Original Research Article

Comparative study of waist circumference and body mass index in obese patients for the risk of developing coronary artery disease

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Abstract

Background: Obesity increases the risk for developing the cardiovascular disease because of the adverse effects caused by visceral fat accumulation than due to the accumulation of subcutaneous fat, which constitutes more than eighty-five percent of total body fat. Among Indians, CAD appears a decade earlier compared with the age than in developed countries.

Aim of the study: To determine the association of Body mass index and waist circumference for the risk of developing coronary artery disease.

Materials and methods: The current study was done at Government Mohan Kumaramangalam Medical College and Hospital, Salem at, Department of Medicine from our inpatient and outpatient departments from August 2017 to August 2018. Totally 100 patients were included in the study. The patient was considered to be obese if his or her body mass index calculated by Wt in kg / Ht in m^2 was > 25 Kg /m^2. Abdominal circumference was measured at the level equidistant between the costal margin and iliac crest. ECG, Lipid profile was measured by standard measures.

Results: The Mean Age in the study group was 51.28 with SD of 7.7 years and Mean age in the Control group was 53.3 with SD of 5.5 years. In our study Waist circumference and body mass index were measured and analysed for the risk of coronary artery disease. It showed that both BMI and Waist circumference correlates well with risk for developing coronary artery disease, and Waist circumference measurement was superior to BMI in assessing the risk of CAD. Thus our study

highlights the importance of a simple measurement of waist circumference and BMI in day to-day clinical practice in detecting the patients with high cardiovascular risk.

Conclusion: A BMI of ≥ 25 and waist circumference of > 90 cm in males and > 80 cm in females increases the sensitivity of detecting high risk for coronary artery disease. Waist circumference is more sensitive in predicting the risk than BMI chiefly because of its potential to measure central adiposity.

Key words

Body Mass Index, Waist Circumference, Lipid Profile, Coronary Artery Disease.

Introduction

Obesity currently thought-about as a "Killer lifestyle" and the leading cause for CAD (which is now considered the “modern epidemic” of the world) is a preventable cause of death worldwide [1]. Obesity increases the risk of developing cardiovascular disease because of the adverse effects caused by visceral fat accumulation than due to the accumulation of subcutaneous fat, which constitutes more than eighty-five percent of total body fat [2]. Among Indians, CAD appears a decade earlier compared with the age than in developed countries. Body mass index (BMI) and Waist circumference are the two most widely used methods used for measuring obesity in clinical practice to assess the risk of developing cardiovascular diseases [3]. This study tries to bring out the significance of body mass index and waist circumference for detecting people with high cardiovascular risk and to determine the optimum level of waist circumference and BMI, for diagnosing central obesity among our population [4, 5].

Materials and methods

The current study was done at Government Mohan Kumaramangalam Medical College and Hospital, Salem at, Department of Medicine from our inpatient and outpatient departments from August 2017 to August 2018. The patient was considered to be obese if his or her body mass index calculated by Wt in kg / Ht in m^2 was > 25 Kg /m^2. Abdominal Circumference was measured at the level equidistant between the costal margin and iliac crest. Lipid profile was measured by standard measures.

Inclusion criteria

- Newly diagnosed cases of myocardial infarction.
- Age group 30 to 60 years.

Exclusion criteria

- Old cases of myocardial infarction, unstable angina, chronic stable angina,
- Age below 30 years and above 60 years,
- Pregnant mothers,
- Other major risk factors like hypertension, diabetes and family history.

Anthropometry measurements: Height, Weight, Waist Circumference. From these measurements, the Body Mass Index was calculated. The patient was considered to be obese if his or her body mass index calculated by Wt in kg / Ht in m^2 was > 25 Kg /m^2.

Lipid profile: Consists of total cholesterol and triglycerides done by direct enzymatic assay. Levels > 200 for total cholesterol and > 150 for TGL are at high risk.

