Anthropometric Correlation of Lipid Profile in Healthy People in Rural Kolar

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Abstract

The association of anthropometric profile with hyperlipidemia after adjustment for important confounding variables such as smoking, alcohol intake and diabetes in healthy male volunteers was analyzed. Anthropometric measurements of weight, height, waist and hip circumferences were measured. Serum levels of total cholesterol (TC), high density lipoprotein cholesterol (HDL-c) and triglycerides (TG) were measured and low-density lipoprotein cholesterol (LDL-c) was calculated by the Friedewald's formula. Statistical analysis was done to examine the associations between anthropometric variables and lipid parameters. Mean age of the study population was 51.0±10.189 (30 to 60 years). 43.40 Percent of study population had BMI >25 kg/m^2. In 68.4 % subjects waist hip ratio (WHR) was more than 0.9 and 62.8 % had waist circumference more than 90 cm. High LDL (85.2%) was the commonest abnormality noted followed by hypercholesterolemia (77.0%). Correlation analysis revealed that there is positive correlation between BMI and WC with respect to TC(r=0.165), TG(r=0.139) and VLDL-c (r=0.140). Combination of anthropometric variables predicts dyslipidemia better in asymptomatic healthy subjects rather than any one particular variable.

KEYWORDS: Obesity, anthropometry and lipid profile

Introduction:

The World Health Organization (WHO) defines obesity as a condition with excessive fat accumulation in the body, to the extent that health and wellbeing are adversely affected[22]. It has been widely accepted that excess body fat and obesity constitute risk factors for diabetes[8], cardiovascular diseases[17], hypertension[20], gall bladder disease [13] and dyslipidemia[6]. Various lipid/lipoprotein abnormalities have been observed in obese individuals, including elevated cholesterol, triglycerides, and lower high-density lipoprotein (HDL-c) cholesterol levels. Of these indicators, changes in triglyceride and HDL-c cholesterol levels are most consistent and pronounced[4]. These adverse lipid/ lipoprotein profiles in obese individuals are important, because they may be responsible for their increased risk for cardiovascular disease (CVD). Despite several publications on the relation between anthropometric markers and lipid profile, the best anthropometric index of fat location remains controversial. Controversies may be explained in part by differences in body composition and fat distribution in different racial groups[15].

However, to evaluate the association of markers of obesity with dyslipidemia, analysis should be adjusted for overall adiposity. Body mass index (BMI) is widely used as a marker of adiposity, but it may not be a good measurement of fat distribution, mainly in extremes of stature and with advancing age [18]. In addition the strength of the relationship between BMI and fat percentage (BF %) varies between populations and ethnic groups, implying that a BMI-based classification of weight status would necessary be population specific[5]. It was thought worthwhile to test the credibility of other variables such as WC and WHR in predicting serum concentrations of lipids and lipoproteins. In the present study, we have tried to correlate the anthropometric variables with lipid profile in a randomly selected healthy population after adjusting for other confounding variables

Material and Methods:

This study was carried out from July 2012 to December 2012 at Healthy, non-diabetic, normotensive patients. Informed consent was obtained from all the volunteers after explanation of the procedure. The subjects participated in the medical examination in the morning. After taking a brief medical history, a detailed physical examination was conducted for all participants.

Anthropometry: Anthropometric assessment included a record of height, weight, waist circumference (WC) and hip circumference (HC). WC and HC were measured in duplicate to the nearest 0.5 cm with a flexible but inelastic measuring tape while the subjects were standing relaxed. Waist was taken at the level of the natural waist (the narrowest part of the torso). The HC was measured at the maximum circumference of the buttocks posterior and the symphysis pubis anteriorly, in a horizontal plane[1]. BMI was calculated by dividing the body weight (in kilograms) by the square of height (in meters).Venous blood was drawn for biochemical examination which included blood glucose and lipid profile. Total cholesterol (TC), high-density lipoprotein-cholesterol (HDL-c) and triglyceride (TG) were estimated directly while low-density lipoprotein-cholesterol (LDL-c) was calculated by the Friedewald's formula.

Definition: Obesity was defined as BMI greater than 25 kg/m[223]. The cut off values used for WC and WHR as a reference for analyzing its relation to dyslipidemia were greater than 90 cm and 0.91, respectively[19]. Dyslipidemia was defined as abnormal levels of at least one of the serum lipids (LDL-c, HDL-c or TG) as per the criteria of the National cholesterol Education Program, Adult Treatment Panel III[7].

Statistical analysis: Data was recorded on a predesigned proforma and managed in a Microsoft Excel spread sheet. All the entries were double-checked for any possible keyboard error. The correlation coefficient was worked out to find out the degree of association between anthropometric parameters and lipid fractions.

