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Research Article

CORRELATION BETWEEN BODY MASS INDEX & WAIST CIRCUMFERENCE WITH BLOOD PRESSURE INDICES IN HEALTHY ADOLESCENTS

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ABSTRACT

Background: Obesity is a complex condition, with serious social and psychological dimensions, affecting virtually all ages and socioeconomic groups (WHO). The direct effects of the obese state on heart function, and the means by which excessive body fat might negatively affect cardiac health during the growing years, however, has received less attention, so priority is given in this study to assess cardiac parameters in young adults ***Aim:*** we compared blood pressure indices in Normal & Overweight groups and also according to waist circumference. ***Methods:*** Subjects were enrolled between age group of 18-22 years based on detailed questionnaire and informed consent was obtained. *Exclusion criteria*: we excluded subjects having cardiovascular problems and also on steroid or other drugs. Automated blood pressure monitor was used to measure blood pressure. Unpaired *'t'* test was used for comparing groups and Pearson's correlation coefficient was used for comparing according to waist circumference. *Result:* systolic blood pressure, Diastolic blood pressure & Mean pressure are significantly high in overweight groups and the same showed significant positive correlation with waist circumference. ***Conclusion:*** Increase in body fat leads to increase in blood pressure in apparently healthy adolescent group.

INTRODUCTION

Obesity has emerged as an epidemic in developed countries during the last quarter of the 20th century. The prevalence is however increasing in the developing countries as well. Often coexisting in developing countries with under-nutrition; obesity is a complex condition, with serious social and psychological dimensions, affecting virtually all ages and socioeconomic groups (*Chhatwal J et al, 2004*).Concern grows that the current dramatic rise of obesity among adolescents portends a future wave of increasing cardiovascular disease as these overweight youths reach the adult years (*Mohan B et al, 2004*). The direct effects of the obese state on heart function, and the means by which excessive body fat might negatively affect cardiac health during the growing years, however, has received less attention, so priority is given in this study to assess cardiac parameters in young adults (*Maffeis C et al, 2001*). A variety of adaptations in cardiorespiratory structure and function occur in the individual as adipose tissue accumulates in excess amounts, even in the absence of co-morbidities. Hence, obesity may affect the heart and lungs through its influence on known risk factors such as dyslipidemia, hypertension, glucose intolerance, inflammatory markers, obstructive sleep apnea, hypoventilation, and the prothrombotic state, in addition to as yet unrecognized mechanisms. The cardiovascular disorders due to obesity result in increased mortality from complications such as coronary artery disease, heart failure, arrhythmias and sudden death. Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and increased health problems. Most popular index to compare body composition of people and to categorize them as obese and non-obese is the Body mass index (BMI) (*Julie A et al, 2014*).

The BMI is an index of weight adjusted for stature. It is one of the useful tools for diagnosing obesity or malnutrition; however, such diagnosis should take into account a person's age, gender, fitness, and ethnicity. The BMI has also been associated with mortality, with lower values generally correlating with longer life (*Prospective Studies Collaboration, 2009*). Because ethnicity has been shown to require adjustments to the levels of concern for the BMI, care must be taken when comparing different population groups. For example, Asian populations may require a lower BMI to describe health risk, while Pacific populations, specifically Hawaiian, may require a higher threshold or higher level of BMI to indicate that an individual is at risk (*Yates A et al, 2004*). This variation can be explained by body type. Fat

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redistributes centrally, with increase in waist circumference is thought to reflect increase in visceral fat with age .BMI and waist circumference have been used to evaluate health risks associated with overweight and obesity. Because both are easy measures to do, standardization of both are encouraged for widespread use as a reference. Additionally, the two measurements have been used in an algorithm with a cardiovascular risk index to determine which individuals would benefit most from weight loss.

Students of M.B.B.S course have a hectic schedule consisting of lectures, practical and examinations, due to which making time available for exercise is difficult. Most students of M.B.B.S Course have a sedentary lifestyle. Because of lack of regular physical exercise good proportion of students tend to be overweight. Overweight and obesity are associated with hemodynamic changes at rest. The current study looks into comparisons made between obesity and cardiovascular fitness indices in medical students in the age group of 18-23 years. We hypothesized that obesity leads to sympathetic changes which may lead to future hypertension (*Yakinci C et al, 2000*). So, it may help to early recognition of such risk and help to prevent further complication in future.

MATERIALS AND METHODS

This cross-sectional study was to compare Blood pressure and Heart rate according to BMI groups & waist circumference. Ethical permission was taken from Institutional Ethics Committee (IEC), Seth G. S. Medical College & KEM Hospital, Mumbai. The study was an observational study. The study continued for 3 months till all subjects are recruited. 200 medical students of either sexes in the age group of 18 – 25 years fulfilling the inclusion criteria were included.