Statistical analysis

Data analysis was done on the collected information using with the help of a computer**.** By using this software, range, frequencies, percentages, means, standard deviations, chi-square, and 'p' values were calculated. By using Kruskal Wallis chi-square test the significance of the difference between quantitative variables and by using Yate’s test for qualitative variables were calculated. A 'p' value < 0.05 was taken to denote a significant relationship.

Results

Table - 1 shows the mean age in the study group was 51.28 with SD of 7.7 years and Mean age in the Control group was 53.3 with SD of 5.5 years. The "p" value was 0.1711 and the difference was statistically not significant.

Table – 1: Total no. of cases and controls age wise distribution.

Age in years	Number		Percentage	
	Cases	Controls	Cases	Controls
31-40	06	02	12%	4%
41-50	14	10	28%	20%
51-60	30	38	60%	76%
Total	50	50	100%	100%

Table - 2: Sex wise distribution of cases and controls.

Sex	Cases	Controls	Percentage	
			Cases	Controls
Male	36	36	72%	72%
Female	14	14	28%	28%
Total	50	50	100%	100%

Table – 3: BMI in cases and controls.

BMI	Cases	Controls
< 25	10	50
> 25	40	0
Mean	27.510	22.186
S.D	2.793	1.080
"p" value < 0.0001, considered extremely significant		

Table – 4: Serum cholesterol and TGL in patients with increased BMI.

Patients	Total cholesterol		Fasting triglycerides	
	< 200	> 200	< 150	> 150
Male	09	19	07	21
Female	04	08	05	07
Total	13	27	12	28
Percentage	32.50%	67.50%	30%	70%

Table - 2 shows in both cases and control groups, sexes were equally distributed. The "p" value was 1.0000 and it was statistically not significant, and the two groups were comparable.

Table – 5: Comparison of serum cholesterol in patients with increased BMI and controls.

BMI	Total cholesterol		Triglycerides	
	< 200	> 200	< 150	> 150
< 25	51	09	40	20
> 25	13	27	12	28
"p" value	<0.0001 extremely significant.		0.0007 extremely significant.	
Relative risk	2.615		2.222	
95% Confidence Interval	1.652 to 4.140		1.340 to 3.687	

Table – 6: Waist circumference in cases and controls.

Waist circumference	Cases		Controls	
	Male	Female	Male	Female
Normal	01	02	36	14
Increased	35	12	0	0
Mean	95.778	87.000	83.111	74.929
S.D.	4.350	6.540	2.364	2.526
"p" value < 0.0001, considered extremely significant				

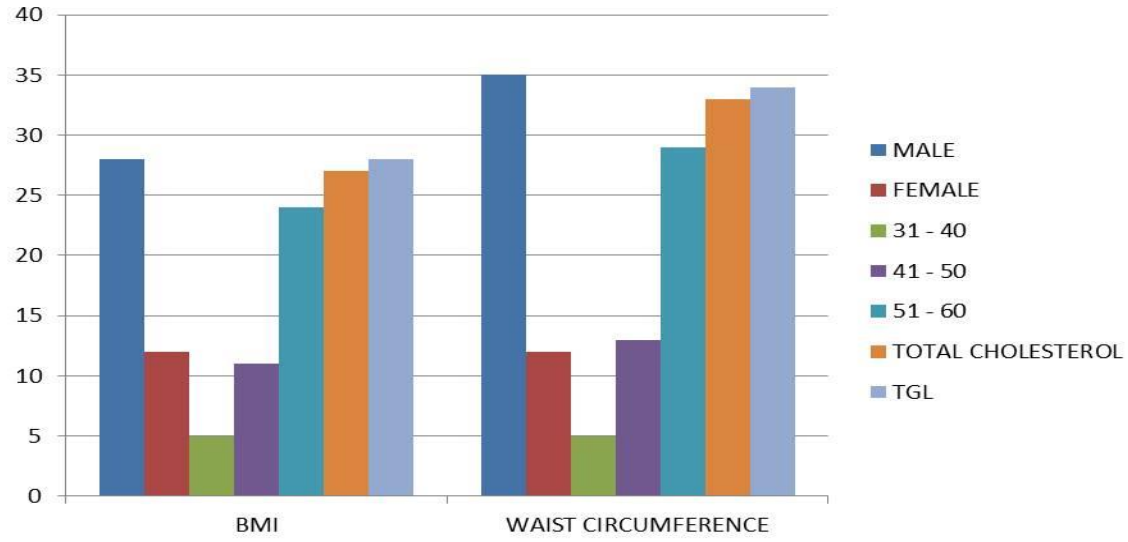
Table – 7: Comparison of BMI and waist circumference percentage of distribution.

