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EFFECT OF OBESITY IN RATE PRESSURE PRODUCT OF MALE INDIVIDUALS

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ABSTRACT

Overweight and obesity are the fifth leading risk for global deaths. Obesity increases adverse cardiac events in many ways.Increased blood pressure, heart rate and rate pressure product (Double product) can affect the cardiovascular system in numerous ways. They can determine MVO_2 and are thought to act as risk factors for cardiovascular diseases. With this background this study was carried out to find the impact of obesity on blood pressure, heart rate and double product.In this comparative cross-sectional study, 150 obese males (BMI≥23) and 150 non-obese males (BMI≤22.9) in the age group of 18-28 years were selected from the general population of Dibrugarh randomly. The obese individuals were divided into two groups according to BMI. BMI, Heart-rate and blood pressure was recorded and rate pressure product calculated. This study showed a increase in systolic blood presssure, diastolic pressure, heart-rate and double product syudy with increase in BMI. The present syudy suggest that obesity causes cardiac remodelling.

KEY WORDS:- Obesity, Rate pressure product, BMI,, myocardial oxygen consumption.

INTRODUCTION

Obesity can be seen as the first wave of a defined cluster of non-communicable diseases called “New World Syndrome”, creating an enormous socio-economic and public health burden in poorer countries.[1] Worldwide obesity has nearly doubled since 1980.[2] Obesity affects people of all ages and all groups. Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. The rising prevalence of overweight and obesity in India has a direct correlation with the increasing prevalence of obesity-related co-

morbidities like hypertension, the metabolic syndrome, dyslipidemia, type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD)[3,4]. Data from animal studies suggest that obesity increases myocardial fatty acid metabolism & oxygen consumption leading to increased oxidative stress, cardiac dysfunction & apoptosis. [5]Rate-Pressure Product which is a product of heart rate & systolic blood pressure, is a major determinant of myocardial oxygen consumption. It is an indirect & easy method of measuring myocardial oxygen consumption. With this background Present study has been planned to study the impact of obesity on blood pressure, heart rate and double product.

Aims and Objectives

1.To study the effect of increasing BMI on blood pressure, heart rate and double product.

2.To compare the findings of blood pressure, heart rate and double product with that of non-obese

MATERIALS AND METHODS

In this comparative cross-sectional study,150 obese males (BMI≥23) and 150 non-obese males (BMI≤22.9) in the age group of 18-28 years were selected from the general population of Dibrugarh randomly. The ethical committee clearance and an informed consent of the subjects were taken.Subjects less than 18 years and more than 28 years and young obese with overt cardiovascular disease, respiratory disease, electrolyte abnormalities, renal failure, hypertension, diabetes mellitus and with other serious co-morbid conditions, obese involved in competitive sports or trained athletes or on medication which can affect B.P., ECG changes and not consenting for ECG were excluded from the study.

Anthropometric parameters like height (in cm), weight (in Kg) were recorded and body mass index(BMI) was derived by Quetelet's index.

BMI=weight (kg)/height (m^2).

Depending upon body mass index, the study population was divided into following groups.

1.Group I –subjects with BMI 18-22.9 kg / m^2,

2.Group II - subjects with BMI 23-29.9 kg/m^2

3Group III subjects with BMI ≥ 30kg/m^2

After 20 mins of rest in supine position ECG and blood pressure (measured with mercury sphygmomanometer using the appropriate sized cuff) were recorded. Heart rate (HR) was calculated from ECG by using the formula.

Heart rate= 1500/R-R.

The rate pressure product was calculated as:-

Rate pressure product = Systolic BP X HR.

The data were analyzed by using Microsoft Excel and Statistical Package of Social Sciences (SPSS version 20.0). The mean and standard deviation (SD) were calculated and reported for the quantitative variables. The statistical difference in the mean values was tested by using one way ANOVA (analysis of variance). A p-value of < 0.05 was considered as statistically significant.

RESULTS AND OBSERVATION

The study population consist of 150 young obese individuals with BMI $\geq$ 25 kg/m^2 and 150 age matched healthy individuals with BMI between 18.5—22.9 kg/m^2. Only male individuals were included in the study. The distribution of the cases in different groups of BMI is shown in table 1.The mean±SD of blood pressure,heart-rate and double pressure product in different groups is shown in table 2.