Exclusion Criteria

1. Any student suffering from any chronic disease such as hypertension, diabetes mellitus or any other hormonal problems, etc.
2. Any student taking drugs such as corticosteroids, any hormones, etc. for a short or long duration of time.
3. Any student having any physical deformity and is unable to stand erect or has any implant in the body

A detailed history was recorded regarding daily physical activities, exercise routine and duration. Also, their personal history, past history and family history were recorded.

Automated Blood pressure monitor: manufactured by OMPRON HEALTHCARE CO. LTD. SEM-1 model, 6607551LF was used for recording blood pressure.

The height of the students will be measured by a measuring tape after making them to stand erect with their heels, buttocks, back & occiput touching the wall. The students will be made to stand on weighing machine in light clothes and their weight will be measured. Height will be calibrated up to 0.1cm & weight up to 0.01kg. BMI will be finally calculated using the formula:

BMI = weight in kg / (Height in meters) ^{2}

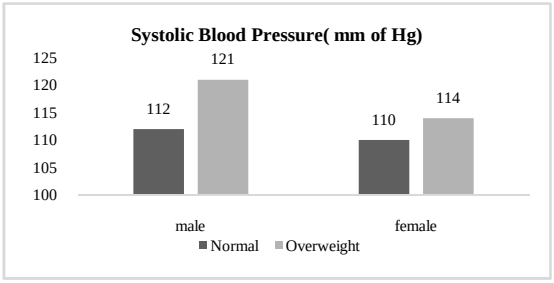
Waist circumference will be measured according to WHO protocol. Abdominal girth at the level midway between last costal margin and highest point of iliac crest will be measured using measuring tape.

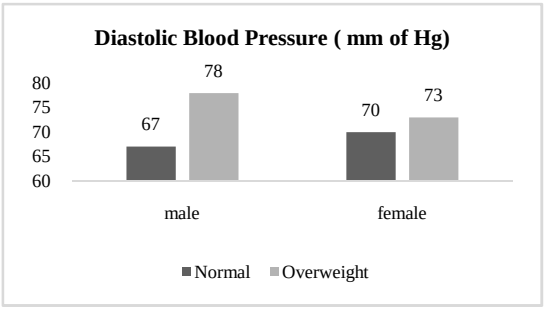
Prior to testing students were instructed about the pre-test preparation. Students were asked to come 3 hours after a light breakfast. They were asked not to indulge in any kind of vigorous exercise within 24 hours prior to test. They were asked to wear loose and comfortable clothing. Their resting heart rate and blood pressure were recorded after giving adequate rest in sitting position.

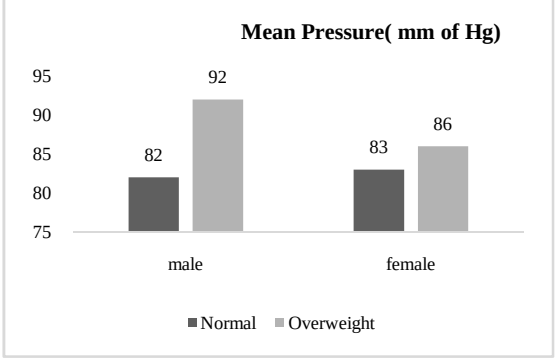
Unpaired 't' test has been used for statistical analysis. Pearson's correlation coefficient is used for evaluating relation with waist circumference. For comparing data, software GraphpadInstat (version 3.1) was used. The level of significance was set as $p < 0.005$ for all comparisons.

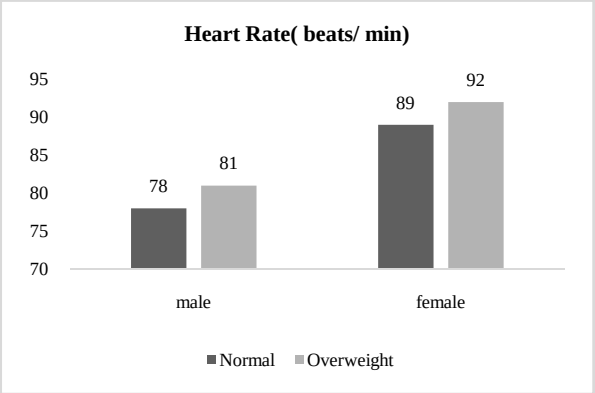
RESULTS

	Gender	Groups		P value
		Normal Weight	Over Weight	
SBP	male	112±10	121±10	<0.001*
(mm of Hg)	female	110±8	114±9	<0.02*
DBP	male	67±9	78±8	0.001*
(mm of Hg)	female	70±6	73±8	0.013*
MAP	male	82±8	92±7	<0.001*
(mm of Hg)	female	83±6	86±8	0.004*
HR	male	78± 7	81± 6	0.06
(beats/ min)	female	89±6	92±7	0.18









DISCUSSION

In this study, we found that systolic, diastolic pressure and mean arterial pressure were significantly high in overweight subjects in both male and female population. Heart rate was found to be highest in overweight population but it was not statistically significant. *Hernandez et al. (2009)* also confirmed a positive relation between BMI and BP. They demonstrated that there was an association between blood pressure and body mass index in children and adolescents. *Berkey CS et al (1998)* confirmed that greater BMI in adolescence is associated with raised BP.

