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CARDIOVASCULAR PARAMETERS IN OBESE AND NORMAL WEIGHT PEOPLE: A COMPARATIVE STUDY

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Abstract
Introduction: Obesity can be classified as generalized obesity (GO) and abdominal obesity (AO) and obese population have higher rates of mortality and morbidity compared to non-obese individuals. World Health Organization (WHO) has defined overweight and obesity as abnormal or excessive fat accumulation that presents a risk to health. A commonly used simple measure to classify overweight and obesity in adults is body mass index (BMI). BMI is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2). WHO defines overweight when BMI is greater than or equal to 25; and obesity when BMI is greater or equal to 30 but in Asians, the cut-offs for overweight (≥23.0kg/m^2) and obesity (≥25.0kg/m^2) are lower than WHO criteria due to risk factors and morbidities MATERIAL AND methods: A sample of 50 male and 50 female obese patients with body Mass Index > 30 kg/m^2 and also 50 male and 50 female non obese patients with body Mass Index of 18.50 – 24.99 kg/m^2 were selected. Sample was randomly selected. A pilot study was carried out on 20 patients to ensure feasibility, and time needed for completing the study.
Results: A total of 200 participants were included in the study of which 100 were obese and 100 were non obese subject. Comparison of cardiac paramenters between obese and non obese individual was done like hrart rate, systolic and diastolic blood pressure, mean arterial pressure and pulse pressure. Demographic variables were also compared.
Conclusion: The strong association of obesity with cardiovascular disease necessitates the importance of prevention and control of obesity and it should begin in early child hood also proper diet and regular medical check-up should be carried out to cope up with the problem of obesity.

Introduction

There are number of clinical measurements for obesity which are used to determine susceptibility to cardiovascular diseases[i]. These measurements includes these include anthropometric indices such as body mass index (BMI), waist-hip ratio (WHR) and waist circumference (WC). Body Mass Index (BMI) is recognized as one of the most useful indices for obesity in adults. BMI is determined by dividing weight (wt) in kilograms by height (ht) in meters square[ii]. Obesity has reached epidemic proportions globally, and at least 2.8 million people dying each year as a result of being overweight or obese. Earlier obesity was associated with high-income countries, but now it is also prevalent in low- and middle-income countries[iii].

According to CDC (Centre for disease preventionand control) The prevalence of obesity was 39.8% and affected about 93.3 million of US adults in 2015~2016. Obesity-related conditions include heart disease, stroke, type 2 diabetes and certain types of cancer that are some of the leading causes of preventable, premature death and yhe estimated annual medical cost of obesity in the United States was $147 billion in 2008 US dollars; the medical cost for people who have obesity was $1,429 higher than those of normal weight[iv].

Obesity can be classified as generalized obesity (GO) and abdominal obesity (AO) and obese population have higher rates of mortality and morbidity compared to non-obese individuals[v]. In India, obesity is emerging as an important health problem particularly in urban areas. According to National family health survey India-3 (NFHS-3), 13% of women (15-49 Years) and 9% of men (15-49 Years) were overweight or obese in 2005-06. World Health Organization (WHO) has defined overweight and obesity as abnormal or excessive fat accumulation that presents a risk to health. A commonly used simple measure to classify overweight and obesity in adults is body mass index (BMI). BMI is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2). WHO defines overweight when BMI is greater than or equal to 25; and obesity when BMI is greater or equal to 30 but in Asians, the cut-offs for overweight (≥23.0kg/m^2) and obesity (≥25.0kg/m^2) are lower than WHO criteria due to risk factors and morbidities[vi].

Overweight, obesity and their related non-communicable disease can be prevented by making the choice of healthier food and regular physical activity overweight and obesity can be prevented. In India overweight or obesity is seen in 30-65% of adult urban population[vii]. ICMR-INDIAB Study showed that today the prevalence of generalized and

abdominal obesity was higher in India compared to earlier studies[viii].