The mean±SD systolic blood pressure, showed a increase with increase in BMI as shown in figure 1 ,table2. On comparison between Groups I and II, Group II and Group III, a rise was observed, which was statistically non significant. On comparison between Groups I and Group III a rise was observed which was statistically significant as shown in table 3.

The mean±SD diastolic blood pressure, showed a rise with increase in BMI as shown in figure 1 ,table2. On comparison between Groups I and II, Group I and Group III, a rise was observed, which was statistically non significant. On comparison between Group II and Group III a rise was observed which was statistically significant as shown in table 3.

The mean±SD heart-rate, showed a increase with increase in BMI as shown in figure 2 ,table2. On comparison between Groups I and II, a rise was observed, which was statistically non significant. On comparison between Group I and Group IIIand between Group II and Group III a rise was observed which was statistically significant as shown in table 3

The mean±SD rate-pressureproduct, showed a increase with increase in BMI as shown in table2. On comparison between Groups I and II, a rise was observed, which was statistically non significant. On comparison between Group I and Group IIIand between Group II and Group III a rise was observed which was statistically significant as shown in table 3.

Table 1:Showing the Distribution of Cases in Different Groups of Bmi

Groups	Number of individuals	BMI range
I	150	18-22.9
II	97	23-29.9
III	53	≥30

Table 2: Showing The Mean±Sd of Blood Pressure,Heart-Rate and Double Pressure Product in Different Groups

PARAMETERS	GROUPS	MEAN±SD
Systolic BP (mm Hg)	I	111.68±5.53
	II	112.65±5.43
	III	115.78±4.39
Diastolic BP (mm Hg)	I	72.84±3.55
	II	74.21±3.91
	III	74.52±3.54
Heart-rate (beats/ minute)	I	71.36±9.41
	II	74.98±6.22
	III	86.90±5.05
Double pressure product	I	7963.54±1059.21
	II	8433.06±624.99
	III	10056.37±747.43

Table 3:-Showing the Comparison of the Parameters in Different Groups of BMI

Parameters	groups	p-value	Significance
Systolic BP (mm Hg)	Gr I vs gr II	1.00	NS
	Gr I vs gr III	0.018	S
	Gr II vs gr III	0.156	NS
Diastolic BP (mm Hg)	Gr I vs gr II	0.113	NS
	Gr I vs gr III	0.442	NS
	Gr II vs gr III	1.00	S
Heart-rate (beats /minute)	Gr I vs gr II	0.137	NS
	Gr I vs gr III	<0.001	S
	Gr II vs gr III	<0.001	S
Rate pressure product	Gr I vs gr II	0.69	NS
	Gr I vs gr III	<0.001	S
	Gr II vs gr III	<0.001	S

p value > 0.05 was non-significant (NS);p value < 0.05 was significant(S)

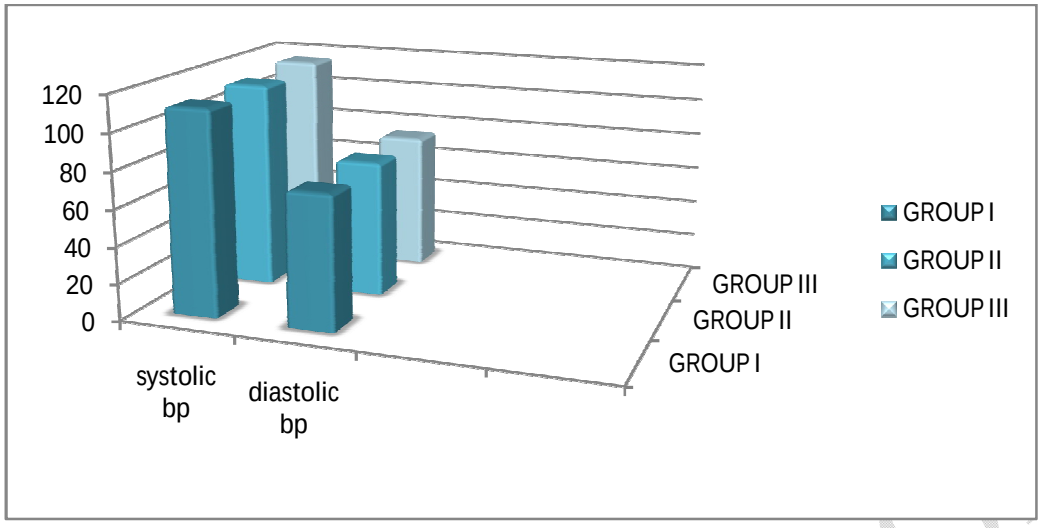

Figure 1:Showing the Mean ± Sd of Systolic B.P and Diastolic B.P in Different Groups

