

Study of Relationship Between Cardiovascular Parameters And Waist Circumference in Obese And Non Obese Females

Dr. D.P. Bansal¹, Dr. Ankit Manglunia², Dr. Prakhar Garg³, Dr. Shekhar Pamnani⁴, Dr. Shivjeet Yadav⁵, Dr. Ashish Sharma⁶, Dr. Vinit Kumar⁷, Dr. G.N. Saxena⁸

(General Medicine, Mahatma Gandhi Medical College, Jaipur, India)

Abstract: In obesity, an excessive adipose tissue accumulates, an altered metabolic profile occurs along a variety of adaptations and Alteration in cardiovascular structure and function even in absence of co-morbidities. This study was undertaken to analyze the difference in certain well defined cardiovascular parameter in obese and non-obese subjects.

Methods : 110 obese female with waist circumference > 80 cm and 100 non-obese female with waist circumference < 80 cm were selected. Parameter such as heart rate, systolic blood pressure and diastolic blood pressure, mean blood pressure and pulse blood pressure were assessed.

Results : In our study there was a statistically significant increase in HR, SBP and DBP in obese subjects when compared to non-obese in all age groups. There was a positive correlation between BMI and HR, SBP and DBP, mean blood pressure and pulse blood pressure.

Conclusion : Although our study is by no means exhaustive, it does provides glimpse into the variety of adaptation in cardiovascular structure and function that runs in the absence of overt disease as excessive adipose tissue accumulates.

Keywords: Cardiovascular Disease, Metabolic Syndrome, Obesity

I. Introduction

Overweight and obesity represents a rapidly growing threat to the healthy populations in an increasing number of countries. Obesity is becoming a global epidemic. Through the use of body mass index, the epidemic of obesity that began in 1980s has been recognized through the end of the century. Obesity is associated with increased risk of morbidity and mortality as well as residual life expectancy. Complications are either directly caused by obesity or in directly related through mechanisms sharing a common cause as well as a poor diet or a sedentary lifestyle. Overweight and obesity may account for as many as 15-30% of deaths from CHD and 65-75% of new cases of type 2 diabetes mellitus.[1]

Concern grows that the current dramatic rise of obesity among adolescent pretends a future cause of increasing cardiovascular disease as these overweight youth reach the adult years. Overweight and obesity are associated with increased risk of disabling conditions such as arthritis and impaired quality of life. The cardiovascular disorder due to obesity results in a morbidity from complications such as coronary artery diseases, heart failure, arrhythmias and sudden death[2]. Therefore our study highlights the complications because obesity is one of the leading preventable cause of death worldwide.

II. Material And Methods

110 female obese subjects and also 100 females non-obese controls were selected from general population. The waist circumference >80 cms were taken for obese whereas waist circumference <80 cms were taken for non-obese. Central obesity defined as per modified IDF criteria. All the subject gave an informed consent after detailed procedure of the non-invasive technique was explained to them. A brief history including smoking history and a clinical examination of the cardiovascular systems and respiratory system was done to exclude medical problem to prevent confounding results. Physical examinations of all subjects inclusively measuring height in meters, weight in kilograms and BMI was derived. Cardiac parameters such as HR, SBP, DBP and pulse blood pressure were assessed.

III. Statistical Analyses

Descriptive data are preserved as mean standard deviation and range value. A p-value of 0.05 or less was considered for statistical significance.

IV. RESULTS

Out to total number of subjects, the cases i.e.100 non-obese subjects 21 were in age group of 21-30, 26 in age group of 31-40, 28 in age group of 41-50 and 25 in age group of 51-60. Whereas out of 110 obese

subjects, 24 were in age group of 21-30, 27 in age group of 21-30, 27 in age group of 41-50 and 52 in age group of 51-60. This means standard deviation was calculated between obese and non-obese female subjects.

