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Research article

CENTRAL OBESITY AND LIPID PROFILE IN NORTH INDIAN MALES

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ABSTRACT: Obesity is a known risk factor for metabolic syndrome in adults. Metabolic syndrome includes a group of cardiovascular disease risk factors namely impaired glucose tolerance, dyslipidaemia and hypertension. Central fat distribution, particularly intra-abdominal fat, is a greater risk factor than peripheral fat distribution. Anthropometric indices used to measure fat distribution have been shown to be associated with altered lipid profile. The objective of the present study was to compare the serum lipid profile levels in obese and non-obese males according to their Waist Circumference (WC) and Waist-Hip Ratio (WHR). A total of 60 males (aged 18-56 years, Mean age 31.00±11.81 years) were included in the study. WC and Hip Circumference (HC) were measured and WHR was calculated. An overnight fasting venous blood sample was drawn for lipid profile. Central obesity was defined as WC ≥ 90 cm or WHR ≥ 0.9. When compared according to WC and WHR, High Density Lipoprotein Cholesterol (HDL-C) was significantly decreased in obese compared to non-obese, while no significant change in Total Cholesterol (TC), Triglycerides (TG) and Low Density Lipoprotein Cholesterol (LDL-C) levels was observed. Both WC and WHR were positively correlated with TG, TC and LDL-C and negatively with HDL-C. The correlations with HDL-C were statistically significant. Thus, it can be concluded from our study that obesity measured either as WC or WHR is associated with altered lipid profile in the form of low HDL-C. In obese individuals the accompanying hyperinsulinaemia due to insulin resistance may be responsible for changes in lipid and lipoprotein concentration.

Key Words - Obesity, Waist Circumference, Waist-Hip Ratio, Lipid Profile.

INTRODUCTION:

Obesity has been associated with an increased risk for metabolic syndrome in adults **(**Lerario et al., 2002**).** Metabolic syndrome is defined as a group of cardiovascular disease risk factors including impaired glucose tolerance, dyslipidaemia and hypertension. Central distribution of body fat, particularly intra-abdominal fat is more a risk factor for obesity related ill health than peripheral distribution **(**WHO, 2000**).** Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) more correctly measure the fat distribution but their high cost and radiation hazards prevent their use in large scale epidemiological studies, clinical study and self assessment **(**Ho et al., 2001**).** Waist Circumference (WC) and Waist-Hip Ratio (WHR) can be used to asses the risk associated with intra-abdominal fat. Internationally accepted cut off points for abdominal obesity are >102 cm for men and >88 cm for women **(**National Cholesterol Education Program, 2002**).** The risk associated with fat distribution varies in different populations. Some populations (like Indians) are susceptible to obesity related disorders even at lower levels of obesity, than the global standards. So, WHO recommends to develop population specific cut-off points for anthropometric variables to assess the risk associated with obesity.

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Many studies **(**Snehalatha et al., 2003**,** Misra et al., 2006**)** have questioned the sensitivity of these cut off points in identifying cardiovascular risk in Indian subjects and have proposed lower cut off points for Indians. Many studies **(**Bertsias et al., 2003**,** Chadha et al., 2006) have used WC cut off points of >90 cm for men and >80 cm for women. Internationally accepted cut of points for WHR are >0.90 for men and >0.80 for women **(**National Cholesterol Education Program, 1994**).**

The aim of the present study was to compare the lipid profile levels in obese and non-obese males according to their WC and WHR and to find out the degree of correlation of WC and WHR with lipid profile variables (TC, TG, LDL-C and HDL-C).

STATISTICAL ANALYSIS

All the data was statistically analysed using SPSS software (version 17.0). The continuous variables were presented as mean ± standard deviation. Student's t test was used to compare the significance of difference in the lipid profile levels in the two groups. The mean difference was significant at $p < 0.05$ level. For correlation between obesity variables and lipid profile levels Pearson's correlation coefficient (r value) was calculated.

MATERIALS AND METHODS

The present study was conducted in the Department of Physiology, G.S.V.M. Medical College, Kanpur from April 2009 to September 2009. A total of 60 males (aged 18-56 years, Mean age 31.00+11.81 years) were included in the study. Subjects with the history of Diabetes Mellitus, Hypertension, Coronary Artery Disease, Endocrinopathy or those taking any lipid altering medication were excluded from the study. Waist Circumference was measured in centimetres (cm) to the nearest 0.1 cm, with a flexible tape, at the level of umbilicus, at the end of expiration with person breathing silently. Hip Circumference (HC) was measured in centimetres to the nearest 0.1 cm at the level of greater trochanter, using a flexible tape. Waist-Hip Ratio was calculated as WC divided by HC (WC/HC). Central obesity was defined as WC>90 cm or WHR > 0.9. A 5 ml venous blood sample was collected in the morning between 8-11 AM after an overnight fasting of 12-14 hours. Total Cholesterol (TC), Triglycerides (TG) and High Density Lipoprotein Cholesterol (HDL-C) were estimated using auto-analyser while Low Density Lipoprotein Cholesterol (LDL-C) was calculated using Friedwald's formula (LDL-C = TC - TG/5 - HDL-C). The subjects were divided into obese and non-obese groups according to their WC and WHR cut offs separately. Various characteristics of the groups are presented in table 1 and 2. The normal values of TC < 200 mg/dl, TG < 150 mg/dl, LDL-C<130 mg/dl and HDL-C >40 mg/dl were taken for comparing the values **(**National Cholesterol Education Program, 2002**).**

RESULTS

The data collected from the 60 subjects was divided into obese and non-obese categories according to the WC and WHR cut offs separately and was analysed for any statistically significant difference in the lipid profile levels in two groups.

