

A Comparative Study of Cardiovascular Parameters in Obese and Non-Obese Individuals

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Abstract- Obesity by definition is a state of excess adipose tissue mass. Obesity is a global epidemic becoming a threat to healthy populations in increasing number of countries. . Numerous studies have documented that obesity and, more particularly, central adiposity as indicated by an enlarged waist circumference (WC), is associated with the presence of systemic hypertension, coronary heart disease, type 2 diabetes mellitus as well as an increased mortality risk. The cardiovascular disorders due to obesity result in increased mortality from complications such as coronary artery disease, heart failure, arrhythmias and sudden death(8). This study was done to study the importance of cardiac parameters in obesity which is a preventable condition which in turn reduces the morbidity and mortality.

Objectives: Objectives: To analyze the parameters like Systolic blood pressure , diastolic blood pressure ,mean arterial pressure, heart rate and pulse pressure in obese and non-obese population.

Materials and methods: 75 male obese and non-obese patients were randomly selected for the study from the outpatient department. Careful measures were taken to avoid people with age less than 20years and more than 50years, female sex, smoking, existing cardiovascular disease and respiratory diseases. **Results:** Mean age of obese subjects was 31.52+/-6.38 and non-obese subjects was 31.41+/-6.20. BMI in obese and non-obese subjects was 32.26+/-1.39 and 22.76+/-0.730 respectively which is statistically significant($p < 0.001$). They also had statistically significant difference in terms of weight(83.72+/-5.17 in obese subjects and 61.12+/-3.73kgs in non obese subjects, $P < 0.001$) and Body surface area(BSA) (1.94+/-0.0777 in obese and 1.68+/-0.0682 in non obese subjects). The study showed that the obese subjects had significantly high systolic(140.32+/-6.93 vs 121.59+/-6.67mmhg) and diastolic blood pressure(86.11+/-6.79). **conclusion:** The study shows that obese individuals had significantly more blood pressure(both systolic and diastolic) and increased heart rate compared to non-obese individuals.

Index Terms- obesity. systolic, diastolic, blood pressure, mean arterial pressure, heart rate

I. INTRODUCTION

Obesity by definition is a state of excess adipose tissue mass. Although it is often viewed as a equivalent to increased body weight, which maybe not true always. Lean but very muscular individuals may be overweight by numerical standards without increased adipose tissue(1) Obesity is a global epidemic becoming a threat to healthy populations in increasing number of countries.(2). The prevalence of obesity has increased recently in

younger population. Numerous studies have documented that obesity and, more particularly, central adiposity as indicated by an enlarged waist circumference (WC), is associated with the presence of systemic hypertension, coronary heart disease, type 2 diabetes mellitus as well as an increased mortality risk.

Most widely used method to measure obesity is Body-mass Index(BMI). Other approaches are Anthropometry(skin fold thickness), Densitometry(underwater weighing), CT scan/MRI scan and electrical impedance. A BMI of 19-24.99 are considered normal, 25 -30 are considered overweight and >30 are considered as Obese. Data from the National health and Nutrition examination survey(NHANES) shows that the percentage of American adult population with obesity has increased from 14.5% to 33.9%. As many as 68% of US population above the age of 20 are were overweight(1)

Obesity is a global epidemic becoming a threat to healthy populations in increasing number of countries.(2). Obesity has been reported to be associated with a number of cardiovascular (CV) diseases, pro-inflammatory state, coagulation abnormalities and metabolic disturbances such as lipid abnormalities, altered glucose metabolism, insulin resistance and type 2 diabetes mellitus (3). Studies have shown that the obese patients are more prone to ventricular arrhythmia and obesity is a strong predictor of sudden death in men.(4). Decreased HRV has been shown to significantly increase CVD risk and it has been considered as a strong mortality predictor (5). Numerous studies have documented that obesity and, more particularly, central adiposity as indicated by an enlarged waist circumference (WC), is associated with the presence of systemic hypertension, coronary heart disease, type 2 diabetes mellitus as well as an increased mortality risk. 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 comorbidities. 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(6). Heart rate variability (HRV) analyses represent a noninvasive technique for assessing the heart autonomic nervous system function in a variety of clinical conditions such as diabetic neuropathy , obesity , myocardial infarction , sudden death and congestive heart failure . Reduced HRV has been shown to predict increased mortality in the general population as well as in patients with cardiovascular disease (CVD)(5) . Along with the epidemic of obesity and abdominal obesity, concomitant metabolic derangements pose obese individuals at greater risk for future morbidity and mortality (7) The exact mechanism of increased cardiovascular mortality in obese individuals has not

been clearly specified yet but reduced HRV may be one of the potential pathways involved in sudden death. Indeed, cardiovascular autonomic dysfunction has been associated with obesity in humans and animals.(5).

