender distribution among the participants

Among 99 participants 57 were male, hence male preponderance was obvious.

Total participants who had normal BMI were 73%. Total overweight or obesity (as per BMI) was found to be more in case of female participants 28.6%with respect to male 24.6%.

Table- 2: Relationship between hypertension (HTN) and BMI

Types of HTN		BMI Groups (kg/ m^2)						Total
		<18	18-24.99	25- 29.99	30- 34.99	35- 39.99	>40	
No HTN	Count	4	37	5	0	0	0	46
	% within HTN	8.7%	80.4%	10.9%	0%	0%	0%	100%
	% within BMI groups	80%	54.4%	26.3%	0%	0%	0%	46.5%
ISH	Count	1	20	3	0	0	0	24
	% within HTN	4.2%	83.3%	12.5%	0%	0%	0%	100%
	% within BMI groups	20%	29.4%	15.8%	0%	0%	0%	24.2%
IDH	Count	0	6	4	2	0	0	12
	% within HTN	0%	50.0%	33.3%	16.7%	0%	0%	100%
	% within BMI groups	0%	8.8%	21.1%	50%	0%	0%	12.1%
Both SH & DH	Count	0	5	7	2	2	1	17
	% within HTN	0%	29.4%	41.2%	11.8%	11.8%	5.9%	100%
	% within BMI groups	0%	7.4%	36.8%	50%	100%	100%	17.2%

Adolescents with higher BMI were significantly associated with Isolated systolic Hypertension (ISH), Isolated Diastolic Hypertension (IDH), Systolic Hypertension (SH) and Diastolic hypertension (DH).

Table- 3A: Relationship between BMI and Blood Pressure of the participants

BMI		Blood Pressure (mm of Hg)		Total
		Normotension	Hypertension	
Normal BMI	Count	41	32	73
	% within BMI group	56.2%	43.8%	100.0%
Overweight or Obese	Count	5	21	26
	% within BMI group	19.2%	80.8%	100.0%
Total	Count	46	53	99
	% within BMI group	46.5%	53.5%	100.0%

Table- 3B: Odds ratio between BMI and Blood Pressure of the participants

Risk Estimation			
	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for BMI group (Normal/Overweight or Obese)	5.381	1.829	15.835
For cohort BP = Normotension	2.921	1.295	6.587
For cohort BP = Hypertension	0.543	0.394	0.748

Table 3A and 3B showed that overweight or obese subjects were more likely to have hypertension than those with normal BMI.

Table- 4: Spearman correlation between parameters

Spearman's Correlations		**Age**	**BMI**	**SBP**	**DBP**
Age	Correlation Coefficient	1.000	0.136	0.032	0.139
	Sig. (2-tailed)		0.180	0.751	0.169
BMI	Correlation Coefficient	0.136	1.000	0.456	0.442
	Sig. (2-tailed)	0.180		**<0.001**	**<0.001**
SBP	Correlation Coefficient	0.032	0.456	1.000	0.421
	Sig. (2-tailed)	0.751	**<0.001**		**<0.001**

There was a highly significant positive correlation between BMI and both Systolic and Diastolic Blood pressure.

IV. Discussion

Our study showed that significant correlation present between BMI and DBP or SBP among medical students. Many previous works by various authors also support this finding. In a study, conducted among Punjabi girls of Delhi, a significant correlation of BMI with Blood pressure was also found.[5] Positive association between BMI and BP have also been reported in other Indian populations.[6,7] Kumanyika et al. had shown BMI was even more strongly related than race to Blood pressure.[8] Although ethnicity and genetics have long been known to influence the distribution of blood pressure levels within a population, these factors seemed to have less bearing on the difference in blood pressure levels between populations.[9] Odds ratio showed that BMI was a significant predictor of high Systolic and Diastolic BP. Similar findings had been reported in other studies.[10,11] Some studies have documented a consistent but modest association between BMI and BP,[12] whereas others suggested a BMI threshold at which level the relationship with BP begins.[13]

V. Conclusion

Significant correlation is present between BMI and DBP or SBP among Medical Students. So Basic measurement of weight and height to determine the BMI as routine assessment with appropriate life style modification will help in controlling hypertension as also reduce its prevalence.

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Dr. Gautam Chaudhuri " Association Between Body Mass Index And Blood Pressure: Study Among Medical Students In West Bengal. "IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), vol. 17, no. 7, 2018, pp 04-10.