STUDY ON RELATIONSHIP BETWEEN POSTPRANDIAL TRIGLYCERIDES WITH OVERWEIGHT AND OBESITY

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Summary

Overweight and obesity are the major health problem in both developed and devloping countries. Various lipid abnormalities are observed in overweight and obese population. The objective of the study to evaluate relationship between postprandial triglycerides with overweight and obesity.The present case control study was carried out in the Department of Biochemistry, Chittagong Medical College. Samples were collected from population of different area of Chittagong City Corporation of different occupations, age from 35-60 years. The data were collected by a structured questionaries. BMI was calculated by standardized protocol.Serum triglycerides was estimated at fasting, 2 hours postprandial and 4 hours postprandial condition and was analyzed in the semi auto analyzer.In the obtained results of this study the mean BMI of female was significantly (p <0.05) higher than that of male. Regarding fasting triglycerides there was a significant difference between values of serum triglycerides of cases and controls (p <0.001) . In respect of postprandial serum triglycerides value the mean value were significantly higher than of controls (p <0.001). Increased serum fasting TG was observed in 73% but increased postprandial serum triglycerides was observed in a higher score, ie, 92% cases in two hours postprandial and 81% cases in four hours postprandial.Study showed that post prandial hypertriglyceridemia was the common lipid abnormality in overweight and obese population.

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Key words
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Introduction

Overweight and obesity are increased globally and are public problem throughout the world. The prevalence of obesity and overweight is increasing world wide and both have reached in epidemic proportions in both developed and developing countries [1,2]. Obesity is now estimated to be second leading cause of morbidity and mortality, causing an estimated 2.6 million deaths worldwide and 2,3% of the global burden of diseases [3]. Diseases associated with abdominal obesity includes hypertention, hyperlipidemia, insulin resistance, DM and CVDs [4].

However historically obesity has been considered as a sign of a prosperous and wealthy society.Today obesity has become a major health problem in both developed and developing countries. The filling of the tissue cells fat by lipid-based obesity is typically a postprandial phenomenon [5]. Recently neumerous studies have shown disturbance in postprandial lipid and lipoprotein responces in diabetic and non diabetic subjects as reviewed and the role of obesity on postprandial lipid metabolism has been studies in some occations [6].

Various lipids abnormalities have been observed in obese individuals including elevated Total cholesterol,TG, LDL and lowered HDL-C [7]. The association between metabolic abnormalities and cardiovascular diseases have been studies largely during fasting condition. However the important contributions of postprandial state to CVDs are increasingly being recognized particularly in condition of insulin resistance and DM and obesity. In fact, in contemporary post industrialized societies most individuals spend the majority of non-sleeping hours in the postprandial state. As the typical American diet consist of 3 or more meals per day and it takes more than 8 hours for TG concentration to return to fasting levels after a meal, postprandial concentration TG often remain elevated throughout the day [8].

Importantly postprandial TG concentration may infact be a better predictor of CVD events than fasting TG. The adverse effect of postprandial TG is thought to be mediated by proatherogenic lypolysis products of nascent TG rich lipoprotein. The postprandial state is characterized by a fast rise in triglycerides rich lipoprotein derived from the intestine as chylomicron and from the liver as VLDL [9].

Postprandial hyperlipidemia are not only seen in diabetes or non diabetes but also in first degree relatives of T2DM, in obese person and asymptomatic persons with higher fasting TG. Case control studies have shown high postprandial TG levels in patients with angiography proved coronary artery diseases than normal population [10].

Atherogenesis is a postprandial phenomenon and that chylomicron and chylomicron remnants per se could causes atherosclerosis [11]. Endothelial dysfunction is an important link between the postprandial state, atherosclerosis and CVD. It is characterized by impaired endothelium-dependent vasodilation and increased pro-coagulant and pro-inflammatory activity [12].

With the growing prevalence of obesity the prevalence of DM and CVD in our communities also increased. Prevention and management of dyslipidemic state is critically important for the prevention of coronary artery and macrovascular diseases. Weight loss achieved by reduce diet or increase exercise has shown a reduction of TG level and elevation of HDL level [12].

So early detection and prevention of obesity and overweight and hypertriglyceridemia can largely reduce morbidity and mortality and alleviate undue burden on our limited health budget.

