



EFFECT OF GENERAL AND VISCERAL OBESITY INDICES ON RESTING HEART RATE IN YOUNG ADULT MALES OF WESTERN CHHATTISGARH

Physiology

Dr. Hemlata Gupta Assistant Professor, Department of Physiology, Lakhiram Agrawal Medical College, Raigarh, Chhattisgarh

Dr. Ram Krishna Gupta* Associate Professor, Department of Plastic Surgery, Cancer Hospital and Research Institute, Gwalior, M.P.*Corresponding Author

ABSTRACT

Background: Abdominal obesity is closely associated with CVD risk and has been decorated as a growing problem particularly in countries of Asia-Pacific region where individuals relatively have normal BMI (<25 kg/m²) but have a disproportionately large waist circumference.

Objective- To compare body mass index (BMI), waist circumference (WC), waist hip ratio (WHR), and Body Fat% (BF%) as indices of obesity and to assess their association with Resting Heart Rate (RHR).

Material and Method: A cross sectional descriptive study was done on 300 individuals. Anthropometric measure was obtained and indices of general obesity BMI and indices of visceral obesity WC, WHR, BF % were calculated. Pearson's correlation (r) between obesity indices and resting heart rate in were calculated. Analysis was done using Epi-info software.

Result: In obese group only, WC is significant contributor for RHR (supine and standing), while FFM also significantly contribute for RHR.

Conclusion: The stronger correlation of WC, compared to that with BMI has led to the suggestion that WC should be used as an index of abdominal obesity.

KEYWORDS

Resting Heart Rate, Body Fat Percentage, Body Mass Index, Waist Circumference, Waist Hip ratio.

INTRODUCTION

Obesity has touched epidemic proportion in India in 21 st Century, with morbid obesity affecting 5% of the country's population. Obesity is related with an increased risk of morbidity and mortality as well as decreased life expectancy. Excess obesity has been shown to be an independent risk factor for cardiovascular diseases (CVD) like Type II diabetes, dyslipidemia and hypertension. The worldwide prevalence of overweight and obesity has been increasing at an alarming rate, indiscriminately distressing populations of both higher and lower middle-income countries [1]. The autonomic dysfunction associated with obesity could lead to variations in Resting Heart Rate and arterial blood pressure. Since ANS is involved in energy metabolism and regulation of cardiovascular system, it is conceivable that one or more sub groups of obesity have an alteration in their autonomic nervous system that may promote obesity and account for several clinical consequences of obesity [2]. Obese people tend to have increased RHR as autonomic responsiveness has been shown to be diminished in these individuals [3]. In adults, the use of resting heart rate (RHR) as screening index for cardiovascular risk has been postulated and supported by studies that reported its relationship to mortality [4]. Quantifying RHR can give an index of the load imposed on the heart and the state of imbalance between sympathetic and parasympathetic activity.

It is not clear if RHR can also be applied as a screening for other risk factors, such obesity. Since there is lack of literature for comprehensive studies which focus on the association between obesity, body composition and RHR among young adults in Western Chhattisgarh, the present study was aimed to investigate the effect of body composition and obesity on RHR in Adult Males and finding correlation of RHR with indices of general obesity namely body mass index (BMI) an abdominal obesity viz. waist circumference, waist-hip ratio. (WC, WHR respectively).

MATERIALS AND METHODS

Study design- The present study was Cross sectional study.

Study settings- The study was carried out in Department of Physiology of LAMC, Raigarh (Chhattisgarh)

Study population- Young adults aged between 21-40 years included in the study.

Sampling Technique- Simple random sampling

Sample Size- About 300 individuals were included in the study which were divided into two groups Controls (154) whose BMI is between 18.5-24.9 and Cases (146) whose BMI>25.

Inclusion Criteria- Individuals aged between 21-40 years, physically

and mentally fit, Co-operative. Not suffering from any known medical problem.

Exclusion criteria- Individuals aged < 21 years > 40 years, Uncooperative. Suffering from Hypertensive, Diabetic or suffering from any long-term systemic illness were excluded from the study. Smoker, Tobacco and alcohol users were also excluded from this study. **Methodology-** A prior informed consent was also obtained from each subject for participation in the study and was briefed about the procedure to achieve full cooperation. Detailed demographic details like age, gender and anthropometric feature was taken. Subject was examined for their weight, height, waist circumference & hip circumference. Weight was measured nearest to 0.1 Kg. by weighing balance after removal of shoes with light clothing Height was measured to the nearest 0.5 cm. against the wall without shoes using a stadiometer. Waist circumference was measured using a measuring tape in standing position at the level midway between the lower rib margin and the iliac crest in a horizontal plane. Hip circumference was measured in standing position at the widest point over the buttocks. For each of the waist & hip circumference, two measurements to the nearest 0.5 cm were recorded. BMI was calculated by dividing the weight taken in Kg by the square of height taken in meters. WHR was calculated by dividing waist measurement by the hip measurement. We have used the cut-off point of 25 for BMI and 85 cm for WC, .85 for WHR in our study according to the WHO criteria for South Asian population recommendations [5]. BF% is another parameter for defining obesity. This was also used in present study because of its sensitivity and specificity. Resting Heart Rate (RHR) was recorded in early morning using the ECG after fixing the standard bipolar limb leads. Since 25 mm/sec is the speed normally used, the RHR is counted with the calculation as: - 1500/Distance between two consecutive R-R waves in mm.

Statistical Analysis- The recorded Observations were put in Epi info software for analysis. Unpaired student T test and Pearson's correlation were used to find the association. P<0.05 is considered statistically significant.

