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A study on lipid profile and anthropometric measurements in patients with hyperlipidemia

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ABSTRACT

Hyperlipidemia is commonly ascribed to obesity. In the current study, the association of anthropometric profile with hyperlipidemia after adjustment for important confounding variables such as smoking, alcohol intake, and diabetes in volunteers with elevated lipoproteins was analyzed. Anthropometric assessment included measurement of weight, height, waist and hip circumferences. Serum levels of total cholesterol (TC), High- density lipoprotein-cholesterol (HDL-C) and triglyceride (TG) were measured. Low-density lipoprotein-cholesterol (LDL-C) was calculated by the Friedewald formula. Statistical analysis was done to examine the associations between anthropometric variables and lipids. The mean age of the study population was 63.31±9.56 years (30-80 yrs). Majority of individuals (51.5%) were in the age group of 61-70 years. Nearly 75.7% and 64.7% of the male and female population of the study respectively had BMI >30 kg/m^2. Overall analysis of data revealed that HDL-C and BMI were correlated negatively (r= -0.25, p<0.05), whereas other lipid sub fractions did not have any significant association with the markers of obesity.

Introduction

The World Health Organization (WHO) defines obesity as a condition with excessive fat accumulation in the body, to the extent that health and well being are adversely affected [1]. It has been widely accepted that excess body fat (BF) and obesity constitute risk factors for diabetes [2], cardiovascular disease [3], hypertension [4], gall bladder disease [5] and dyslipidemia [6]. Various lipid/lipoprotein abnormalities have been observed in obese individuals, including elevated cholesterol, triglycerides, and lower high-density lipoprotein (HDL) cholesterol levels. Of these indicators, changes in triglyceride and HDL cholesterol levels are most consistent and pronounced [7]. 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 public actions 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, age groups, and sexes [8]. 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 fatness, mainly in extremes of stature and with advancing age [9].

In addition the strength of the relationship between BMI and body fat percentage (BF %) varies between populations and ethnic groups, implying that a BMI-based classification of weight status would necessarily be population specific [10]. In the present study, we have tried to correlate the anthropometric variables with lipid profile in randomly selected hyperlipidemic patients after adjusting for other confounding variables.

Material and Methods

This study was carried out during the months of May, June and July, at Salem town and Ayodhyapattanam blocks of Salem district, TamilNadu, India of which one hundred hyperlipidemic, non-diabetics, normotensive subjects constituted the study population. Informed consent was obtained from all the volunteers after full explanation of the procedure. The subjects participated in the medical examination in the morning after fasting overnight. After taking a brief medical history, a detailed physical examination was conducted for all participants. Anthropometric assessment included a record of height, weight, waist circumference (WC) and hip circumference. WC and hip circumference were measured with a flexible but inelastic measuring tape while the subject was standing relaxed. Waist was taken at the level of the natural waist (the narrowest part of the torso).

The hip circumference was measured at the maximum circumference of the buttocks posteriorly and the symphysis pubis anteriorly, in a horizontal plane [11]. BMI was calculated by dividing the body weight (in kilograms) by the square of height (in meters). Investigations for biochemical examination which included 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 formula.

Statistical Analysis

Data was recorded on a predesigned performa and managed in a Microsoft Excel spreadsheet. All the entries were double checked for any possible keyboard error. The data was subjected to statistical analysis using software SPSS 17.

The correlation coefficient was worked out to find out the degree of association between anthropometric parameters on the one-side and lipid fractions on the other.

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Results

One hundred subjects including 66 male and female hyperlipidemic subjects were enrolled for the study. The mean age of the study population was 63.31±9.56 years (30-80 yrs). Majority of individuals (51.5%) were in the age group of 61-70 years. The anthropometric indices have been summarized in Table 1. Nearly 75.7% and 64.7%of the male and female population of the study had BMI >30 kg/m^2. In 59.1% and 50% of male and female cases WHR was more than 1 respectively and majority of the subjects had waist more than 95 cm. high values of BMI and WHR were noted in the study population. Lipid sub-fraction analysis revealed hypertriglyceridemia to be the commonest abnormality noted in 92.42% of male and 100% of female population followed by high total cholesterol with the mean value of 263.64±47.45. Overall analysis of data revealed that HDL-C and BMI were correlated negatively ($r= -0.25$, $p<0.05$), whereas other lipid sub fractions did not have any significant association with the markers of obesity (Table 2).