We also found that increase in waist circumference also has strong positive association with systolic, diastolic and mean arterial pressure. *Maffeis et al (2001)* also found that Waist circumference may be helpful parameter in identifying prepubertal children with an adverse blood-lipids profile and hypertension. Children with a waist circumference greater than the 90th percentile are more likely to have multiple risk factors than children with a waist circumference that is less than or equal to the 90th percentile. *Choy et al (2011)* also concluded that elevated blood pressure in children was associated with waist circumference, which is both easier to measure than blood pressure and provides important information on metabolic risk.

This increase blood pressure may be because of stimulation of sympathetic nervous system. The sympathetic nervous system (SNS) plays a critical role in the regulation of cardiovascular homeostasis. SNS activation plays an important role in the pathophysiology of obesity hypertension in humans. There a number of proposed mechanisms linking obesity with SNS activation including baroreflex dysfunction, hypothalamic-pituitary axis dysfunction, hyperinsulinemia/insulin resistance, hyperleptinemia, and elevated circulating Angiotensin II concentrations.

One of the causes of hypertension is abnormal sodium and fluid balance. In obesity hypertension, abnormal kidney function initially is due to increased tubular sodium reabsorption, which causes sodium retention and expansion of extracellular and blood volumes. The increase in sodium reabsorption results in a rightward shift in the renal pressure-natriuresis relationship and BP elevation. Thus, the obese individual requires higher levels of BP to maintain sodium and fluid homeostasis. There are several potential mechanisms that could mediate the sodium retention and hypertension associated with obesity, including sympathetic nervous system activation, renin-angiotensin-aldosterone system activation, and compression of the kidney.

CONCLUSION

This study concluded that Increase in body mass index significantly increased systolic as well as diastolic blood pressure in apparently healthy adolescents. Also, increase in waist circumference significantly increased systolic and diastolic blood pressure in these population.

References

1. Chhatwal J, Verma M, Riar SK. (2004): Obesity among pre-adolescent and adolescents of a developing country (India). *Asia Pac J ClinNutr.* 2004;13(3):231-5.
2. Mohan B, Kumar N, Aslam N, Rangbulla A, Kumbkarni S, Sood NK, Wander GS. (2004): Prevalence of sustained hypertension and obesity in urban and rural school going children in Ludhiana. *Indian Heart J.* Jul-Aug; 56(4):310-4.
3. Maffeis C, Tato L. (2001): Long-term effects of Childhood obesity on Morbadity and Mortality. *Hormone Research*; 55(Suppl.1): 42-45.
4. Julie A Pasco, Kara L Holloway, Amelia G Dobbins, Mark A Kotowicz, Lana J Williams, Sharon L Brennan. (2014): Body mass index and measures of body fat for defining obesity and underweight: a cross-sectional, population-based study. *BMC Obesity*2014 1:9
5. Prospective Studies Collaboration. (2009): Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. Lancet. 373(9669):1083-1096. doi:10.1016/S0140-6736(09)60318-4.
6. Yates A, Edman J, Aruguete M. (2004): Ethnic differences in BMI and body/self-dissatisfaction among Whites, Asian subgroups, Pacific Islanders, and African-Americans. *J Adolesc Health.* Apr; 34(4):300-7.
7. Yakinci C, Mungen B, Karabiber H, Tayfun M, Evereklioglu C. (2000): Autonomic nervous system functions in obese children. *Brain Dev*. May;22(3):151-3.
8. Hernandez M, Briceño S, Stepenka V, Mendoza Z, Labastidas N, Gonzalez K, *et al*. (2009). Realation between body mass andex and blood pressure in adolescents. *Eur J Intern Med*, 20S:S183
9. Berkey CS, Gardner J, Colditz GA,(1998) Blood pressure in adolescence and early adulthood related to obesity and birth size, *Obesity Research* ;6(3):187-95
10. Maffeis C, Pietrobelli A, Grezzani A, Provera S, Tatò L. (2001): Waist circumferenceand cardiovascular risk factors in prepubertal children. *Obes Res. Mar*; 9(3):179-87.
11. Choy CS, Chan WY, Chen TL, Shih CC, Wu LC, Liao CC. (2011): Waist circumference and risk of elevated blood pressure in children: a cross-sectional study. *BMC Public Health.* Aug 2; 11:613. doi: 10.1186/1471-2458-11-613.