Variable	Increased in	Total cases	%
BMI	40	50	80%
Waist circumference	47	50	94%

Table - 3 shows the mean BMI in study group was 27.51 with SD of 2.7 and in the Control group Mean BMI was 22.18 with SD of 1.08 "p" value was < 0.0001 and the difference was extremely significant.

Table - 4 shows serum total cholesterol and triglycerides were elevated in cases with raised BMI. About 19 males and 8 females had elevated serum total cholesterol and 21 males, 7 females had elevated serum triglycerides.

Graph – 1: Overall comparison.



Serum cholesterol was increased in 27 cases with raised BMI, whereas it is raised only in 13 controls who had normal BMI. Serum triglycerides were elevated in 28 cases with raised BMI, whereas it is raised in 20 cases with normal BMI (**Table – 5**).

Table - 6 shows the mean waist circumference in the Study group was, in males -95.77 with SD of 4.3. In females-87.00 with SD of 6.5 and in the Control group Mean Waist circumference was males-83.11 with SD of 2.3 In females-74.92 with SD of 2.5„p" value was < 0.0001 and the difference was extremely significant.

Table - 7 shows the comparison of percentage of BMI and Waist circumference distribution in the study group. The results were interpreted as follows,

Comparison results

Correlation coefficient (r) = 0.3157 95%, confidence interval = 0.04089 to 0.5461Coefficient of determination (r squared) = 0.09967. 'p' value 0.0255, considered significant.

Waist circumference incidence was more than BMI in the study group and is statistically significant.

Graph - 1 shows the overall comparison of parameters in relation to age, sex, total cholesterol, BMI, Waist circumference. It shows the total cholesterol levels and triglycerides increased significantly in patients with increased waist circumference.

Discussion

In our study, 100 patients presented with acute myocardial infarction were evaluated on the basis of including and excluding criteria. Those who have increased Body Mass Index or increased Waist Circumference or both were included. Also the well-known risk factors for CAD like family history, Hypertension and Diabetes were excluded [6]. Even though there is higher chance of developing diabetes and hypertension in obese individuals, we carefully selected the study group such that those presented without hypertension and diabetes are included, since we want to evaluate whether obesity is an independent risk factor for developing CAD [7]. In our study it is found that there is definite association between BMI and CAD as evidenced by the occurrence of 80% of the patients with increased BMI and the 'p' value is <0.0001 which is very significant [8]. This shows that increased BMI is definitely a risk factor for developing CAD. In our study it is found that there is definite association of waist circumference with Coronary artery disease as evidenced by the occurrence of 94% of the

patients with increased BMI and the 'p' value is <0.0001 which is very significant. It is evident that both increased BMI and increased Waist Circumference are associated strongly and both are considered as independent risk factor for developing coronary artery disease [9]. The strongest association of which of the above anthropometric measure is studied by various researchers [10].

In our study, we found that waist circumference was strongly associated with the risk of developing CAD as evidenced by 94% of patients who had CAD, as compared to 80% with increased BMI and the p value is 0.0255, considered significant [11, 12].

Conclusion

It was showed that both BMI and Waist circumference correlates well with the risk for developing coronary artery disease, and Waist circumference measurement was superior to BMI in assessing the risk of CAD. Thus our study highlights the importance of a simple measurement of waist circumference and BMI in day to- day clinical practice in detecting the patients with high cardiovascular risk.

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