

LETTER TO THE EDITOR

ATHEROGENIC LIPID RISK FACTORS IN MEN CLASSIFIED AS OVERWEIGHT AND OBESE ACCORDING TO THE PRELIMINARY WHO GUIDELINES FOR ASIANS

Sir,

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The prevalence of obesity is increasing in both the developed and developing countries, with 10–50% of the Indian population are being reported as obese (1). Obesity is an important risk factor for coronary heart disease and it has been reported that overweight and obesity increase the risk for hospitalization and death from cardiovascular disease (2). The increased cardiovascular risk in obesity is at least partly mediated through atherogenic dyslipidemia characterized by an increase in plasma triglycerides, low density lipoprotein (LDL) cholesterol as well as low concentrations of high density (HDL) cholesterol. Defining BMI (body mass index) cut-off levels at which adverse cardiovascular outcomes are more likely to occur are relevant to patient care. The BMI cut-off levels for Asians differ from that of Europeans. There is increasing evidence of a high prevalence of type 2 diabetes mellitus and cardiovascular disease in Asian countries despite an average BMI < 25 kg/m² in these countries (3). The WHO (World Health Organization) had put forward new BMI criteria for Asians based on the report by regional office for the Western Pacific region of WHO (4). The present study was an attempt to assess the suitability of these new guidelines for classifying Indians into

overweight and obese based on their atherogenic indices of lipid metabolism.

We included the male staff members of JIPMER, who visited our laboratory for routine check up as our subjects for the study. BMI was calculated as weight (kg)/height (m²). They were categorized in to obesity (BMI ≥ 25 kg/m²), overweight (BMI = 23–24.9 kg/m²) and normal weight (BMI < 23 kg/m²) based on WHO BMI cut-off criteria for Asian Indians (3, 4). Forty two obese, 27 overweight and 27 normal weight subjects were enrolled in the study. Waist and hip circumference were measured in all the subjects. Subjects with a history of diabetes, renal disease, hypertension, lipoprotein disorders, endocrine dysfunction, coronary heart disease, smokers, alcoholics and those who are on any kind of medications were excluded from the study. A written informed consent was obtained from the subjects. The study was approved by the research and ethics committee JIPMER. On the day of the study, subjects reported to our laboratory in the morning after overnight fasting for 12 hours. Five ml of venous blood was collected from them in bottles containing EDTA. Plasma was collected by centrifuging the sample at 5000 rpm for 5 min and glucose and lipid profile were estimated immediately. Plasma

glucose, total cholesterol and triglyceride were estimated by enzymatic methods. HDL-Cholesterol was estimated by phosphotungstate-magnesium acetate method using the reagent kits from Agappe diagnostics (Maharashtra, India) adapted to 550 express plus random access autoanalyser (West pole, Canada). LDL cholesterol was calculated by Friedwald's formula. Non HDL-Cholesterol was calculated as total cholesterol minus HDL-Cholesterol. The atherogenic indices as indicated by various risk ratios were calculated as Total cholesterol/HDL-Cholesterol, Non HDL-Cholesterol/HDL-Cholesterol, LDL cholesterol/HDL cholesterol and Triglyceride/HDL-Cholesterol.

All results are presented as mean \pm S.D. The results were compared between the groups using One-Way ANOVA followed by post-hoc Tukey's HSD test. Correlation analyses were carried out by Pearson test using SPSS 10 software. A 'P' value of less than 0.05 was considered statistically significant.

The general characteristics and clinical profiles of overweight and obese subjects are shown in Table I. There was no significant difference in fasting glucose and blood pressure between all the three groups. Total cholesterol, Triglyceride, VLDL cholesterol, Non-HDL cholesterol and Triglyceride/HDL cholesterol were significantly increased in overweight and obesity groups as compared to the normal weight group. LDL cholesterol, Non-HDL cholesterol/HDL cholesterol, Total cholesterol/HDL cholesterol, LDL cholesterol/HDL cholesterol were significantly increased and

HDL cholesterol was significantly decreased in obese subjects compared to controls. Pearson's correlation analysis showed significant positive correlation of BMI with total cholesterol ($r = 0.353$, $p = 0.022$), LDL cholesterol ($r = 0.397$, $p = 0.009$) and Non-HDL cholesterol ($r = 0.305$, $p = 0.049$) in the obese group.

The WHO expert committee which has revised the BMI cut-off for Asian Indians had reported that overweight and obese subjects are at higher risk for the development of cardiovascular disease (3, 4). Recent studies have suggested that waist circumference (WC), waist-hip ratio (WHR) and waist-to-height ratio (W/Ht) are better predictors of cardiovascular risk than BMI (5). In the present study WC, WHR and W/Ht were significantly higher in overweight and obese subjects as compared to subjects with normal body weight (Table I). These findings were in accordance with previous studies which documented higher waist circumference among obese Indian subjects (6).

Plasma lipoprotein abnormalities are said to be the underlying major risk factors for the occurrence of atherosclerotic vascular disease. Previous studies have showed that higher levels of triglyceride (TG) and low density lipoprotein cholesterol (LDL-C) are strong risk factors for coronary heart disease (7). In the current study, total cholesterol, triglyceride and LDL cholesterol were found to be significantly increased in overweight and obese subjects and HDL cholesterol was significantly decreased in obese subjects. Also in obesity group BMI significantly correlated with total cholesterol and LDL cholesterol indicating

TABLE I: Mean and S.D of age, anthropometric measurements, blood pressure, fasting glucose and lipid risk factors in normal weight, overweight and obese subjects.

