

## A CROSS SECTIONAL STUDY OF EFFECT OF OBESITY ON BLOOD PRESSURE IN YOUNG INDIAN POPULATION

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### Abstract

**Background:** With advancement of technology sedentary life style is increasing in developed and developing countries. In this study we gave priority to obese subjects and compared the variations in blood pressure among two categories- obese and non-obese in attempt to highlight the complications. **Materials and Methods:** After applying inclusion and exclusion criteria 51 obese and 49 non-obese males and 45 obese and 55 non obese females were randomly selected (aged between 18 years-30 years) in this study. **Result:** There was significantly higher pulse rate and systolic blood pressure among obese male and female subject in comparison to non-obese subjects. **Conclusion:** Systolic blood pressure and pulse rate was more and statistically significant in both male and female obese subject as compared to the non-obese, this might be due to over activity of sympathetic system and reduction in parasympathetic in obesity.

## INTRODUCTION

The sedentary life style is increasing with advancement of technology in developed and developing countries. Imbalance between energy intake and expenditure occurs due to faulty dietary habits and physical inactivity and causes obesity. According to WHO obesity is a “medical condition which involves excessive accumulation of fat leading to cardiovascular, pulmonary, metabolic, orthopedic, gastroenterological and psychosocial disorders.<sup>[1]</sup> Obesity can result in various life threatening conditions like hypertension, type 2 diabetes mellitus, increased risk for coronary diseases, hyperlipidemia, higher prevalence of colon, prostate and breast cancer.<sup>[2,3]</sup>

Adipose tissue store house of fats synthesizes and releases variety of peptides and non-peptide compounds into the blood stream which is important for cardiovascular homeostasis.

It is a significant source of Tumor Necrosis Factor-alpha), interleukin-6, plasminogen activator inhibitor-1, leptin, angiotensinogen and TNF-insulin like growth factor-1 (IGF-1).<sup>[4]</sup> Augmentation of cardiac output, stroke volume, left ventricular filling pressure and expansion of intravascular volume occurs due to excess of adipose tissue.

Obesity mainly abdominal obesity increases risk of hypertension and cardiovascular disease by activating renin-angiotensin-aldosterone system, by increasing sympathetic activity, by promoting insulin and leptin resistance and by endothelial dysfunction.

Many studies have shown that discrepancy between raised cardiac output and normal arterial capacity is one of the major cause of increased prevalence of high blood pressure which results due to obesity.

BMI is a simple index of weight for height and defined as the weight in kilograms divided by the square of the height in meters (kg/m<sup>2</sup>). It is used to classify underweight, overweight and obesity in adults.

Weight gain causes increase in metabolic rate, decrease in respiratory quotient, and a decrease in insulin sensitivity. It increases risk of morbidity and mortality from complications such as coronary artery disease, heart failure, arrhythmias and reduces life expectancy.

In this study we gave priority to obese subjects and compared the variations in blood pressure and pulse rate among two categories- obese and non-obese male and female subjects in attempt to highlight the complications.

## AIM

The aim of this study was to study the effect of obesity on blood pressure in young Indian population.

## MATERIALS AND METHODS

After taking approval from the ethical committee the study was conducted in the Department of Physiology, PMCH, Patna.

51 obese and 49 non-obese males and 45 obese and 55 non obese females aged 18-30 years were randomly selected from medical and dental students, healthy attendants of patients of PMCH.

Healthy males and females with BMI  $\geq 30$  kg/m<sup>2</sup> in the age group of 18- 30 years were classified as obese. Healthy males and females with BMI of 18.50 – 24.99 kg/m<sup>2</sup> in the age group of 18-30 years were included as controls in this study.

### Inclusion Criteria

1. Subjects who gave written consent.
2. Obese males and females aged 18-30years.
3. Non obese males and females aged 18-30 years.
4. Subject with no history of HTN, Diabetes Mellitus,

### Exclusion Criteria

1. Subject who did not gave written consent

2. Age below 18 years and above 30 years.
3. Subjects with history of Asthma, cardiovascular diseases, endocrine disease or surgery.

A brief history was taken and then physical examination was done along with clinical examination of the cardiovascular system. Height was measured in meters and weight in kilograms. Body mass index was derived by Quetelet's index - weight (kg)/ height (m<sup>2</sup>). Blood pressure measurement was done with a mercury sphygmomanometer.

We followed JNC 8 Classification of blood pressure.

Classification	Systolic Blood Pressure (mm Hg)	Diastolic Blood Pressure (mm Hg)
Normal	< 120	<80
Prehypertension	120-139	80-89
Stage 1 HTN	140-159	90-99
Stage 2 HTN	$\geq 160$	$\geq 100$

### Statistical Analysis

Data between control and study groups are presented as Mean,  $\pm$  Standard deviation. Student's t-test was used for two groups comparison. If p-value was < 0.05 it was considered statistically significant.

## RESULTS

Table 1: Comparison of pulse rate between obese and non- obese male subjects

Group	Subject(N)	Range	Mean $\pm$ SD	p value
Obese	51	70-95	80.4 $\pm$ 3.9	<.001,HS
Non obese	49	65-83	78.06 $\pm$ 2.6	

Table 2: Comparison of systolic blood pressure between obese and non- obese male subjects

Group	Subject(N)	Range	Mean $\pm$ SD	p value
Obese	51	110-140	131.4 $\pm$ 6.4	<.001,HS
Non obese	49	100-140	126.5 $\pm$ 7.8	

Table 3: Comparison of pulse rate between obese and non- obese female subjects

Group	Subject(N)	Range	Mean $\pm$ SD	p value
Obese	45	74-94	81.5 $\pm$ 4.7	<.001,HS
Non obese	55	67-82	76.2 $\pm$ 3.8	

