LONGER THE BELT, SHORTER IS THE LIFE SPAN

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Five hundred and twenty-one subjects presenting for routine exercise tolerance test had their waist circumference, body mass index (BMI), waist-hip ratio(WHR) and serum cholesterol measured. Compared to weight and body mass index, waist-hip ratio and waist circumference has been found to be better anthropometric predictors of hypercholesterolemia and positive exercise tolerance test. Moreover, an average waist circumference and WHR is high in our population and females are having relatively higher serum cholesterol levels than men.

INTRODUCTION

Ischemic heart disease is the most common cardiac disorder and is the leading cause of death all over the world, therefore search for its predisposing factors have always been an object of interest.

Obesity is a well-known risk factor for ischemic heart disease, it is important because it also contributes to all other risk factors for ischemic heart disease, except smoking. The definition of obesity is arbitrary' and is defined as an increase of 20 percent above ideal body weight. The term obese and overweight are not synonymous, overweight is expressed by body mass index (BMI i.e. wt in kg/Ht (m^2) and obesity is estimated by thickness of skin folds in various body regions. To simplify the issue WHO endorsed ranges of BMI are:

a)	NORMAL	20-25 (kg/m^2)
b)	OVERWIEGHT	25-30 (kg/m^2)
c)	OBESE	> 30 (kg/m^2)
d)	MORBID OBESITY	> 40 (kg/m^2)

Alter the paper of Vague in which he for the first time demonstrated that android or central obesity was more closely associated with diabetes, gout and athero-sclerosis than the gynaecoid or peripheral obesity \ search for the significance of regional distribution of fat started.

Larsson B et al in a 13 years follow up of 1913 men observed that android type of obesity expressed by high waist to hip ratio was associated with increased risk of ischemic heart disease despite indices and measures of total obesity having no predictive power[2].

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Papidus et al in a 12 years follow up of 1462 women showed a significant positive relation between increased waist to hip ratio and incidence of myocardial infarction, angina pectoris, stroke and death; this relation was independent of age, body mass index, smoking habit, serum cholesterol, serum triglycerides and systolic blood pressure [3]. Both these long term studies indicate that abdominal distribution of fatty tissue rather titan the overall obesity accounts for cardiovascular risk. The most accurate way of measuring intrabdominal fat is the CT scan of abdomen, however it is very expensive and impractical for routine purposes. Margaret et al in a comparative study reported that waist-hip ratio correlates better with intrabdominal fat titan the degree of obesity (BMI); in this study intrabdominal fat was measured by CT scan of abdomen in sagittal plane [4].

Recently Marie-Christine et al in a study of 81 men and 70 women observed that both waist circumference and waist-hip ratio correlates with abdominal adipose tissue measured by CT scan and related cardiovascular disease risk factors (triglycerides, high density lipoproteins cholesterol levels, fasting and post glucose insulin and glucose levels'.

We conducted this study to see the relation of waist circumference and waist hip ratio, weight and BMI to cardiovascular disease risk expressed by- positive exercise tolerance test and hypercholesterolemia.

MATERIALS AND METHODS

521 subjects (411 men, 110 women) age 25-72 years were randomly selected. Body weight was measured with a balance scale in kilograms, waist circumference was measured with the patient standing at the level midway between lower rib margin and iliac crest by a flexible tape.

Hip circumference was measured by same tape at widest point between hip and buttocks. All the anthropometric measures were performed by the same observer. BMI was obtained by dividing body wt in kilograms by height in meters squared. Waist-hip ratio (WHR) was obtained by dividing waist circumference by hip circumference. Serum cholesterol was measured by reflotran. For ETT (Exercise tolerance test) Bruce/Modified Bruce protocols were used and the results were expressed as positive, negative or inconclusive. A positive test was defined by development of any of the following:

a) Typical chest pain.
b) Horizontal or down sloping ST depression 1 mm or more 80 msec after the J. point.
c) Electrocardiographic evidence of myocardial infarction in pre-exercise resting ECG.

d) ETT was considered negative when at least 85 % of the maximum heart rate was achieved without significant ST segment depression on ECG. ETT was considered inconclusive if the patient failed to achieve 85% of the target heart rate in the absence of significant ST-T changes. Subjects with inconclusive ETT's were dropped from the study.

RESULTS

The total number of patients was 521 (males 411, females 110), out of which we excluded 21 patients (males 11, females 10).