	<i>Normal weight</i> (n=27)	<i>Overweight</i> (n=27)	<i>Obesity</i> (n=42)
BMI (kg/m ²)	20.40±1.79	23.88±0.56**	27.11±1.41***
Waist circumference (cms)	74.49±4.78	85.33±7.18**	96.06±6.08***
Waist/Hip	0.86±0.04	0.91±0.05**	0.94±0.02**
Waist circumference/Height	0.44±0.03	0.52±0.05**	0.57±0.04***
Age (years)	35.67±8.12	38.41±9.45	38.38±7.53
Systolic Blood Pressure (mm Hg)	117±8	118±8	121±8
Diastolic Blood Pressure (mm Hg)	76±5	76±6	78±6
Fasting glucose (mmol/L)	4.97±1.14	5.04±0.90	5.25±0.81
Total Cholesterol (mmol/L)	4.29±0.57	4.91±1.01*	4.96±0.94**
Triglycerides (mmol/L)	0.92±0.49	1.51±0.70*	1.70±0.92**
HDL – cholesterol (mmol/L)	1.34±0.33	1.19±0.29	1.09±0.26**
LDL – cholesterol (mmol/L)	2.52±0.58	3.03±1.10	3.09±0.91*
VLDL – cholesterol (mmol/L)	0.42±0.22	0.68±0.32*	0.77±0.42**
Non HDL – cholesterol (mmol/L)	2.94±0.53	3.72±1.10**	3.86±0.96**
Non HDL – cholesterol/HDL – cholesterol	2.36±0.90	3.47±1.96	3.90±2.07**
Triglyceride/HDL – cholesterol	0.73±0.38	1.46±1.19*	1.72±1.36**
Total cholesterol/HDL – cholesterol	3.36±0.90	4.47±1.96	4.90±2.07**
LDL – cholesterol/HDL – cholesterol	2.03±0.86	2.80±1.67	3.11±1.72*

*P<0.05 and **P<0.01 as compared to control.

#P<0.05 and ##P< 0.01 as compared to overweight.

(Non HDL Cholesterol = Total Cholesterol – HDL Cholesterol)

that these subjects are at higher risk for developing cardiovascular disease.

Non-HDL cholesterol has been found to be a better tool for screening and assessing the risk for atherosclerosis. In the current study the level of non-HDL cholesterol was significantly elevated in overweight and obese subjects compared to controls. Also Non-HDL cholesterol was positively correlated with BMI in obesity group. The atherogenic index as indicated by various risk ratios like total cholesterol/HDL cholesterol, LDL cholesterol/HDL cholesterol, Triglyceride/HDL cholesterol and Non HDL cholesterol/HDL cholesterol were found to be significantly elevated in obesity as compared to subjects with normal body weight. It has been hypothesized that

changes in the function of individual lipids due to peroxidation, imbalanced fatty acid composition or their altered flux from peripheral tissues may contribute to development of atherosclerosis (8) in obesity.

The data from the present study confirms the presence of increased levels of coronary lipid risk factors in subjects who were classified as overweight and obese as per new WHO guidelines for Asians. Further studies are needed to assess these lipid risk factors for enhanced incidence of cardiovascular diseases in these subjects.

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REFERENCES

1. Dhurandhar NV, Kulkarni PR. Prevalence of obesity in Bombay. *Int J Obes Relat Metab Disord* 1992; 16: 367–375.
2. Smith SC Jr. Multiple risk factors for cardiovascular disease and diabetes mellitus. *Am J Med* 2007; 120(3): S3–S11.
3. WHO Expert Consultation: Appropriate body mass index for Asian population and its implications for policy and intervention strategies. *Lancet* 2004; 363: 157–163.
4. The Asia Pacific perspective: Redefining obesity and its treatment. Regional Office for the Western Pacific of the World Health Organization. World Health Organization, International Association for the Study of Obesity and International Obesity Task Force. Health Communications Australia Pty Limited, St Leonards, Australia 2000; 22–29.
5. Hsieh SD, Yoshinaga H, Muto T. Waist-to-height ratio, a simple and practical index for assessing central fat distribution and metabolic risk in Japanese men and women. *Int J Obes Relat Metab Disord* 2003; 27(5): 610–616.
6. Ramachandran A, Snehalatha C, Viswanathan V, Viswanathan M, Haffner SM. Risk of noninsulin dependent diabetes mellitus conferred by obesity and central adiposity in different ethnic groups: a comparative analysis between Asian Indians, Mexican Americans and Whites. *Diabetes Res Clin Pract* 1997; 36: 121–125.
7. Hokanson JE, Austin MA. Plasma triglyceride level is a risk factor for cardiovascular disease independent of high-density lipoprotein cholesterol: a meta-analysis of population based prospective studies. *J Cardiovasc Risk* 1996; 3: 213–219.
8. Wenk MR. The emerging field of lipidomics. *Nat Rev Drug Discov* 2005; 4: 594–610.

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