Obesity has been recognized as a major independent risk factor for cardiovascular diseases[ix].this due to the reason that the increased body fat is always accompanied by profound changes in the physiological and metabolic functions of the body, which are directly dependent on the degree of excess weight and on its distribution around the body. Systolic blood pressure is the most consistent and significant risk factor for CVDs compared to the diastolic blood pressure and there is a relationship between body mass index and cardiovascular parameters among obese persons.

Material and Methods

AIM: comparison of cardiovascular parameters between obese and normal individual. A sample of 50 male and 50 female obese patients with body Mass Index > 30 kg/m^2 and also 50 male and 50 female non obese patients with body Mass Index of 18.50 – 24.99 kg/m^2 were selected. Sample was randomly selected. A pilot study was carried out on 20 patients to ensure feasibility , and time needed for completing the study.

All the patients were assured that participation in the study was voluntary. Verbal consent was obtained from patients who accepted to take part in the study. Written informed consent was taken from all the participants included in the study. Ethical clearance was obtained from the research ethical committee of the institute. Anonymity and the confidentiality of responses were assured to all the participants. Socio demographic data was obtained from patients which includes age, occupation, educational level and smoking status. Cardiovascular parameters were recorded including first; blood pressure that was measured on left/right arm by auscultatory method using mercury sphygmomanometer at dorsal comfortable position in bed. After getting the systolic and diastolic readings, mean arterial blood pressure was calculated. Pulse pressure was calculated by calculating the difference between the systolic and diastolic blood pressure. Pulse rate was calculated by palpation of radial pulse. anthropometric measurements were obtained including measuring body weight. Height was measured by tape measure marked in centimetre with the patient in standing position by marking the point on the wall. BMI was calculated as weight in kilograms divided by squared height in meter. Conventional BMI cutoff points were applied to classify the study populations into normal BMI (18.5≥BMI 30 kg/m2).

Descriptive data are presented as Mean and Standard Deviation and Range values. Unpaired student's t-test was used for groups comparison. Pearson's correlation coefficient was used to measure the relationship between the measurements. A p-value of 0.05 or less was considered to be statistical significant.

Results

A total of 200 participants were included in the study of which 100 were obese and 100 were non obese subject.

Table 1: Age and gender distribution of obese and non obese participants

Variable	Male (n,%)	Female (n,%)	Total
Obese	50 (100%)	50 (100%)	100
Non Obese	50 (100%)	50 (100%)	100

Table 2: Comparison of mean age, anthropometric measurements and cardiovascular parameters

	Obese			Non obese		
parameter	Male (M± SD)	Female (M± SD)	P value	Male (M± SD)	Female (M± SD)	P value
Age	52.84±17.52	52.01±15.62	0.7131	51.22±17.21	50.12±14.21	0.6227
Weight	78.12±11.28	79.57±10.24	0.3393	61.21±9.29	59.22±8.45	0.1146
Height	1.58±0.5	1.49±0.32	0.0523	1.57±0.6	1.40±0.39	0.0185
BMI	31.54±2.87	33.44±3.12	0.0001	23.19±1.24	22.14±2.10	0.0001
Heart rate	81.01±11.25	86.12±12.08	0.0022	86.31±10.22	86.45±9.89	0.9217
Systolic BP	128.45±12.45	124±11.78	0.05	116.21±9.54	112.8±7.8	0.05
Diatolic BP	78.21±11.45	76.54±10.24	0.2783	75.64±9.5	74.57±8.4	0.3998
Pulse pressure	48.54±18.47	46.88±15.45	0.4914	39.58±16.42	38.54±10.24	0.5916
Mean arterial pressure	96.21±20.14	90.21±14.94	0.0177	89.55±12.54	88.45±11.98	0.5266

Table 4: Comparison of cardiac paramenters between obese and non obese individuals

Variable	Obese	Non obese	P value	Significance
HR (beats /min)	85.12±17.24	88.54±15.45	0.0373	Significant
Systolic blood pressure (mm of Hg)	127.54±15.44	115.29±12.78	< 0.0001	Highly significant
Diastolic blood pressure (mm of Hg)	84.44±10.58	75.52±8.53	< 0.0001	Highly significant
Mean arterial pressure (mm of Hg)	95.68±19.45	88.67±11.94	< 0.0001	Highly significant
Pulse pressure (mm of Hg)	47.38±17.48	38.10±9.42	< 0.0001	Highly significant

Higly significant correlation was found in cardiovascular parameters of obese and non-obese persons.

