ISSN- O: 2458 - 868X, ISSN–P: 2458 – 8687
National Library of Medicine - ID: 101731606

International Journal of Medical Science and Innovative Research (IJMSIR)
IJMSIR : A Medical Publication Hub
Available Online at: www.ijmsir.com
Volume – 9, Issue – 5, October – 2024 , Page No. : 17 – 21

Study of Haemodynamic Parameters in Relation to Basal Metabolic Index in Young Adults

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Citation this Article: Dr. Tanushri, Dr. SatyajitBagudai, Dr. Vijaykumar Gupta, Amit Dayma, Shubham Patel, "Study of Haemodynamic Parameters in Relation to Basal Metabolic Index in Young Adults", IJMSIR - October - 2024, Vol – 9, Issue - 5, P. No. 17 – 21.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Old age was often associated with high blood pressure due to atherosclerosis but in present times high blood pressure and age has no longer any association as even youth is suffering from high blood pressure, underlying cause for which is overweight and obesity in young individuals.

Obesity has an effect on the haemodynamic variables such as respiratory rate, pulse rate, systolic and diastolic blood pressure.

Keywords: Barabanki, Non-Obese and Obese Young Adults, Safedabad

Abbreviations: BP = Blood pressure, BMI = Basal metabolic index

Introduction

Among all the population affected by obesity and overweight, it is the young adults aged 18 to 25 years who are in most productive years of their life that in effect have a huge economic cost owing to obesity and overweight.

Incidentally, while developed countries have recognized 18–25 year olds as a 'vulnerable group' for unhealthy lifestyles leading to overweight and obesity. (1,2)

It is now being recognized as a major health issue in the developing countries too where prevalence of obesity among young adults in developing countries ranging from 2.3 to 12 %, with overweight as high as 28.8%. (3,4,5.6,7)

Cardiac output seems to be related to surface area; which increases the bulk but when augmented cardiac output is forced into an aorta and elastic arterial reservoir which may have not increased in capacity as the body weight rose, this leads to an increase in pressure inside the

vascular bed which might lead to elevated blood pressure. (8)

Material and Methods

This case control study was conducted in the Department of Physiology at Hind Institute of Medical Sciences, Barabanki with permission from the ethics committee of the institute. Study participants were young subjects both male and female (age 18 years to 29 years).

Inclusion Criteria

- Obese young subjects of age group 18 to 29 years of age
- Non – obese young subjects of age group 18 to 29 years of age

Exclusion Criteria

- Known case of diabetes
- Known case of hypertension
- Known case of respiratory disease
- History of drug usage such as steroids etc
- History of chronic alcohol abuse

The participants fulfilling the inclusion criteria and giving their consent for inclusion in the study were subjected to anthropometric measurements.

Weight was measured by weighing machine in kilograms and height was measured in meters. Body mass index of the participants was calculated using Quetels index by dividing weight in kilogram by square of height in meter. Thereafter, the participants were divided in two groups after assessing the anthropometric measurements as obese (BMI >_25.0 kg/m2) non-obese (BMI <25.0 kg/m2). Study subjects with BMI >_25.0 kg/m2 were categorised as Obese (Cases) and those with BMI <25.0 kg/m2 as non- obese (Controls).

Data was collected using a semi-structured proforma that recorded name, age, gender and dietary habits. Anthropometric details like height, weight and BMI were also noted. Details regarding blood pressure, heart rate and respiratory rate were also recorded. Obesity was estimated as per Asia pacific classification of basal metabolic rate. (WHO,2000)

Blood pressure was measured with mercury sphygmomanometer in sitting position, measurements were obtained using a cuff of appropriate size and with instruments at the level of heart in the right arm after five minutes of rest. The cuff pressure was inflated 30 mm Hg above the level at which the radial pulse disappears and then deflated slowly at the rate of 2mm Hg per second and the readings were recorded to the nearest 2mmHg. The first and the fifth koratk off sounds were taken as indicative of the systolic and diastolic blood pressure respectively. Hypertension was classified using 8th JNC Guidelines for Prevention, Detection, Evaluation and Treatment of High Blood Pressure (9) that classifies hypertension as systolic blood pressure >140 mmHg and/or diastolic blood pressure >90 mmHg among the adults <60 years of age.

Respiratory rate was calculated by observing and with instrument at the level of the number of abdominal movements in one minute in lying position.

Pulse rate was measured for one minute on radial artery.

Results

BMI of subjects in Group I ranged from 25.1 to 40.54 kg/m2 whereas in Group II it ranged from 18.5 to 24.4 kg/m2. Mean BMI of Group I subjects was 29.32±2.63 kg/m2 as compared to 21.42±1.53 kg/m2 in Group II.