TABLE-1: CORONARY ARTERY DISEASE

Diagnostic Mode	Males	Females	Total
Positive ETT	183	25	208
Negative ETT	217	75	292
Inconclusive ETT	10	11	21

TABLE-2; STATISTICS (By Chi-Square Method)

TESTS	p VALUE
MALES:	
WHR vs Positive ETT	<0.025
WHR vs S Cholesterol (> 200 mg%)	<0.025
WHR vs Obesity (BMI > 30 kg/m^2)	<0.005
Waist vs Positive ETT	<0.05
Waist vs S Cholesterol (> 200 mg%)	<0.05
Waist vs BMI (> 30 kg/m^2)	<0.005
Weight vs Positive ETT	<0.05
Weight vs S Cholesterol (> 200 mg%)	<0.05
FEMALES:	
WHR vs Positive EXP	<0.95
WHR vs S Cholesterol (> 200 mg%)	<0.95
WHR vs Obesity (BMI > 30 kg/m^2)	<0.95
Waist vs Positive ETT	<0.95
Waist vs S Cholesterol (> 200 mg%)	<0.05
Waist vs BMI (> 30 kg/m^2)	<0.005
Weight vs Positive ETT	<0.05
Weight vs S Cholesterol (> 200 mg%)	<0.05

TABLE-3: MALES WITHOUT CORONARY ARTERY DISEASE (TOTAL NO. - 27)

Variable	Mean	S.D.	S.E.	95% C.I.
Age (Yr.)	44.26	10.70	0.727	42.83-45.68
Weight (kg)	78.45	13.88	0.94	76.70-80.29
BMI (kg/m^2)	26.556	5.695	0.387	25.79-27.30
Waist (m)	0.953	0.133	0.009	0.935-0.979
WHR	0.962	0.100	0.007	0.948-0.975
Cholesterol (mg/dl)	194.42	38.50	2.614	189.30-199.54

TABLE-4: MALES WITH CORONARY ARTERY DISEASE (TOTAL NO. - 183)

Variable	Mean	S.D.	S.E.	95% C.I.
Age (yrs)	51.92	9.89	0.731	50.49-53.35
Weight (kg)	74.04	10.42	0.771	72.53-75.54
BMI (kg/m^2)	25.95	3.479	0.257	25.451-26.458
Waist (m)	0.947	0.091	0.007	0.900-0.960
WHR	0.985	0.062	0.005	0.975-0.994
Cholesterol (mg/dl)	201.32	47.95	3.53	194.38-208.3

TABLE-5: FEMALES WITHOUT CORONARY ARTERY DISEASE (TOTAL NO. -75)

Variable	Mean	S.D.	S.E.	95% C.I.
Age(yrs)	43.21	9.90	1.143	40.96-45.45
Weight (kg)	71.35	10.07	1.162	69.07-73.55
BMI (kg/m^2)	28.47	5.10	0.588	27.31-29.62
Waist (m)	1.008	0.086	0.009	0.990-1.025
WHR	0.974	0.071	0.008	0.95-0.989
Cholesterol (mg/dl)	207.03	53.04	6.124	195-219.03

TABLE-6: FEMALES WITH CORONARY ARTERY DISEASE (TOTAL NO. - 25)

Variable	Mean	S.D.	S.E.	95% C.I.
Age(yrs)	51.04	7.95	1.59	47.24-54.84
Weight (kg)	68.29	12.75	2.55	63.29-73.28
BMI (kg/m^2)	27.97	3.97	0.75	26.48-29.45
Waist (m)	1.002	0.09	0.018	0.966-1.037
WHR	0.996	0.059	0.0117	0.973-1.018
Cholesterol (mg/dl)	207.12	53.87	10.77	186.0-228.0

DISCUSSION

Our results suggest that in men there is a significant positive correlation between waist circumference and waist-hip ratio to cardiovascular disease risk markers i. e. positive ETT and high serum cholesterol. The waist-hip ratio has relatively better correlation then the waist circumference. Weight and BMI did not show significant positive correlation with positive ETT and high serum cholesterol.

The exact reason that why abdominal distribution of fat is more related to cardiovascular disease risk is not known. Kissebal et al showed that abdominal fat cells of women with centralized distribution of tat were larger and exhibited a higher rate of lipolysis titan those from woman with a peripheral distribution of fat [6]. They suggested that the presence of these hypertrophied subcutaneous fat cells with high output of free fatty acids could be an important factor in the susceptibility of these women with centralized obesity to glucose intolerance, hyperinsulinemia and hypertriglyceridemia. These free fatty' acids have direct access to portal vein thus exposing the liver to high concentration of free fatty acids which may contribute to hypertriglyceridemia and insulin resistance.

n females we did not observe a positive correlation of the anthropometric measurements to cardiovascular risk factors. This issue needs further study; however, the obvious fact which we have noticed is that females are not used to exertion therefore die percentage of negative ETT’s in females in 69% and inconclusive ETT is 8% compared to males which is 50% and 3% respectively. Moreover, the number of females is also small. For men our results support the previous long term studies on waist to hip ratio and waist circumference as ideal anthropometric measure for cardiovascular risk and we recommend their routine use in our population for evaluation of ischemic heart disease. The previous routine of relying on body weight only should be discouraged.

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