The cardiovascular disorders due to obesity result in increased mortality from complications such as coronary artery disease, heart failure, arrhythmias and sudden death(8). This study was done to study the importance of cardiac parameters in obesity which is a preventable condition which inturn reduces the morbidity and mortality.

II. OBJECTIVES

To analyze the parameters like Systolic blood pressure , diastolic blood pressure ,mean arterial pressure, heart rate and pulse pressure in obese and non-obese population.

III. MATERIALS AND METHODS

75 male obese and non-obese patients were randomly selected for the study from the outpatient department. Careful measures were taken to avoid people with age less than 20years and more than 50years, female sex, smoking, existing cardiovascular disease and respiratory diseases. Obese people are those with BMI >30 and non obese were had BMI between 18-24.99. People with BMI of 25 to 30 were also excluded from the study. After taking the detailed history, clinical examination .Subjects were allowed to take rest for 10 minutes in bed before the examination. BMI was calculated using the Quetelex index= weight in kgs/height(m²), Blood pressure was recorded using a sphygmomanometer and heart rate was calculated with 12 lead

ECG. Mean arterial pressure was calculated using the MAP calculator and pulse pressure was derived from the standard protocol by deducting diastolic pressure from systolic blood pressure.

IV. STATISTICAL ANALYSIS

Was done using chi square test and pearson's coefficient was measured to compare both groups , results were mentioned in mean with SD.

V. RESULTS

Of the 75 subjects in each group, there were 32 subjects in obese group and 31 subjects in non obese group in the age group of 21-30 years,34 subjects in both groups in 31-40 years age group and 9 subjects in obese and 10 subjects in non obese in age group 41-50(table1).

Mean age of obese subjects was 31.52+/-6.38 and non-obese subjects was 31.41+/-6.20. BMI in obese and non-obese subjects was 32.26+/-1.39 and 22.76+/-0.730 respectively which is statistically significant(p<0.001).They also had statistically significant difference in terms of weight(83.72+/-5.17 in obese subjects and 61.12+/-3.73kgs in non obese subjects, P<0.001) and Body surface area(BSA) (1.94+/-0.0777 in obese and 1.68+/-0.0682 in non- obese subjects).The study showed that the obese subjects had significantly high systolic(140.32+/-6.93 vs 121.59+/-6.67mmhg) and diastolic blood pressure(86.11+/-6.79).

Table 01: Distribution according age & Obesity in the study subjects

Age	Obesity (%)	Non Obesity (%)	Total
20 - 30	32(50.79)	31(49.21)	63
30 - 40	34 (50.0)	34(50.0)	68
40 - 50	09(47.37)	10 (52.63)	19
Total	75	75	150