Table-3 shows the mean value of the lipid profile variables in the obese and non-obese according to their waist circumference cut offs. The obese were found to have high TC, TG and LDL-C and low HDL-C than non-obese, but the difference was significant only for HDL-C ($p < 0.01$).

Table-4 shows the mean value of the lipid profile variables in the obese and non-obese according to their waist-hip ratio cut offs. The obese were found to have high TC, TG and LDL-C and low HDL-C than non-obese, but the difference was significant only for HDL-C ($p < 0.01$).

Table-5 shows the correlation between WC and WHR with the lipid profile variables. Both WC and WHR were correlated positively with TC, TG and LDL-C and negatively with HDL-C, but the correlation was significant only with HDL-C.

Table-1: Mean ± SD of Sample Characteristics

Characteristics	mean ± SD
Age (years)	31.00 + 11.81 years
Waist Circumference (WC)	84.75 + 8.58 cm
Waist-Hip Ratio (WHR)	0.91 + 0.05
Total Cholesterol (TC)	156.58 + 29.67 mg/dl
Triglycerides (TG)	145.57 + 58.81 mg/dl
Low Density Lipoprotein Cholesterol (LDL-C)	83.44 + 30.40 mg/dl
High Density Lipoprotein Cholesterol (HDL-C)	44.03 + 7.47 mg/dl

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Table-2: Number of subjects (n), Age distribution and mean WC and WHR

		n	Age Distribution (years) (mean ± SD)	Mean WC and WHR (mean ± SD)
WC	**< 90 cm**	43	30.09 ± 11.22	80.48 ± 5.32 cm
			33.29 ± 13.26	95.55 ± 4.92 cm
WHR			30.00 ± 10.96	0.86 ± 0.03
	≥ 0.9	38	31.55 ± 12.37	0.94 ± 0.03

Table-3: Lipid profile levels in two Waist Circumference groups

WC Groups	TC (mg/dl)	TG (mg/dl)	LDL-C (mg/dl)	HDL-C (mg/dl)
< 90 cm	154.67 ± 31.46	139.26 ± 58.91	81.13 ± 32.98	45.70 ± 7.73
≥ 90 cm	161.41 ± 24.76	161.53 ± 57.14	89.28 ± 22.37	39.82 ± 4.76**

** p <0.01, WC – Waist Circumference, TC – Total Cholesterol, TG – Triglycerides, LDL-C – Low Density Lipoprotein Cholesterol, HDL-C – High Density Lipoprotein Cholesterol

Table-4: Lipid profile levels in two Waist-Hip Ratio groups

WHR Groups	TC (mg/dl)	TG (mg/dl)	LDL-C (mg/dl)	HDL-C (mg/dl)
< 0.9	151.64 ± 33.51	131.95 ± 52.43	78.11 ± 35.40	47.14 ± 8.43
≥ 0.9	159.45 ± 27.26	153.45 ± 61.48	86.52 ± 27.12	42.24 ± 6.29**

** p <0.01, WHR – Waist-Hip Ratio, TC – Total Cholesterol, TG – Triglycerides, LDL-C – Low Density Lipoprotein Cholesterol, HDL-C – High Density Lipoprotein Cholesterol

Table-5: Correlation of WC and WHR with Lipid Profile

	TC	TG	LDL-C	HDL-C
WC	0.17	0.22	0.15	-0.28*
WHR	0.13	0.19	0.14	-0.35**

* p<0.05, ** p<0.01, WC – Waist Circumference, WHR – Waist-Hip Ratio, TC – Total Cholesterol, TG – Triglycerides, LDL-C – Low Density Lipoprotein Cholesterol, HDL-C – High Density Lipoprotein Cholesterol

DISCUSSION

The present study shows significantly decreased levels of HDL-C (all p<0.01) in obese compared to non-obese. Similar findings were suggested by previous studies **(**Bertsias et al., 2003**).** Both WC and WHR were correlated positively with TC, TG, LDL-C and negatively with HDL-C. The correlations of both WC and WHR were significant with HDL-C. This is similar to previous studies **(**Ho et al., 2001**,** Anderson et al., 1998**,** Hu et al., 2000**,** Van Pelt et al., 2002**),** but the strength of association and statistical significance differed in different studies, which may be attributed to different age distribution of subjects as well as to the ethnic variations in fat distribution. In obese individuals the accompanying hyperinsulinaemia due to insulin resistance may be responsible for changes in lipid and lipoprotein concentration **(**Goran and Gower, 1999**).** Lipid mobilization from the fat depots and release of FFA is mainly regulated by catecholamines and insulin.

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Catecholamines regulate lipolysis in human adipocytes through stimulatory β (mainly β_3) and inhibitory α_2 receptors. Insulin has an inhibitory effect on lipolysis. Central fat depots show higher density and sensitivity to stimulatory β receptors, while lower density and sensitivity to inhibitory α_2 receptors. These are also less sensitive to the anti-lipolytic effect of insulin. Thus all these factors combined together may explain the altered lipid profile level in individuals with central obesity.

CONCLUSION

Thus it can be concluded by our study that, central obesity is associated with the abnormal lipid profile particularly low HDL-C, in north Indian males. This risk associated with the central obesity is present at lower obesity levels, than global standards. Lower cut off values for WC and WHR should be used for evaluating the risk associated with central obesity.

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