Original Research Article

A study of waist hip ratio in identifying cardiovascular risk factors at Government Dharmapuri College Hospital

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Abstract

Introduction: Rising incidence of Diabetes mellitus, Systemic hypertension and Dyslipidemia, the well-known risk factor for cardiovascular disease is the leading cause for increased incidence of cardiovascular diseases1. Till today, body mass index and waist circumference are the two popular parameters used to assess the cardiovascular risk factors. Though Asian people are not overtly obese, they are still at an increased risk of cardiovascular disease and this may be due to presence of visceral obesity, but the cut off value for waist circumference.

Aim of the Study: To assess the effectiveness of the newer anthropometric index, Waist/Height ratio in identifying cardiovascular risk factors. To compare the effectiveness of various anthropometric indices Body mass index, Waist Circumference and Waist/Height ratio in identifying Cardiovascular risk factors.

Materials and Methods: 135 patients were included in our study. Careful history taking was first taken in these patients regarding pre-existing diabetes mellitus, systemic hypertension and dyslipidemia and about the treatment for these illnesses. In all these patients the following anthropometric measurements are done: Height, weight, waist Circumference were measured using standard methods.

Results: In our study, 135 patients was selected randomly. The cut off values of anthropometric indices which was taken as abnormal were Body mass index > 25kg/m^2, Waist Circumference Males > 90 cm Females > 85 cm, Waist/Height ratio > 0.5.

Conclusion: Waist/Height ratio with cut off > 0.5 was found to be an effective, newer and cheaper anthropometric index in identifying cardiovascular disease.

Key words

Diabetes mellitus, Systemic hypertension, Dyslipidemia.

Introduction

Rising incidence of diabetes mellitus, systemic hypertension and dyslipidemia, the well-known risk factor for cardiovascular disease is the leading cause for increased incidence of cardiovascular diseases [1]. Till today, body mass index and waist circumference are the two popular parameters used to assess the cardiovascular risk factors [2]. Though Asian people are not overtly obese, they are still at an increased risk of cardiovascular disease and this may be due to presence of visceral obesity, but the cut off value for waist circumference varies among sex, ethnics and countries [3]. So we are still in need of simple, cheap and effective anthropometric parameter to assess cardiovascular risk of our population. In our study, use of Waist/Height ratio parameter was assessed for identifying cardiovascular risk and to compare with other studies. The average height of Asian is low, when compared to western countries. Height is an independent negative predictor of cardiovascular disease, so waist circumference, as a parameter of visceral obesity should be taken in context to height as waist/height ratio [4, 5]. Waist/height ratio with cut-off >0.5 is the newer parameter under clinical trial expected to emerge in clinical practice in near future. In our study, effectiveness of waist/height ratio was studied in identifying cardio-metabolic risk factors. This parameter was also compared with well-known other parameters like body mass index and waist circumference in our study. The propensity of clustering of metabolic and cardiovascular risk factors in the same individual has been recognized for many years. The first description of cardio-metabolic risk factor clustering appeared in the medical literature in 1923, when Eskil Kylin (1889 – 1975), a Swedish physician, described a syndrome involving hypertension, hyperglycemia, and hyperuricemia [6, 7]. Sixty five years later in 1998, Reaven described a cluster of risk factors for diabetes and Cardio Vascular Disease. (hypertension, hyperglycemia, glucose intolerance, elevated triglycerides and low high density lipoprotein level). He named it as syndrome X and introduced the concept of insulin resistance [8].

Materials and methods

Among patients attending medical OP department in Government Dharmapuri Medical College Hospital, Dharmapuri for various illness, 135 patients were included in our study. Males: 114 members and females 21.Patients was taken up during the period from July 2016 to December 2016.Patients were selected between the age group of 20-75 Years, both males and females.

Exclusion criteria

Chronic renal failure patients, Cirrhosis of liver, Congestive cardiac failure, Nephrotic syndrome, Hypo thyroidism, Ascites of any cause.

Anthropometry

In all these patients the following anthropometric measurements were done

- Height: Height was taken by asking the patient to stand erect against the wall and vertical height was measured in centimeters.
- Weight: Weight was measured in kilograms using a weighing machine.
- Waist Circumference: Waist circumference was taken using an inch tape at the midlevel between lower costal margin and iliac crest. From these anthropometric measures, body mass index and Waist/Height ratio were calculated. Blood pressure recording: BP was taken 3 times over a period of 1 week to confirm Systemic Hypertension.

Investigations

The following Investigations are done after an overnight fasting for >8 hours

- Fasting plasma Glucose,
- Serum Total Cholesterol,
- HDL,
- Triglyceride.

The information collected regarding all the selected cases were recorded in a master chart. Data analysis was done with the help of Computer using Epidemiological information package (EPI 2002). Using this software, frequencies, percentages, means, standard deviations, chi-square and 'P' values were calculated. Kreskas Wallis Chi–square test was used to test the significance of the difference between quantitative variables and test for qualitative Variables. A 'P' value less than 0.05 is taken to denote significant relationship.

Results

The cut off value of body mass index above which it was taken as abnormal in our study was > 25. The mean BMI in our study group was 23.7. It was clearly made out from the table that nearly 70% of the study group has normal BMI. This is similar to the pattern seen among Asians, where the BMI was less but cardio metabolic risks are high (**Table – 1**).

Table - 1: Weight and Height.