Table 4: Comparison of systolic blood pressure between obese and non- obese female subjects

Group	Subject(N)	Range	Mean $\pm$ SD	p value
Obese	45	100-140	127.2 $\pm$ 4.7	.045,S
Non obese	55	100-136	123.6 $\pm$ 7.8	

## DISCUSSION

Obesity is commonly associated with hypertension, increased blood volume and cardiac output. There is also activation of the adrenergic system. Obesity and the risk of heart failure was assessed by Satish Kenchaiah and others in 2002, revealed that Systolic Blood Pressure (SBP), Diastolic Blood Pressure (DBP) and serum cholesterol levels were more in obese compared to non-obese individuals. They also

concluded that increased BMI was associated with an increased risk of heart failure.<sup>[5]</sup>

In this study we found that pulse rate was more and statistically significant in both male and female obese subject as compared to the non-obese, this might be due to over activity of sympathetic system and reduction in parasympathetic in obesity. our findings were supported by many previous studies done by Alberto Salvadori et al,<sup>[6]</sup> Hugh R Peterson et al,<sup>[7]</sup> and Gilles Paradis et al.<sup>[8]</sup>

When the systolic blood pressure was compared among obese male and non-obese subject then it was found that systolic blood pressure was higher in obese male which was also highly significant. Similar finding was also found when we compared systolic blood pressure among obese female and non-obese female subject. our findings were supported by many previous studies done by Rose Stamler et al,<sup>[9]</sup> Efrain Reisin et al,<sup>[10]</sup> Fronz H. Messerli.<sup>[11]</sup> There are many factors which link an association between increase in blood pressure among obese subjects like increase in peripheral vascular resistance in obesity, endothelial dysfunction, increased sympathetic nervous system activity and increase in total blood volume and cardiac output due to increased metabolic demand induced by excess body weight.

As there is increasing trends of obesity in young adults, we should adopt every measure in order to reduce obesity related complications. obese subjects should change their life style by reducing body weight, consuming low low-caloric diet, low intake of saturated fats, consuming more fruits, vegetables and increasing physical activity.<sup>[12,13]</sup>

## CONCLUSION

Obesity can result in various life-threatening conditions like hypertension, type 2 diabetes mellitus, increased risk for coronary diseases, hyperlipidemia, higherprevalence of colon, prostate and breast cancer. Obese subjects should change their life styleby reducing body weight, consuming low low-caloric diet, low intake of saturated fats, consuming more fruits, vegetables and increasing physical activity.

## REFERENCES

1. Baillargeon JP, Diamanti-Kandarakis E, Ostlund RE Jr, Apridonidze T, Iuorno MJ, Nestler JE. Altered D-chiro-

- inositol urinary clearance in women with polycystic ovary syndrome. *Diabetes Care*. 2006;29(2):300-5. doi: 10.2337/diacare.29.02.06.dc05-1070.
2. Bloomgarden ZT. Third Annual World Congress on the Insulin Resistance Syndrome: associated conditions. *Diabetes Care*. 2006;29(9):2165-74. doi: 10.2337/dc06-zb09.
3. Strumpf E. The obesity epidemic in the United States: causes and extent, risks and solutions. *Issue Brief (Common Fund)*. 2004;(713):1-6.
4. Hotamisligil GS, Arner P, Caro JF, Atkinson RL, Spiegelman BM. Increased adipose tissue expression of tumor necrosis factor-alpha in human obesity and insulin resistance. *J Clin Invest*. 1995;95(5):2409-15. doi: 10.1172/JCI117936.
5. Wofford MR, Hall JE. Pathophysiology and treatment of obesity hypertension. *Curr Pharm Des*. 2004;10(29):3621-37. doi: 10.2174/1381612043382855.
6. Salvadori A, Fanari P, Mazza P, Agosti R, Longhini E. Work capacity and cardiopulmonary adaptation of the obese subject during exercise testing. *Chest*. 1992;101(3):674-9. doi: 10.1378/chest.101.3.674.
7. Peterson HR, Rothschild M, Weinberg CR, Fell RD, McLeish KR, Pfeifer MA. Body fat and the activity of the autonomic nervous system. *N Engl J Med*. 1988;318(17):1077-83. doi: 10.1056/NEJM198804283181701.
8. Paradis G, Lambert M, O'Loughlin J, Lavallée C, Aubin J, Delvin E, et al. Blood pressure and adiposity in children and adolescents. *Circulation*. 2004;110(13):1832-8. doi: 10.1161/01.CIR.0000143100.31752.B7.
9. Stamler R, Stamler J, Riedlinger WF, Algera G, Roberts RH. Weight and blood pressure. Findings in hypertension screening of 1 million Americans. *JAMA*. 1978;240(15):1607-10. doi: 10.1001/jama.240.15.1607.
10. Reisin E, Abel R, Modan M, Silverberg DS, Eliahou HE, Modan B. Effect of weight loss without salt restriction on the reduction of blood pressure in overweight hypertensive patients. *N Engl J Med*. 1978;298(1):1-6. doi: 10.1056/NEJM197801052980101.
11. Messerli FH. Cardiovascular effects of obesity and hypertension. *Lancet*. 1982;1(8282):1165-8. doi: 10.1016/s0140-6736(82)92234-6.
12. Yap JC, Watson RA, Gilbey S, Pride NB. Effects of posture on respiratory mechanics in obesity. *J Appl Physiol* (1985). 1995;79(4):1199-205. doi: 10.1152/jappl.1995.79.4.1199.
13. Collins LC, Hoberty PD, Walker JF, Fletcher EC, Peiris AN. The effect of body fat distribution on pulmonary function tests. *Chest*. 1995;107(5):1298-302. doi: 10.1378/chest.107.5.1298.