Comparison of Cardiac parameter like heart rate, systolic BP, Diastolic BP, mean BP between obese and non-obese showed statistically highly significant increase in obese as compared to non-obese. The degree of rise in SBP was more than the rise in DBP. There was statistically significant increase in SBP in obese subjects compared to non-obese subjects in all age groups ($P < 0.001$). Comparison of age related changes in diastolic blood pressure between non-obese and obese, there was statistically significant increase in DBP in obese subject compared to non-obese subjects in age group of 41-50 ($P < 0.001$). Correlation between various cardiac parameter and waist circumference in obese showed that there was a statistically significant correlation between various cardiac parameters.

V. Discussion

Obesity is often defined simply as condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired. Obesity produces an increment in total blood volume and cardiac output that is covered in part by the increased metabolic demand induced by excess body weight. The increase in blood volume increases the venous return to the heart, increasing filling pressure in the ventricles and increasing wall tension. This leads to left ventricular hypertrophy and this can decrease the diastolic compliance of the ventricle which can further progress to diastolic dysfunction and as wall tension increases it further can lead to systolic dysfunction.[3] Thus though different mechanism like increased total blood volume, increased cardiac output, Left ventricular hypertrophy and further diastolic dysfunction, obesity may predispose to heart failure.[4]

In our study, there was a statistically significant increase in heart rate in obese subject when compared to non-obese when each sub group was compared. Activation of sympathetic Nervous System occurs early in the course of obesity and the autonomic nervous system is an important contributor to the regulation of both the cardiovascular system and energy expenditure. A 10% increase in body weight is available with a decline in parasympathetic tone accompanied by a rise in mean HR and conversely HR decline during weight reduction. Overweight associated sympathetic activation could represent one potential mechanism contributing to the increase incidence of cardiovascular complication in overweight subjects.

In our study there was a statistically significant increase in SBP in obese subject as compared to non-obese subjects. Similarly there was a statistically significant increase in DBP in obese subjects as compared to non-obese. Obese subjects have increased sympathetic nerve activity, increased insulin level and activity of the renin-angiotensin-aldosterone system.

VI. Figures and Tables

GROUP	HR Beats/min		SBP Mm of Hg		DBP Mm of Hg		PP Mm of Hg
	RANGE	Mean \pm SD	RANGE	Mean \pm SD	RANGE	Mean \pm SD	RANGE
Non-obese WC<80	64-85	80.2 \pm 3.4	114-136	124.6 \pm 5.4	60-90	73.1 \pm 5.2	32-62
Obese WC>80	82-98	92.3 \pm 4.5	128-156	144.6 \pm 7.7	68-96	84.5 \pm 7.2	52-68
Significance	<0.001HS		<0.001HS		<0.001HS		<0.001HS

Table 1 : comparison of cardiac parameters between non-obese and obese

Age group	Non-obese		obese		significance
	No. of cases	Mean \pm SD	No. of cases	Mean \pm SD	p
21-30	21	116.4 \pm 6.0	24	128.8 \pm 1.3	<0.05 S
31-40	26	114.5 \pm 5.3	27	125.8 \pm 1.1	<0.05 S
41-50	28	127.6 \pm 4.4	27	142.2 \pm 5.2	<0.001 HS
51-60	25	128.3 \pm 3.5	32	148.7 \pm 3.8	<0.001 HS

Table 2 : comparison of age related changes in systolic blood pressure between obese and non-obese

Age group	Non-obese		obese		Significance
	No. of cases	Mean \pm SD	No. of cases	Mean \pm SD	p
21-30	21	54.9 \pm 1.2	24	65.8 \pm 4.0	<0.001 HS
31-40	26	62.1 \pm 4.2	27	65.1 \pm 1.1	0.15 NS
41-50	28	70.3 \pm 1.2	27	80.3 \pm 6.4	<0.001 HS
51-60	25	72.9 \pm 4.2	32	90.2 \pm 1.2	<0.001 HS

Table 3 : comparison of age related changes in diastolic blood pressure between obese and non-obese

VII. Conclusion

Though our study is by no means exhaustive, it does provide a glimpse into the variety of adaptations in cardiovascular structure and function that occur as excessive adipose tissue accumulates, even in absence of

overt diseases. Further research is recommended to understand how gene and gene environment interaction leads to obesity. A better understanding of racial difference in the progression of obesity is needed. We need to evaluate the strategies and efficiency of obesity treatment.

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