RESULTS

Table1- Distribution of Cases and Controls based on Obesity Indices

Obesity Indices	Controls (Normal)	Cases (Overweight and Obese)
BMI	154 (51%)	146 (49%)
WC	164 (54.6%)	136 (45.4%)
WHR	165 (55%)	135 (45%)

As per table 1 based on the cut-off point waist circumference >85 cm was found in 45.4% of cases of total 49% cases. Similarly, out of 146 cases, 45% had high Waist hip ratio.

Table 2- Effect of Obesity Indices on Resting heart rate on different position

Obesity Indices	RHR at Standing		RHR at Supine	
	Normal	Obese	Normal	Obese
BMI	72.21±2.41	82.21±5.35*	65.05±2.05	73.41±1.19*
WC	72.29±2.32	84.29±4.78*	65.14±2.11	74.11±1.81*
WHR	72.11±2.45	84.11±4.56*	65.33±2.23	74.89±1.98*
Body fat %	74.32±4.11	86.90±2.30*	66.78±2.09	76.87±2.11*

*p<0.05 is significant

According to table 2 shows significant changes Resting heart rate in obese males at both standing and supine position on different obesity indices.

Table 3- Correlation of BMI, WC, WHR and Body Fat % with RHR

Characteristics	BMI	WC	WHR	BF%
RHR (STANDING)	0.80	0.86	0.79	0.87
RHR (SUPINE)	0.77	0.81	0.71	0.81

Table 3 shows RHR is standing position shows a strong correlation with obesity indices as compared RHR in supine position which also shows positive correlation. Also, in both position RHR is significantly associated with obesity indices.

DISCUSSION

The prevalence of obesity is now reaching epidemic proportions in India and is of great concern because it increases risk of Coronary Heart disease, Stroke, Diabetes and mortality [6] as per WHO report. WC, WHR and BF% are good indicator of abdominal obesity. Increased WC represents increased abdominal fat or visceral fat. WHR considers the distribution of body fat in the abdominal region but it may remain the same even when there is a change in body size because WC & HC can increase or decrease proportionality. Resting heart rate (RHR) is a marker of sympathetic tone, and independently associated with cardiovascular events and death in various populations. Abdominal obesity is characterized by sympathetic nerve activation (SNA), probably mediated by elevated insulin and leptin levels. Visceral adipose Tissue (VAT) is the predominant adipose tissue compartment producing various proinflammatory cytokines and adipokines. The results of our study also show a significant positive correlation between RHR sup and BMI, WC, WHR & BF%. The correlation of RHR standing with indices of obesity is much stronger than RHR Supine. The effects of autonomic dysfunction would be reduced in supine position especially if they are related to the sympathetic activation [7] this is probably why the difference in RHR supine between Normal and Obese group is less significant as compared to RHR standing and the correlation of RHR sup with adiposity is weaker than that of RHR standing. The changes in the B.P & HR that occur in humans on standing up or lying down are done for the most part to baroreceptor reflex [8]. One major benefit of this study could be that young adults of Western Chhattisgarh may be advised to change their eating habit & lifestyle by demonstrating them an immediate observable effect of obesity on RHR & B.P. A recent study by Gupta R. & Mishra A. et al (2009). Showed a low prevalence of multiple cardio-vascular risk factors (including dyslipidemias, diabetes & obesity) in adolescent but a rapid escalation of these risk factors by age of 30-39 years [9,10].

CONCLUSION- The stronger correlation of Waist circumference, compared to that with BMI has led to the proposal that WC should be used as an index of abdominal obesity and may be more sensitive in the assessment of disease risk than BMI alone in the population.

Conflict of Interest- None declared

Source of Funding- None

REFERENCES

1. Deurenberg P., Yap N. and van Staveren, Body mass index and percent body fat: A meta-analysis among different ethnic groups. *International Journal of Obesity and Related Metabolic Disorders*, 1998; 22:1164-1171.
2. Jules H, Ronald MM. Measuring activity of the autonomic nervous system in humans.

- ObesRes. 2003; 11: 2-4.
3. Yoshiyuki Shigetoh1, Hisashi Adachi1, Sho-ichi Yamagishi1 et al Higher Heart Rate May Predispose to Obesity and Diabetes Mellitus: 20-Year Prospective Study in a General Population. *Am J Hypertens*. 2009; 22:151-155
4. Palatini P, Benetos A, Grassi G, et al. European Society of Hypertension: Identification and management of the hypertensive patient with elevated heart rate: statement of a European Society of Hypertension Consensus Meeting. *JHypertens*. 2006; 24:603-610.
5. Wen CP, David Cheng TY, Tsai SP, et al. Are Asians at greater mortality risks for being overweight than Caucasians? Redefining obesity for Asians. *Public health Nutr* 2009; 12:497-506.
6. World health organization: Obesity: preventing and managing the global epidemic. [http://www.who.int/nutrition/publications/obesity/WHO_TRS_894/en/index.html.] 8:634-7.
7. Grassi G. Adrenergic overdrive as the link among hypertension, obesity, and impaired thermogenesis: lights and shadows. *Hypertension* 2007; 49:5-6.
8. Smith JJ, Porth CM, Erickson M. Hemodynamic response to the upright posture. *J Clin Pharmacol* 1994; 34:375-86.
9. Gupta R, Misra A, Vikram NK, et al. Younger age of escalation of cardiovascular risk factors in Asian Indian subjects. *BMC Cardiovasc Disord* 2009; /1471-2261-9-28.
10. Thakur AK. Heart rate as a risk factor in cardiac disease. *Medicine Update*. 2010; 20:335-339.