Discussion

The study examined the relationship between obesity and lipid/lipoprotein profiles and the effects of total obesity and central adiposity on lipids/ lipoproteins. A lower cutoff values of BMI to define overweight (23 kg/m2), obesity (25 kg/m2) and lower limits of waist circumference (WC) 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 [13, 14]. The mean value of the BMI recorded in the present study was 31.36±2.65 kg/m2. This is akin to data derived from migrant Indians [15]. This probably was because our study group was from higher socio-economic strata and was not a true representative of the population.

Lipid abnormalities noted in the present study reveal hypertriglyceridemia to be the most common lipid abnormality. This is in conformity with other Indian studies [16]. The magnitude of changes in lipids/ lipoproteins with obesity in non-diabetic participants were in most cases small, which suggests that obesity may be a less important factor in determining lipid/lipoprotein levels in this population than in others. Some studies have shown a positive association between lipid levels and measures of adiposity [16, 17], whereas other studies have failed to detect such a relationship [18, 19]. In the present study, even though BMI correlated with HDL-C level, it did not correlate with other lipid sub fractions. BMI has been widely used as an indicator of total adiposity; its limitations are clearly recognized by its dependence on race (Asians 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 WHR than WC. These findings are consistent with those of several previous studies [20, 21]. WHR may be more important than WC 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 be relatively less, thus producing high values of WHR. Low values of hip circumference may occur due to less lean mass in the lower extremities in Asian Indians as compared with other ethnic groups [21]. No single anthropometric variable was able to predict dyslipidemia, hence while dealing with dyslipidemic Indians, so physicians should consider combination of anthropometric parameters like WHR in addition to BMI.

Conclusion

A high incidence of obesity was noted in the selected subjects who showed associated lipoprotein abnormality. Combination of anthropometric variables predicted dyslipidemia better in these volunteers than any one particular variable.

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Table 1 Age distribution, basic anthropometric and lipid profile N=100

	Male subjects	Percentage	Female subjects	Percentage	Mean value
AGE (yrs)					63.31±9.56
30-40	3	4.5	0	0	
41-50	5	7.5	3	8.82	
51-60	13	19.6	7	20.58	
61-70	34	51.5	15	44.11	
71-80	10	15.5	9	26.47	
>80	1	1.5	0	0	
BMI (Kg/m^2)					
<25					
25-30	0	0	0	0	31.36±2.65
>30	16	24.3	12	35.3	
	50	75.7	22	64.7	
WHR					
<1	27	40.9	17	50	1.005±0.058
>1	39	59.1	17	50	
WAIST (cm)					
<80	0	0	1	2.9	
80-84	2	3.03	3	8.8	
85-89	4	6.06	13	38.2	95.1±6.75
90-94	2	3.03	3	8.8	
>95	58	87.88	14	41.3	
Cholesterol (mg/dl)					263.64±47.45
<150	0	0	3	8.82	
150-199	5	7.57	2	5.88	
200-250	17	25.76	8	23.53	
>250	44	66.67	21	61.76	
Triglycerides (mg/dl)					298.78±77.09
<200	5	7.58	0	0	
201-300	41	62.12	26	76.47	
>301	20	30.30	8	23.53	
HDL (mg/dl)					56.49±14.91
<50	27	40.91	16	47.06	
>50	39	59.10	18	52.94	
LDL (mg/dl)					153.04±48.3
<150	31	46.97	15	44.12	
>150	35	53.03	19	55.88	
VLDL (mg/dl)					
<40	1	1.52	0	0	
40-50	13	19.7	10	29.41	59.41±15.34
51-60	33	50	16	47.06	
>60	19	28.79	8	23.53	

Table 2 Correlation coefficient analysis between variables of obesity and lipid profile

	TC	LDL-C	HDL-C	TG	VLDL
BMI	-0.117	-0.13	-0.25*	0.165	0.158
WHR	0.103	0.053	0.16	-0.081	-0.08
WAIST	-0.05	-0.14	-0.002	0.061	0.053