Results: Five hundred healthy subjects were enrolled for the study. The mean age of the study population was 51.0±10.19 yrs (30-60yrs). Majority of the individuals (49%) were in the age group of 40-49 years. The anthropometric indices have been summarized in table 1. 43% of the study population had BMI > 25 kg/m ^{2}, while 68 % of the study population had WHR more than 0.9 and 63% had waist more than 90 cm. High values of BMI and WHR were noted in the study population (table2)

Correlation co-efficient analysis of data revealed that significant positive correlation ($p<0.05$) was observed between BMI with respect to TC (r=0.165), TG (r=0.139), and VLDL-c (0.140) whereas HDL-c was negatively correlated(r=-0.130) and was non-significant (table 3). Statistically significant positive correlation was observed between WC with respect to TC (r=0.105), TG (r=0.130) and VLDL-c (r=0.112).

Discussion: The study observed the relationship between obesity and lipid profiles. Lower cutoff values of BMI to define abdominal obesity have been proposed for South Asians by the WHO and the same were used in this study [12]. Based on these parameters, a high prevalence of obesity was noted in our study group compared to what has been noted in other urban studies on obesity from our country[9, 16]. The mean value of the BMI recorded in the present study was 24.62±4.6 kg/m^2. This is akin to data derived from migrant Indians[12].

Lipid abnormality noted in the present study reveals high LDL-c to be the most common lipid abnormality followed by hypercholesterolemia[14]. The magnitude of changes in lipids/lipoproteins with obesity in non-diabetic subjects were in most cases small, which suggests that obesity may be less important factor in determine lipid/lipoprotein levels in this population than in others. Some studies have shown a positive association between lipid levels and measures of adiposity[14, 10], whereas other studies have failed to detect such a relationship [21, 3]. In the present study, even though BMI correlate with cholesterol, TG and VLDL-c levels. BMI has widely used as an indicator of total adiposity, its limitations are clearly recognized by its dependence on race (Asian having large percentages of body fat at low BMI values), and age. As compared to BMI, WC and WHR have been used as surrogates of body fat centralization. The strength of association of WHR and WC with dyslipidemia has been variable in different studies. In the present study, hypertriglyceridemia correlated more with WC. These findings are consistent with those of several previous studies[11,2]. WC is more important than BMI in Asian Indians for the detection of abdominal obesity. A simple explanation may be that the absolute value of WC may not be high in Asian Indians, whereas hip circumference may occur due to less lean mass in the lower extremities in Asian Indians as compared with other ethnic groups[23]. Unlike other investigators[18, 22] .No single anthropometric variables was able to predict dyslipidemia, hence while dealing with dyslipidemic Indians, Physicians should consider combination of anthropometric parameters like WHR and WC, in addition to BMI.

Conclusion:

A high incidence of obesity was noted in the healthy subjects, which was associated with several lipid parameter abnormalities. Combination of anthropometric variables predicted dyslipidemia better in these healthy subjects than any one particular variable.

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Table 1. Age distribution and basic anthropometric profile (n=500)

	No. (%)	Mean values
Age (yrs)		**51±10.19**
<30	8 (1.6)	
30-39	21 (4.2)	
40-49	245 (49.0)	
>50	226 (45.2)	
BMI (kg/m²)		**24.62±4.62**
<25	283 (56.6)	
25-30	167 (33.4)	
>30	50 (10.0)	
WHR		**0.95±0.12**
<0.9	158 (31.6)	
>0.9	342 (68.4)	
WC (cm)		**91.41±12.16**
<80	73(14.6)	
80-84	45(9.0)	
85-89	68(13.6)	
90-94	84(16.8)	
>95	230(46.0)	

Table 2. Lipid profile (n=500)

	No. (%) Mean value
Cholesterol (mg/dl)	**178.46±40.18**
< 150	115 (23.0)
150-199	255 (51.0)
200-249	112 (22.4)
>250	18 (3.6)
Triglycerides (mg/dl)	**167.69±79.97**
<160	279 (55.8)
160-199	72 (14.4)
>200	149 (29.8)
HDL (mg/dl)	**42.05±35.71**
<35	149 (29.8)
35-45	279 (55.8)
>45	72 (14.4)
LDL (mg/dl)	**107.4±61.40**
<70	74 (14.8)
71-100	144 (28.8)
101-150	247 (49.4)
>150	35(7.0)

Table 3. Correlation coefficient analysis between variables of obesity and lipid profile

	TC	LDL-c	HDL-c	TG	LDL-c
BMI	0.165**	0.074	-0.130	0.139**	0.140**
WHR	- 0.200	0.046	- 0.061	0.019	0.014
WC	0.105**	0.074	- 0.072	0.130**	0.112*

*p<0.05, **p<0.001