Discussion

Obesity is associated with a significant morbidity and mortality, and life expectancy decrease from 5–10 years[x]. Cardiovascular diseases and cancer-associated mortalities are significantly increased in persons with obesity[xi]. For a BMI of 25.0 to <30.0 kg/m^2, the Hazard ratio (HR) was 1.11 (95% confidence interval [CI] 1.10, 1.11), and this increased to 1.44 (1.41, 1.47), 1.92 (1.86, 1.98), and 2.71 (2.55, 2.86) for a BMI of 30.0 to <35.0, 35.0 to <40.0, and 40.0 to <60.0 kg/m^2, respectively[xii].

Obesity is considered to be a chronic disease which is associated with a wide range of complications affecting many different aspects of physiology [xiii]. Coronary artery disease, obesity-associated cardiomyopathy, left ventricular hypertrophy, essential hypertension, cor pulmonale, accelerated atherosclerosis, pulmonary hypertension of obesity, dyslipidemia, chronic heart failure (CHD), left ventricular hypertrophy (LVH), cardiomyopathy, pulmonary hypertension, lymphedema (legs) are some of the complications associated with the obesity. Other conditions like Cancer/malignancy, Gastrointestinal , Genitourinary, Musculoskeletal, Neurological and central nervous system are also associated with the obesityxiv,xv.

Most of the times obesity is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired. Body Mass Index provides the most useful, and accurate, population-level measure of obesity. It can be used to estimate the prevalence of obesity within a population and the risk factors associated with it. Due to obesity there is increase in the total blood volume and cardiac output due to increased metabolic demand induced by excess body weight. Left ventricular hypertrophy can be caused by the increase in blood volume in turn increases venous return to the heart, increasing filling pressures in the ventricles and increasing wall tension which progress to diastolic dysfunction and if tension still increases further, can lead to systolic dysfunction and thus obesity may predispose to heart failure[xvi].

Our study has compared the measurements and cardiovascular parameters among obese and non-obese patients in relation to sex and found that there is only significant statistical difference between obese male and female regarding body mass index and systolic blood pressure. Study is consistent with Bakari et al 2006[xvii]. After comparison of systolic blood pressure among obese and non-obese male and female patients, the findings revealed that there is significant statistical difference between obese male and female, and systolic blood pressure is slightly higher in male than female also diastolic blood pressure was higher in male. This finding was in accordance with Bose et al[xviii].

Our study has shown the statistical significance in cardiovascular parameters of obese and non-obese persons with regard to systolic, diastolic , mean arterial pressure and pulse pressure parameters. These findings were in consistent to study by Arıkan et al[xix]. In our study, there was a statistically significant association in systolic blood pressure in obese subjects when compared to non-obese subjects. There was also a positive correlation with increasing BMI causing further consistent increases in systolic blood pressure and diastolic blood pressure. Correlation between BMI and blood pressure indices; was assessed by Ravi Sankar P et al. and found that systolic blood pressure, Systolic blood pressure and mean arterial pressure were lowest in underweight and highest in overweight subjects. Heart rate was increased in overweight subjects which was in consistent with our study[xx].

Conclusion

In the present study the mean body mass index is greater in obese male than obese female. The strong association of obesity with cardiovascular disease necessitates the importance of prevention and control of obesity and it should begin in early child hood also proper diet and regular medical check-up should be carried out to cope up with the problem of obesity.

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