

STUDY OF RELATIONSHIP BETWEEN GENERAL OBESITY INDEX (BMI) AND RESTING HEART RATE IN SCHOOL GOING MALE SUBJECTS (AGED BETWEEN 14 TO 17 YEARS)

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Abstract: Background & Objectives – The studies on resting heart rate in school going children are deficient in this part of Jodhpur city (Rajasthan). The present study was conducted to determine the association between general obesity BMI with RHR in obese and non-obese.

Methods: the study was carried out among 50 male subjects aged between 14 to 17 years were enrolled for present study after they had signed written consent. The anthropometric data i.e. Height (HT), Weight (WT) to calculate Body Mass Index (BMI) of subjects were taken followed by measurements of resting heart rate. All the subjects were divided into two groups according to BMI. The observed valued obtained was then analyzed by students- t test and the data for resting heart rate in both groups i.e. on basis of BMI was then compared by pearson's coefficient correlation.

Results: The general obesity indices (BMI) ($BMI \geq 25 \text{ kg/m}^2$) was found in 22% (BMI Mean = 27.04 ± 1.8). Obese group presented with continuous faster RHR in standing & supine condition (Mean RHRst. = $82.27 \pm 2.45 \text{ bpm}$ & RHRsup = $75.72 \pm 2.27 \text{ bpm}$) and was significantly positively correlated with obesity indices BMI (RHRst. $r = 0.55$, RHRsup. $r = 0.44$ respectively).

Conclusion: RHR in standing condition had higher values and significantly positive correlation with obesity indices among obese group compared to non-obese group ($p < 0.05$).

Keywords: Body Mass Index (BMI), Resting Heart Rate (RHR), Height (HT), Weight (WT)

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INTRODUCTION

The WHO refers Obesity is global epidemic because of rapid increase in the number of overweight and obese individuals in last 20 years [1]. Obese individuals have higher prevalence of several diseases like coronary artery disease, hypertension and diabetes mellitus. Obesity cause alterations in the autonomic modulations of heart rate and in the dynamics of cardiovascular system. Body mass index (BMI) is the marker for body fat content [2].

The relationship mediated by other important cardiovascular risk factors such as obesity [3] which, through inflammatory substances increase RHR [4].

Resting Heart rate (RHR) is easy to measure and important indicator of cardiovascular health. RHR influenced by several constitutional and environmental factors and the important determinants are parasympathetic and sympathetic influences. RHR give the balance between parasympathetic and sympathetic activity [5]. Obesity is known to cause autonomic dysfunction and RHR is dependent on autonomic

system [6]. Obesity can lead to changes in RHR and arterial blood pressure, and also alter the responses to changes in posture [7].

MATERIALS AND METHOD

In the present study, we selected 50 male school going children (Age between 14-17 years) of Jodhpur, Rajasthan during the year of 2018-2019. Institutional ethical clearance was obtained before commencement of the study. An informed consent was taken from each subject during the study. The participants were first given an explanation about the purpose and procedure of the experiment.

Inclusion Criteria

- ☑ Age between 14-17 years.
- ☑ Physically and mentally fit.
- ☑ Not suffering from any known medical problems.

Exclusion Criteria

- ☑ Age below 14 years and above 17 years.
- ☑ Smokers.
- ☑ Not physically fit.

☐ Hypertensive, diabetic or suffering from any long term systemic illness.

☐ Uncooperative.

The anthropometric data i.e. Height (Ht), Weight (Wt) to calculate Body Mass Index (BMI) and of subjects was taken followed by measurements of Resting heart rate. All the subjects were divided into two groups according to BMI.

Procedure for Measurement

Body Mass Index (BMI) – was calculated by dividing the weight taken in kg by the square of height taken in meters. It was calculated by *Quetlet's index*

$[Wt (kg) / Ht (m^2)]$

RHR was measured after a complete rest of 5 minute by taking the radial pulse. Three successive readings were taken in the resting condition for 60 seconds each with an interval of one minute while the person was standing. Similarly three readings for supine resting heart rate were obtained after a further rest period of 3 minute.

Statistical analysis

Mean and standard deviation of all measured parameters with resting heart rate of all subjects were calculated by Microsoft Excel. The data were computed by student t test in 'Open Epi software and Pearson's correlation analysis. The $p < 0.05$ was considered as statistically significant.