Materials and methods

The case control study was conducted in the Department of Biochemistry, Chittagong Medical College from January 2012 to December 2012. The population of different area of Chittagong City Corporation fulfilling the enrollment criteria were included in this study. Total 85 subjects were included in this study. Among them 60 were Case (Group A) and 25 were Control (Group B). BMI 25 kg/ m^2, age 35-60 years were included in cases and BMI < 25 kg/ m^2, age 35-60 years were included in control and persons suffering from diseases which causes rising blood lipids such as Diabetes mellitus, Hypothyroidism, Cushing's syndrome and renal failure were excluded from the study group. Data were collected by interview of the study population by using research instruments. At first fasting blood sample was collected then the subject was allowed to take breakfast. Then two and four hours postprandial blood sample were collected.

Serum Triglyceride (TG) was estimated directly by enzymatic method (GPO-PAP method). All measurements were analyzed in the semi auto analyzer SPECTROPHOTOMETER-5010.

Normal serum Triglycerides level is <150 mg /dl and elevated Triglycerides (TG) level is 150 mg/dl (According to NCEP and ATP –III) [12].

Body Mass Index (BMI)

Body height and weight was measured according to a standardized protocol with participants standing without shoes and heavy outer garments. Body Mass Index (BMI) was calculated as weight in kilograms divided by the square of the height in meter (kg/m^2).

Results

Data was analyzed by computer based software SPSS (Statistical Package for Social Sciences) v 15. Data were expressed as mean ± SD. Confident level was fixed at 95% level and 'p' value of 0.05 or less was considered significant. Student`s 't' test for quantitative or continuous variables, Chi-square test for categorical variables were done where applicable.

Table I : Distribution of Serum Triglycerides among cases (Group A) and controls (Group B) (With t- test significance)

		Fasting	2 hours postprandial	4 hours postprandial	Significance
Serum Triglycerides mg/dl	Group-A (case)	197+67	236+69	210+56	p= <0.001
Serum Triglycerides mg/dl	Group-B (control)	140+29	165+34	144+24	p= 0.05

Table I shows that serum triglycerides level increased in cases (Fasting -197 mg/dl, 2 hours postprandial -236 mg/dl , 4 hours postprandial -210 mg/dl) than that of control (Fasting 140 mg/dl, 2 hours postprandial 165 mg/dl, 4 hours postprandial 144 mg/dl) which is statistically significant, p= <0.001.

Table II : Distribution of (As number and percentage) Serum TG status among the cases (Group-A) and control (Group-B) (With χ^2 test significance)

serum triglycerides status (fasting)	Study groups			
	Group A (case)		Group B (control)	
	n	%	n	%
Normal (<150mg/dl)	16	26.66	14	75.50
High (>150mg/dl)	44	73.33	08	24.50

p = 0.001. Very Highly Significant

Table II shows that in cases (Group A) fasting serum TG level rises in 73.33% (n=44) than that of control 24.50% (n=6), which is statistically significant, p=0.001.

Table III : Distribution of (As number and percentage) Serum TG status among the cases (Group-A) and control (Group-B) (with χ^2 test significance)

serum triglycerides status (2hours postprandial)	Study groups			
	Group A (case)		Group B (control)	
	n	%	n	%
Normal (<150mg/dl)	4	7.45	11	43.33
High (>150mg/dl)	56	92.55	14	56.70

p = 0.001. Very Highly Significant

Table III shows that in cases 2 hours postprandial serum TG level more increase 92.55%(n=56) than that of control 56.70%(n=14), which is statistically significant, p=0.001.

Table IV : Distribution of (As number and percentage) Serum TG status among the cases (Group-A) and control (Group-B) (with χ^2 test significance)

serum triglycerides status (4hours postprandial)	Study groups			
	Group A (case)		Group B (control)	
	n	%	n	%
Normal (<150mg/dl)	11	18.33	18	71.66
High (>150mg/dl)	49	81.66	07	28.33

p = 0.005. Very Highly Significant

Table IV shows that in cases 4 hours postprandial serum TG level increases 81% (n=49) than that of control 28%(n=7) which is statistically significance, p=0.005.

Table V : Association of serum triglycerides status with BMI grading (with χ^2 test significance)

		BMI GRADING			
		Normal (Control) (n = 25)	Overweight (Case) (n = 22)	Obese (Case) (n = 38)	sign.
Serum Triglycerides Status (2hours postprandial)	Normal	11 (43.30%)	06 (27.3%)	3 (7.89%)	p = 0.001
	High	14 (56.70%)	16 (72.7%)	35 (92.10%)	Very Highly Significant

Table V observed that in case of overweight and obese group high serum TG was observed in both fasting 73%, 2 hours postprandial 92% and 4 hours postprandial 81%, which were statistically significant.