Parameters	Cases	
	Mean	**SD**
Weight (kg)	58.4	10.4
Height (cm)	159.3	12.3

The mean waist circumference among the study group was 86 cms. Waist circumference was the best anthropometric index used in assessing cardiovascular risk factors in Asians as it measures truncal obesity and there by insulin resistance. In our patients, as in the general pattern for Asians, waist circumference was high in spite of having low BMI (**Table – 2**).

Nearly 85% of patients in our study group had at least one of the above cardiovascular risk factors. Only 34.6 % of patients had previous history of risk factors. Our study was also useful in detecting risk factors in rest of the patients (**Table – 3**).

It was found that nearly 33.3% of patients with abnormal BMI had any one of the cardiovascular risk factors. The association between BMI and cardiovascular risk factors also statistically significant (P value 0.0336) (**Table – 4**).

Table - 2: Waist circumference.

Waist circumference	Cases	
	No	**%**
Normal (M≤90, F≤85)	97	71.9
Abnormal (M>90, F>85)	38	28.1
Mean	86.1 cm	
SD	24.6 cm	

Table – 3: Abstract of Cardiac Risk Factors.

Risk factors	Cases	
	No	**%**
Abnormal blood sugar (F) (>110 mg/dl)	26	19.3
Past known history (taking treatment)	44	32.6
Blood Pressure (> 140/90 mm Hg)	52	38.8
Total Cholesterol (> 220 mg/dl)	28	20.7
TGL (> 150 mg/dl)	61	45.2
HDL (< 40 mg/dl)	48	35.6
Any one of the above factors present	114	84.4

Table – 5: BMI and Cardiac risk factor.

Cardiac risk	BMI					
	Normal		**Abnormal**		**Mean**	**SD**
	No	**%**	**No**	**%**		
Present (114)	76	66.7	38	33.3	24.18	8.68
Absent (21)	19	90.5	2	9.5	20.89	3.09
P value	0.0336 significant					

Discussion

All of the 135 patients taken for our study belong to low socioeconomic status group. These 135 patients were not representative of general population. Regarding their occupation most of them are coolly workers with high physical activity. In our study the cardio metabolic risk and use of anthropometric measures are studied in this population. Previously it was thought that diabetes mellitus, systemic hypertension, coronary artery disease and dyslipidemia were urban diseases. But today it is not so. The prevalence and incidence of these cardio metabolic diseases is high in India and is increasing even though >60% of Indians belong to low social economic group and living in rural areas [9-12]. Among 135 patients taken in our study, 114 are males and 21 are females. Number of female patients taken in our study was low because many female patients were not willing to take part in our study. More female patients should be studied to assess the anthropometric parameter usage in identifying cardio metabolic risk factors. In our study fasting plasma glucose was taken after 8 hours fasting. The cut off values for fasting plasma glucose used in our study is 110 mg/dl above which it is considered abnormal .This cut off value is taken because this is the cut off value used in WHO criteria for metabolic syndrome and this is the same cut off used in the reference study done among Japanese people [13-18]. The advantage of the fasting glucose is its reliability, convenience to the patients and the values are not altered by patient factors. The drawback of fasting plasma glucose is that it may be normal in early stages of diabetes [19]. In such situations, post prandial plasma glucose is the ideal test. In our study, BP is taken 3 times over a period of 1 week. The cut off values for BP is ≥ 140/90 mm Hg in our study. This same cut off is used in WHO criteria for metabolic syndrome and JNC 7 guidelines for diagnosis of systemic hypertension. Systemic hypertension is considered an important cardiovascular risk factor. In our study fasting serum total cholesterol, triglyceride and HDL levels are taken. In Asians the pattern of lipids is high triglycerides, with low HDL levels. In our study, the mean total cholesterol is 180 mg/dl, mean triglyceride levels are 156 mg/dl and mean HDL levels are 40.5 mg/dl. Our study also reflects the same pattern of lipids among Asians. Still now effective anthropometric parameter to assess truncal obesity and insulin resistance with standard cut off values for all sex and ethnic group is not available [20]. So the prime aim of our study is to search for a new effective, standard and cheap anthropometric index (i.e. Waist/Height ratio) in identifying cardio metabolic risk factors. Waist/Height ratio is the newer parameter taken in our study; its effectiveness is studied and compared with other parameters like BMI and waist circumference. The reference for this study was taken from the Journal of preventive medicine published in July 2005. In our study nearly 55.3% of patients with abnormal Waist/Height ratio had cardiovascular risk. The association between Waist/Height ratio and cardiovascular risk factors was also found to be statistically much significant, the P value was 0.0005. But by comparison only 33.3% and 31.6% of patients with abnormal BMI and waist circumference had cardiovascular risk. In our study by comparison it was found that Waist / Height values are the superior and effective parameter in identifying cardio metabolic risk in both sexes. Till now only few studies are available on this. No Indian study is yet available, so our study provides preliminary evidence that Waist/Height values may be a superior and effective anthropometric index

Conclusion

- Waist/Height ratio with cut off > 0.5 is found to be an effective, newer and cheaper anthropometric index in identifying cardiovascular disease.
- Waist/Height ratio with cut off > 0.5 is an effective parameter in all ages and both sexes among Indians.
- Waist/Height ratio with cut off > 0.5 is the superior parameter in identifying cardiovascular disease than BMI and waist circumference.

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