RESULTS

TABLE – 1 Descriptive analysis *based on BMI* of school going normal and obese group of male subjects (14-17 years)

Parameters	BMI < 25 kg/m ²	BMI > 25 kg/m ²	Students -t- test	
	Normal Weight (N=39)	Obese (N=11)	T value	P value
	Mean ± SD	Mean ± SD		
Age	15.48±1.13	16±1.08	-1.36	>0.05 N.S.
Height (cm)	164.25±7.83	165.54±5.42	-0.51	>0.05 N.S.
Weight (kg)	55.64±8.86	74.18±6.28	-6.47	<0.01 H.S.
BMI (kg/m ²)	20.54±2.67	27.04±1.8	-7.57	<0.01 H.S.

Note- S- Significant, N.S. Non significant, H. S. Highly significant

TABLE – 2 Resting heart rate *based on BMI* school going of normal & obese group of male subjects (14-17 years)

Parameters	BMI < 25 kg/m ²	BMI > 25 kg/m ²	student-t-test	
	Normal Weight (N=39)	Obese (N=11)	T value	P value
	Mean ± SD	Mean ± SD		
RHR (Standing)	75.87±2.72	82.27±2.45	-7.03	<0.01 H.S.
RHR (Supine)	71.1±2.8	75.72±2.27	60.12	<0.01 H.S.
Δ change	4.67±0.08	6.55±0.18	-50.68	<0.01 H.S.

Note- S- Significant, N.S. Non significant, H. S. Highly significant

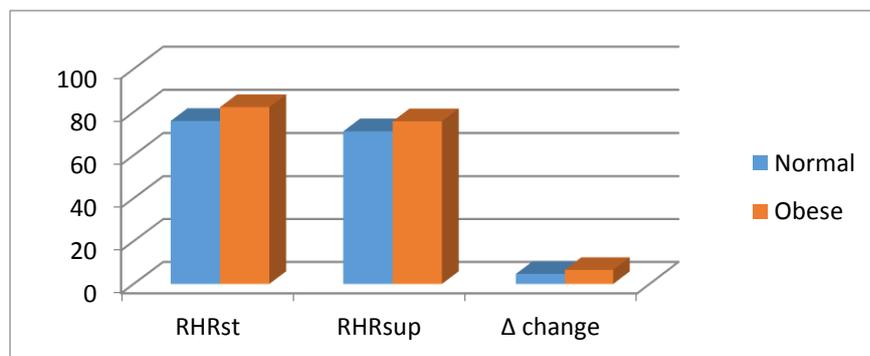


Chart 1: Resting heart rate in standing & supine posture of normal & obese male subjects

TABLE-2 and chart 1 is showing the Resting heart rate is significantly increased in obese group in standing posture. RHR has also increased in supine posture in obese group but which is less than standing posture.

TABLE -3: Correlation of obesity indices with Resting Heart Rate in male subjects

Name of parameters	BMI
RHR (supine)	0.44
RHR (standing)	0.55

TABLE – 3 is showing correlation between obesity indices & Resting Heart Rate. The RHR in standing condition was strongly correlated with BMI.