Table 1:

Obesity Grade (BMI)	No. & %
OBESEI(25-29.9kg/m^2)	70
OBESEII(≥30kg/m^2)	30

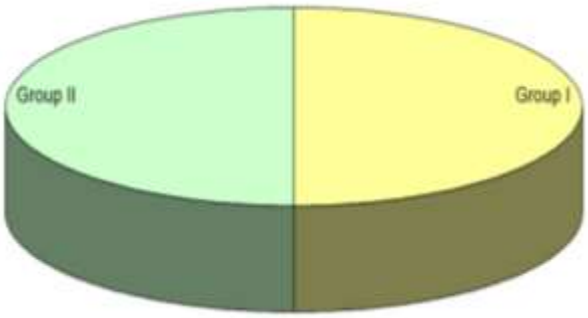
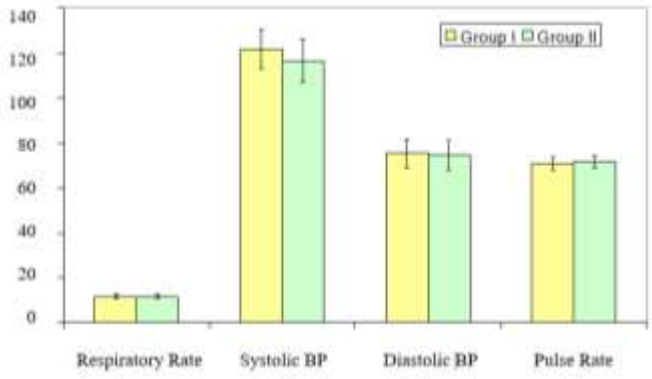


Table 2: Haemodynamic parameters in group I and group II

	Group I (n=100)		Group II (n=100)		Statistical significance	
	Mean	SD	Mean	SD	't'	'p'
Respiratory rate	11.52	1.06	11.54	1.04	-0.135	0.893
Systolic BP	121.82	8.81	116.62	9.64	3.982	<0.001
Diastolic BP	75.36	6.43	74.40	6.81	1.025	0.307
Pulse rate	70.65	3.04	71.53	2.76	-2.143	0.033



Difference in respiratory rate of subjects of Group I (11.52±1.06 per min) and Group II (11.54±1.04 per min) was not found to be statistically significant.

Systolic BP of subjects of Group I (121.82±8.81 mm Hg) was found to be statistically significantly higher as compared to Group II (116.62±9.64 mm Hg).

Diastolic BP subjects of Group I (75.36±6.43 mm Hg) was found to be higher as compared to Group II (74.40±6.81 mm Hg) but this difference was not found to be statistically significant.

Pulse rate of subjects of Group II (71.53±2.76 mm Hg) was significantly higher as compared to Group I (70.65±3.04 mm Hg).

Table 3: Correlation of different study parameters with BMI (Pearson Correlation Coefficient) (n=200)

Sn.	Parameter	R	P
1	Respiratory rate	-0.021	0.766
2	Systolic BP	0.344	<0.001
3	Diastolic BP	0.084	0.239
4	Pulse rate	-0.143	0.044

Systolic blood pressure and heart rate showed a correlation with BMI.

Discussion

In our study, we did not find a significant difference between two groups with respect to respiratory rate however a significant difference between two groups was observed with respect to mean systolic blood pressure and pulse rate. The systolic blood pressure of obese individuals was found to be significantly higher as compared to that of non-obese individuals while pulse rate of obese individuals was significantly lower as compared to that of non-obese individuals. These observations are in partial agreement with various previous studies.(10,11,12) The findings of present study showed a disagreement with the observations of Laxmi*et al.*(12) who had found a significant positive correlation between heart rate and BMI, instead in present study we found that individuals with higher BMI had a lower pulse rate. In our study this correlation was weak negative and significant. As such none of the other studies reviewed by us had evaluated the difference in pulse rate between obese and non-obese young individuals. However, with respect to systolic blood pressure a number of researchers found results similar to present study. Aziz *etal.*(10)

similar to our study found the systolic as well as diastolic blood pressure of obese young individuals as compared to non-obese group. Chabbra*et al.*(11) too also made similar observation with blood pressure of obese (BMI>25 kg/m2) to be higher as compared to non-obese medical students.

Conclusion

Mean systolic BP of obese subjects was significantly higher as compared to non-obese while mean pulse rate of non-obese subjects was found to be significantly higher as compared to obese. Respiratory rate and pulse rate of both the groups were comparable statistically.

A significant positive correlation between BMI and SBP in young adults which should be wake up call for young adults to improve their life style by following healthy eating habits and exercising. Raised SBP is a sign of deteriorating cardiovascular health which in future might lead to metabolic syndrome, Bogaert and Linas (2009)(13) explained the pathogenesis of hypertension owing to obesity. In this model the genesis of hypertension as a result of increased adipose tissue or dysfunctional adipose which triggers multiple mechanisms that contribute to increase in blood pressure, stroke etc.

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