Chi square value 0.069; d.f – 02, with P Value is 0.9663

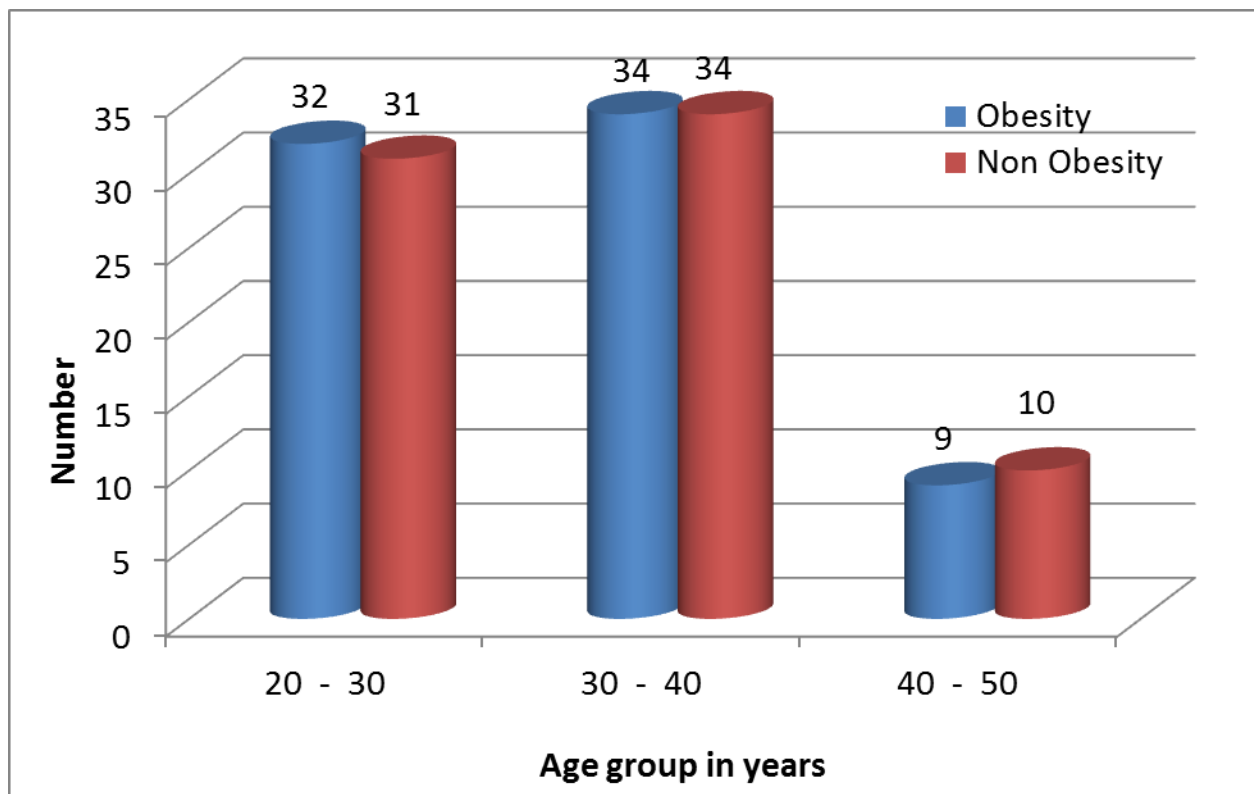
Graph 01: Multiple bar diagram showing distribution according to age group and Obesity status

Table 02 : Mean & Standard deviation among obesity & Non- obesity for all the parameters

	Obesity	Non Obesity	T- test Value (P- Value)
Age	31.52 ± 6.38	31.41 ± 6.20	0.01(0.917) NS
Height	161.85 ± 3.75	164.49 ± 3.16	21.68(0.0000710) S
Weight	83.77 ± 5.17	61.12 ± 3.73	947.14(<0.001) S
BMI	32.26 ± 1.39	22.76 ± 0.730	2745.50(<0.001) S

BSA	1.94 ± 0.0777	1.68 ± 0.0682	476.12(<0.001) S
HR	85.87 ± 3.70	70.67 ± 4.62	494.83 (<0.001) S
SBP	140.32 ± 6.93	121.59 ± 6.67	284.65(<0.001) S
DBP	86.11 ± 6.79	75.87 ± 4.56	117.67(<0.001) S
MAP	104.22 ± 6.16	91.12 ± 5.03	203.35(<0.001) S
PP	53.15 ± 6.54	45.72 ± 4.32	67.39(<0.001) S

Graph 01: Multiple bar diagram showing distribution according to age group and Obesity status



VI. DISCUSSION

Adipose Tissue is not a passive storehouse of fat and has a resting blood flow of 2-3 ml/min/100gm of fat. It is an endocrine and paracrine organ that produces various hormones that are involved in regulating cardiovascular hemodynamics. The increased metabolic demand created by the excess adipose tissue will increase total blood volume and cardiac output to keep up with the demand. This increases the workload on the heart causing cardiac hypertrophy as well as increasing sympathetic activity. This in turn explains the statistically significant increase

in the systolic BP, Diastolic BP, heart rate, pulse pressure and mean arterial pressure which has been observed in our study.

Tuck ML et al have showed in their study that the obese individuals have increased heart rate secondary to increased sympathetic activity and increased rennin-angiotensin-aldosterone system activity(9). In a similar study done by Ravishankar et al have showed that there is significant increase in systolic ,diastolic blood pressures in obese individuals compared to non obese individuals(10).

VII. CONCLUSION

Our study provides a glimpse to some of the cardiovascular alterations that happen as adipose tissue accumulates. These alterations reflect the body's adjustments to cope for the increased workload. The structural/ anatomical alterations secondary to this- for example cardiac hypertrophy and other microscopic/molecular changes does contribute to forming risk factors for cardiovascular disease in the long run. As we can see from many studies obesity is major risk factor cardiovascular disease and diabetes which in turn are responsible for morbidity and mortality. As obesity is a preventable condition, early steps to prevent obesity will reduce the major morbidity and mortality.

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