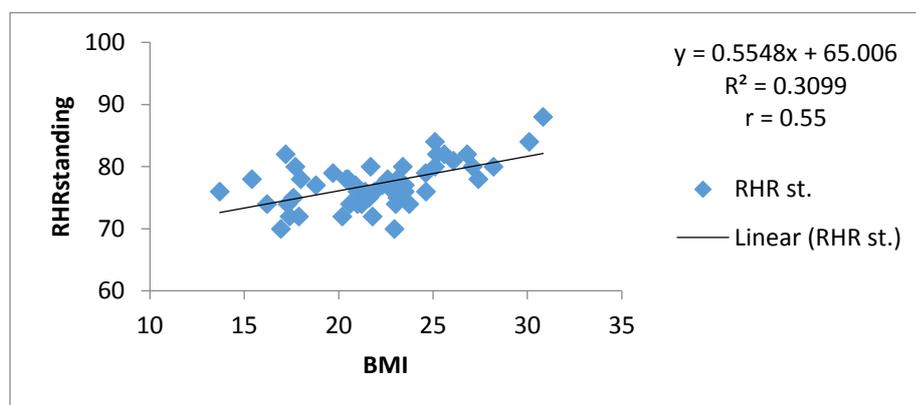


Chart -2: Correlation of BMI with RHR (standing) in male subjects

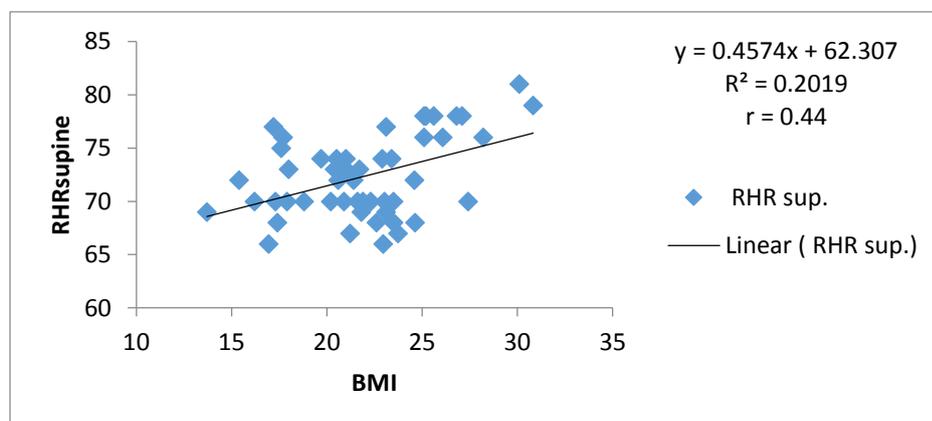


Chart -3: Correlation of BMI with RHR (supine) in male subjects

Chart: 2 Shows the correlation of BMI with RHR in standing posture in male subjects. BMI explained 55% of cases of RHR in standing posture respectively and **Chart: 3** the correlation of BMI with RHR in supine posture in male subjects. BMI explained 44% of cases of RHR in supine posture respectively.

DISCUSSION

The present study was designed to assess the relationship between indices of general obesity (BMI) and Resting Heart Rate in Indian school going male subjects (14-17 years). Which in turn gives the information about the

relationship of Resting Heart Rate with and general obesity (BMI) among school going male subjects (14-17 years).

The present study carried out in 50 healthy male school going children in the age range of 14-17 years, to assess the effect of general obesity on Resting Heart Rate. The

subjects were distributed into 2 groups. Out of total 50 subjects, using the BMI criteria 39(78%) subjects were of normal category and 11(22%) were found under obese category. In our present study the RHR was significantly greater in 48% subjects having general obesity i.e. BMI > 25kg/m² and as compared to non-obese subjects.

On applying Pearson's coefficient correlation analysis we observed a significant correlation of RHR with BMI in the supine & standing posture, explained as 44% & 55% variation. This increase may be due to higher sympathetic tone in the obese and parasympathetic tone less compared to

normal. The RHR relatively higher in both standing & supine position in obese.

Postural changes and RHR

RHR changes are known as to occur when one moves from a recumbent to an upright position or vice versa. Babba et al [8] observed the RHR was strongly associated with obesity and heart rate increased according to the degree of obesity. Adipose tissue releases a substances including adiponectin, which contribute to change in the sympathetic nervous system & decreased parasympathetic nervous system [9]. Obesity important confounding factor to be considered in the analysis.

	Location	Population studied	Type of study	Aims	Findings
Present study	Jodhpur	50 school going male children aged 14-17 years	Cross sectional	To determine the association between general obesity and Resting heart rate (standing & supine) posture in obese and non-obese.	In male subjects, Resting heart rate in (standing & supine) posture was higher in obese compared to non-obese.
Indira Anil Kurane et al [10]	Kolhapur	2000 school going children (Aged 7-11 years)	Cross sectional	To determine the association of Heart Rate with BMI in children.	Obese children have increased heart rate when compared to non-obese children.

CONCLUSION

In our study, we found significant positive correlation between general obesity index i.e. BMI with Resting Heart Rate in obese group male subjects compared to normal weight group subjects. Thus health promotion activities should encouraged in school going male subjects. Further research with large number of subjects is required for confirming our present study results and applying these results to be effectively for these subjects.

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