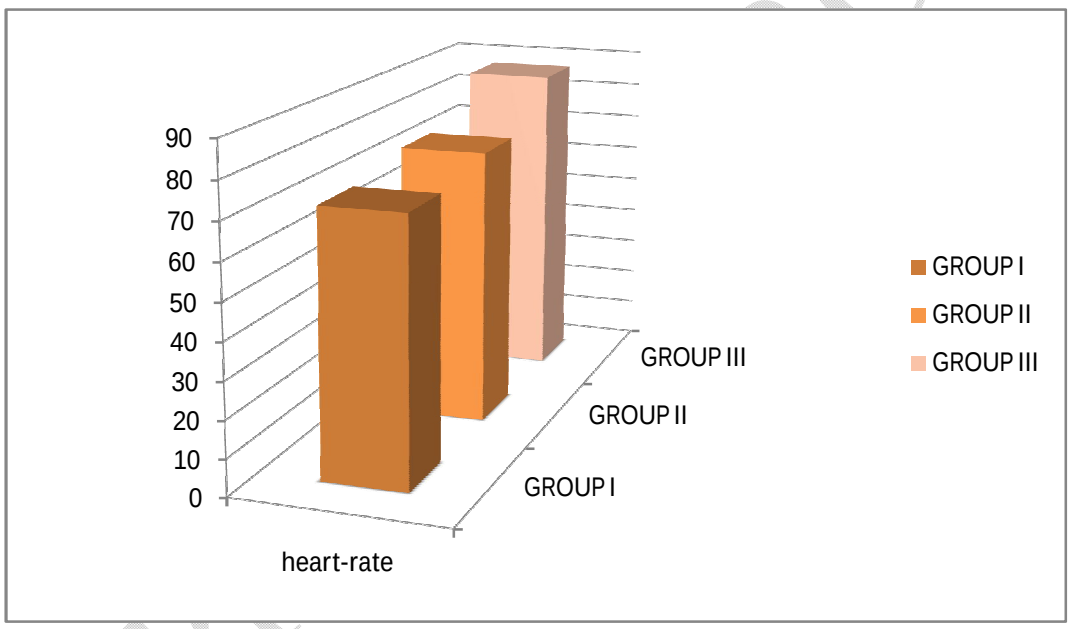

Figure 2:Showing the Mean of Heart Rate in Different Groups

DISCUSSION

The present study showed a increase in systolic and diastolic B.P with increase in BMI. Factors that increases BP in obesity includes the increment in total blood volume and cardiac output that is partly caused by the increased metabolic demand induced by excess body weight and also mechanisms linking obesity and an increase in peripheral vascular resistance: endothelial dysfunction, insulin resistance, increased sympathetic nervous system activity, substances released from adipocytes (IL-6, TNF- and so forth) and sleep apnea.[6]

A statistically significant increase in heart rate with BMI was also found. Similar findings were reported by several studies of Saulette R. Queen *et al*[7], Dr. Arpana Bhide[8], Paul Poirier, Bilora F *et al*[9]. Heart rate is influenced by both sympathetic and parasympathetic nerve activities. Activation of the sympathetic nervous system occurs early in the course of obesity. The higher heart rate in our study may be because of sympathetic over activity.

In our study it was also demonstrated that rate pressure product which is a indicator of MVO2 also increased with increasing BMI,this finding is in agreement with findings of Heinrich taegtmyer et al[10], Vincent HK et al[11] and Pallavi Shantkumar Kanthe et al. The increase in MVO2 associated with an increase in BMI is likely related to the effect of obesity on cardiac remodeling and the fact that obesity increases sympathetic tone, preload and fatty acid metabolism. Increased fatty acid uptake and oxidation by the heart can also increase MVO2, because more oxygen is required to generate ATP from fatty acid than by glucose metabolism.

CONCLUSION

In conclusion, the Present study has shown that obesity causes various cardio-vascular changes in the absence of cardiac disease.The increase in MVO2 with obesity is a indicator of increase in fatty acid metabolism and decrease in cardiac efficiency. So, halting this obesity epidemic Will constitute an important step in our effort to reduce the burden of cardiovascular diseases in the population.

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