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ANTHROPOMETRIC MEASURES OF OBESITY IN ASSOCIATION WITH ECHOCARDIOGRAPHIC LEFT VENTRICULAR HYPERTROPHY IN MALE.

Physiology

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ABSTRACT

Background: This study was aimed to know about the correlation between different measures of obesity and left ventricular mass of an individual.
Material and Method: A total number of 54 normal healthy male volunteers were enrolled in the study from tertiary care teaching rural hospital and M mode echocardiography was performed.
Result: Data were analyzed which shows positive correlation of left ventricular mass values with the obesity indices like BMI, Waist circumference and Waist to Hip ratio (W/H ratio). Group C is highly statistically significant ($p<0.001$) and positively correlated with LVM than other groups. Group C has 6 fold high risk to develop cardiac problems due to 6 times higher LVM than group A.
Conclusion: W/H ratio shows more statistically significant results than WC and BMI. In addition to this the group C which includes obese participants with increased WC is at higher risk to develop left ventricular hypertrophy.

KEYWORDS

Left ventricular mass, body mass index, Waist circumference, Echocardiography

INTRODUCTION

The epidemic of overweight/obesity caused by lifestyle changes associated with economic expansion and urbanization[1] is challenging developing countries with a dramatic increase in morbidity and mortality from cardiovascular diseases,[2] especially in middle-aged productive individuals.[3] The measures used include body mass index[4] for total body adiposity, waist circumference[5] for central adiposity or some normalized obesity index such as the waist–hip ratio[6]. Due to the economic and health burdens involved with cardiovascular disease,[7] every effort should be made to identify abnormal health conditions before the appearance of clinical symptoms to reduce their toll.[8,9] The aim is to identify a phenotype related to left ventricular hypertrophy using a simple, cheap measure that is easily interpreted and could then be carried out in the population in health promotion and prevention of cardiovascular risk factors programs.

Material and Method:

The study included the male participants who visited Dhiraj general hospital after signing the written Informed consent form. Those who willingly participated in the study were recorded with their past history and anthropometric parameters like age, height, weight, waist circumference, hip circumference. After obtaining the parameters, Body mass Index (BMI) and Waist to Hip ratio (W/H ratio) was calculated. According to the WHO Guidelines for BMI, they were divided into 3 groups. BMI values between 18 to 23 kg/m^2 (normal), >23 to <30 kg/m^2 (overweight) and >30 kg/m^2 (obese) named as Group A, B and C respectively. The Echocardigraphic examination with M mode echo was performed for all participants in Cardiology department of Same Hospital, By Cardiologist and Left Ventricular Mass (LVM) was recorded directly from the instrument.

Statistical Analysis:

The study data were recorded and analyzed in the Microsoft Excel 2010. We calculated Means ±Standard deviation for all quantitative variables. We calculated means of LVM for Body mass index, waist circumference and waist to hip ratio and also calculated p-values by 2 tailed significance test ($p< 0.05$) for mean difference across the three variable groups. The predictors and the outcome variables were standardized with corresponding standard deviations and both unstandardized (B) and standardized (β) coefficient estimates and relative standard errors were reported. Differences between groups were assessed by one-way analysis of variance (ANOVA) and post-hoc multiple comparisons were performed.

Result:

In this study the LV mass of participants from all 3 groups were compared and shown in the Table 1. Here we found that in group C (Obese group) mean LV mass is comparatively high compared to other two groups. ($p= 0.0001$). In the table we can see that the LV mass value is increasing when we proceed from group A to B and from group B to C.

Table 1: Comparison individual group with LV Mass

Group	N	Mean	SD	p value
A	17	155.05	15.91	**0.0001**
B	20	181.48	40.46	
C	17	264.14	91.06	

Table: 2 Multiple comparisons between 3 groups

Group		p value	95% Confidence Interval	
			Lower Bound	Upper Bound
A	B	0.506	-73.27	20.42
	C	0.000	-157.80	-60.39
B	A	0.506	-20.42	73.27
	C	0.000	-129.51	-35.82
C	A	0.000	60.39	157.80
	B	0.000	35.82	129.51

Furthermore, in post hoc analysis it was found that there was no significant difference in LV mass of between group A and group B while in Group C, LV mass is highly statistically significant compare to two other groups. (Table 2)

Table 3: Regression analysis of BMI, WC, W/H ratio with LV Mass

Parameter	Unstandardized Coefficients		Standardized Coefficients	t	p value
	B	Std. Error	β		
BMI [12] (kg/m^2)	6.78	1.47	0.54	4.62	**0.00002**
WC (cm)	2.67	0.58	0.54	4.60	**0.00003**
W/H ratio	495.20	119.29	0.50	4.15	**0.0001**

In the above table regression analysis of BMI ($R^2 = 0.289$; p value= 0.00002), WC ($R^2= 0.275$; p value =0.00003), W/H ratio ($R^2= 0.171$; p value= 0.0001) with LV mass was checked.

Discussion:

The present sample represents healthy male participants from mean age 42 ± 2 years who have different values of (A) waist circumference which reflects abdominal fatness, (B) body mass index (BMI) about overall fatness, (C) waist to hip ratio (W/H ratio) giving idea about fat distribution around waist and hip areas that means it gives information about the obesity patterns like apple or pear shape obesity12-15 and (D) left ventricular mass (LVM).

Waist circumference or abdominal obesity enlargement is in direct correlation with visceral adipose tissue fat (VAT) 21. This larger amount of VAT is responsible for increase in epicardial fat. 16-20. The increase in epicardial fat is seen as an increase in left ventricular mass22-23 which is also seen in this study as we compared 3 different groups (table 1, 2)

The conventional findings from different studies have shown that as people get older they tend to get fatter and this fatness is reflected in an increase in BMI. Simultaneously, for a long run this increase in BMI and WC is seen as a large left ventricular mass.

Left ventricular hypertrophy (LVH) because of increased LVM is potent marker of end organ damage26, which is again due to increased adiposity. 25 The LVH contributes to the worsening of cardiovascular outcomes which depends on the presence or in the absence of metabolic syndrome, diabetes and independently of hypertension. 27 The present study data are in accordance with many recent studies which are reporting that the hypertrophic phenotype was better predicted in men who had high BMI with increased waist circumference (Group C participants) 28-31.

Body Mass Index (BMI) has been used as an obesity index in many other studies. Here BMI is positively correlated with LVM ($p<0.001$). The same results were obtained for WC[24] and W/H[25] ratio in Table 3 which is supported by many other studies. [32-34]

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