Effect of Obesity on Cardiovascular Functions in Adolescent Male

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Abstract

Background: Obesity has become a colossal epidemic causing serious public health concern and contributes to 2.6 million deaths worldwide every year. Totally 5% of the Indian population has been affected by obesity. It is an important risk factor for developing chronic diseases like Hypertension, Diabetes Mellitus, Pulmonary diseases and Myocardial Infarction. Hence it is associated with an increased risk of morbidity and mortality as well as reduced life expectancy

Objectives: To compare cardiac functions in terms of systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) by ECG between healthy obese individuals with non obese individuals of late adolescent

Methodology: 50 adolescent obese males and 50 adolescent non-obese males were selected randomly from the general population in and around Davangere city
1.   Blood pressure: Systolic BP, Diastolic BP measured using sphygmomanometer.
2.   Heart rate: Calculated using a 12-lead ECG.

Results: Elevated BP was more prevalent among overweight adolescents. They showed that SBP, DBP and MAP are significantly increased with increase in BMI and also the Heart rate was significantly higher in obese compared to non-obese

Conclusion: The increase in the prevalence of obesity is primarily due to the increasingly obesogenic environment rather than 'pathology' in metabolic defects or genetic mutations within individuals. The control of obesity can be achieved by dietary changes, increased physical activity and a combination of both & hence health education has an important role to play in teaching people the hazards of overweight and to prevent obesity.

Key words: Obese, Heart rate, Blood Pressure

INTRODUCTION

Obesity is a state of excess adipose tissue mass. Presence of nutritional abundance and a sedentary lifestyle, increases adipose energy stores and produces adverse health consequences.[1] Obesity is related with a number of co-morbid conditions like Hypertension, Diabetes Mellitus, Pulmonary diseases, etc. Hence associated with an increased risk of morbidity and mortality as well as reduced life expectancy. It contributes to 2.6 million deaths worldwide every year.[2]

Totally 5% of the Indian population has been affected by obesity. In Karnataka overall prevalence of overweight is 9.3% among boys and 10.5% among girls,5.2% and 4.3% were obese respectively.[3]The increase in the prevalence of obesity is primarily due to the increasingly obesogenic environment rather than 'pathology' in metabolic defects or genetic mutations within individuals.[4]

The control of obesity can be achieved by dietary changes, increased physical activity and a combination of both. Health education has an important role to play in teaching people the hazards of overweight and to prevent obesity.[5]

Thus, the present study is done to evaluate the "effect of obesity on cardiovascular functions in adolescent males". The objectives of present study are to compare cardiac functions in terms of systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate (HR) by ECG between healthy obese individuals with non obese individuals of late adolescent age (15-19 years).

MATERIALS AND METHODS

Source of data:

50 late adolescent obese males (15-19 years) and 50 late adolescent non-obese males (15-19 years) were selected randomly from the general population in and around Davangere city. They were classified in obese & non-obese by using WHO classification of obesity

WHO classification of overweight/obese[6]
- Underweight $< 18.5 Kg/m^2$
- Normal weight $18.5-24.9 Kg/m^2$
- Overweight/pre-obese $25-29.9 Kg/m^2$
- Class I obesity $30-34.9 Kg/m^2$
- Class II obesity $35-39.9 Kg/m^2$
- Class III (morbid) obesity $> 40 Kg/m^2$

Inclusion Criteria:
- Healthy adolescent non-obese males of age group (15-19 years).
- Healthy adolescent obese males of age group (15-19 years).
- Subjects who are not suffering from any cardiac, respiratory and systemic diseases.
- Subjects who have given written consent.

Exclusion criteria -
- Females.
- Smokers.
- Alcoholics.
- Subjects with physical deformity of chest wall.

- Subjects previously diagnosed with any respiratory, cardiovascular or systemic diseases.
- Subjects taking medication.

Method of collection of data

Subjects who were participating in the study were explained the procedure that they would be undergoing in their local language and asked to sign the informed consent form. A brief personal history will be taken and clinical examination of all the systems will be done to exclude medical problems and to prevent confounding of the result. All the subjects were asked not to consume food, tea or coffee for a minimum of 2 hours before the examination. All the parameters were examined between 11:00AM to 01:00PM, after having made participants comfortable and relaxed.

Parameters:
1. Anthropometric measurements:
a. Height- measured on barefoot to the nearest of 0.1cm using a wall fixed stadiometer.
b. Weight-recorded to the nearest 0.1kg with light clothing using a portable weighing machine.
c. Body mass index (BMI)-calculated using Quetlet's Index as weight (Kg) over height (m^2).
2. Blood pressure: Systolic Blood Pressure(SBP) and Diastolic Blood Pressure(DBP) measured using Sphygmomanometer and Stethoscope .
3. Heart rate: Calculated using RMS Vesta 121i-Electrocardiograph.

Statistical analysis

Results will be subjected to appropriate statistical analysis. Unpaired 't' test will be used to compare between two groups. Correlation analysis will be done to measure the relationship between different parameters.

RESULTS

The heart rate (beats/min) in non obese subjects was 86.4 ± 4.6 and the mean heart rate in obese subjects was 95.1 ± 3.5. There was a significant increase in the heart rate in obese subjects (p< 0.001) (Table 1)

The mean SBP (mm of Hg) in non obese subjects was 121.8 ± 5.8 and the mean SBP in obese subjects was 137.4 ± 7.9. There was a significant increase in the heart rate in obese subjects (p< 0.001) (Table 1)

The mean DBP (mm of Hg) in non obese subjects was 72.1 ± 5.1 and the mean DBP in obese subjects 80.4 ± 6.3. There was a significant increase in the heart rate in obese subjects (p< 0.001) (Table 1)

DISCUSSION:

The present study showed a statistically significant increase in HR in obese compared to non obese controls, which was similar to many studies like Gilles Paradis et al[7] & Krzysztof Narkiewicz[8]. This is because there will be activation of sympathetic nervous system, which occurs early in the course of obesity. HR increases with increase in percentage of body fat. A 10% increase in body weight is associated with a decline in parasympathetic tone accompanied by increase in HR & conversely HR decreases with weight reduction.

The present study showed significantly higher mean values of resting BP in obese compared with nonobese. Similar results were also observed by other studies conducted on different age groups and in both genders across the world. M Hosseini et al[9], and Kalpana B et al[10], found a significantly higher resting SBP and DBP in adolescent boys. The cause for higher basal BP values in obese individuals is that the increased adipose tissue in obesity demands additional blood flow by increased metabolic demand, which, in turn, increases the cardiac output and hence the blood pressure. Moreover, sympathetic activation also contributes for this situation.

CONCLUSION

Though our study is no means exhaustive, it provide a glimpse into the variety of alterations in CVS as excessive adipose tissue accumulates. As the control of obesity can be achieved by dietary changes, increased physical activity and a combination of both. Hence health education has an important role to play in teaching people the hazards of overweight, to practice healthy life style and to prevent obesity.

Table - 1: Comparison of cardiac parameters between non-obese & obese.

Group	N	HR (Beats/min)		SBP (mm of Hg)		DBP(mm of Hg)	
		Range	Mean ± SD	Range	Mean ± SD	Range	Mean ± SD
Non- obese	50	77 -87	86.4 ± 4.6	117 -129	121.8 ± 5.8	66-79	72.1± 5.1
Obese	50	90 - 96	95.1 ± 3.5	129- 146	137.4± 7.9.	74 - 90	80.4 ± 6.3.
Significance	t	15.1		15.9		7.9	
	p	< 0.001 HS		< 0.001 HS		< 0.001 HS	

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