Table VI : Correlation between Body Mass Index and serum Triglycerides

Correlation	Pearson,s correlation Coefficient(r)	p	Significance
Serum TG (Fasting) and BMI	0.254	0.008	<0.01 S
Serum TG(2 HPP) and BMI	0.309	0.0001	<0.001 HS
Serum TG (4 HPP) and BMI	0.234	0.016	<0.05 S

Table showed that there was positive correlation between BMI and fasting TG(r=0.254, p=<0.01), 2 hours postprandial TG (r=0.309, p=<0.001) and 4 hours postprandial TG(r=0.234, p= <0.05).

Discussion

The present study provides data on relationship of generalized obesity with fasting and postprandial serum triglycerides. In this study average age of the cases were 43± 6 years and male- female ratio is 3:2. The average BMI of cases were 31.29 ±2 kg/m^2 and controls were 21±1 kg/m^2 . In cases 31.4% were overweight and 68.6% were obese.

Regarding fasting triglycerides there was a significant difference between values of serum triglycerides of cases and controls, iè, the mean serum triglycerides in cases was 197±67 mg/dl and that of control was140±29 mg/dl respectively with p value of < 0.01.So in cases there was significant high serum triglycerides level than that of control. This study was consistent with that of other studies [12,13,14].

In respect of postprandial serum triglycerides value, the mean value were significantly higher than of controls. These showed that mean two hours and four hours postprandial TG levels were 236±69 mg/dl and 210±56 mg/dl respectively and that of control were two hours postprandial TG 165±34 mg/dl and fours postprandial 144±24 mg/dl with p value of < 0.001. A similar kind of observation were also read in others studies [14,15].

Increased serum fasting TG was observed in 73% but increased postprandial serum triglycerides was observed in a higher score, ie, 92% cases in two hours postprandial and 81% cases in four hours postprandial. Similar observation was also found in others studies [16,17].

In present study Pearson´s correlation coefficient (r) showed that there was a positive correlation between BMI and fasting TG (r=0.254, p= <0.01) BMI and two hours postprandial TG (r=0.309, p= <0.001) and BMI and four hours postprandial TG (r=0.234, p= <0.05). This is consistent with other studies [17,18].

In the present study revealed that posprandial hypertriglyceridemia is the most significant and common than fasting hypertriglyceridemia in obese and overweight people. (Fasting 73%, two hours postprandial 92% and four hours postprandial 81%).

In this study the cases have fallen in to the group of metabolic syndrome as their mean BMI was 31.29kg/m^2, mean serum TG was 197 mg/dl and mean age was 43 years. According to WHO metabolic syndrome are a group of criteria in which BMI>30 kg/m^2, Serum TG >150 mg/dl, Serum HDL-C <40 mg /dl, IGT or IFG and BP>140/90 mmHg. A person fulfilling the three criteria from above are grouped into metabolic syndrome [18].

The causes of raised serum TG in obese person are due to insulin resistant. The hepatic overproduction of VLDL appears to be the primary and crucial defect of the insulin resistant state accompanying obesity. Increased flux of free fatty acids from the periphery to the liver in the insulin resistant state stimulates hepatic TG synthesis, which in turn promotes the assembly and secretion of TG containing VLDL [19]. Visceral obesity and increased intra-abdominal fat have been shown to precede development of insulin resistance. In addition to increased synthesis , insulin resistant of obesity is characterized by decreased clearance of triglycerides rich lipoprotein (VLDL). Insulin resistant of obesity suppress the activity of lipoprotein lipase (LPL) and LDL receptor (LDLR) activity [20].

So as per this discussion relating to the alteration of lipid metabolism in obesity or overweight, all these factors might have contributed in alteration of TG levels of blood in the cases included for the study. But a further extension of such studies may reconfirm such state by better inclusion or exclusion criteria and methods.

Conclusion

The magnitude of the burden of CVDs and coronary heart disease is large enough to demand urgent attention and action. In the primary care setting there is a strong need for increased public awareness about early identification and prevention of obesity ,which will help in reducing the proportion of people with high lipid level that consequently increases the risk of acquiring cardiovascular diseases. Therefore, patient education is the cornerstone of disease prevention. Since obesity and overweight are accompanied by unfavorable blood lipid patterns that increases the risk of acquiring coronary heart disease, excess body weight is to be considered a major public health issue. Government should take measures to improve public awareness about healthy lifestyle and food habit. Early detection and prevention of obesity and of course abnormal lipid profile can help to reduce morbidity and mortality to a greater extend in this regard.

Disclosure

All the authors declared no competing interest.

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