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Study of Lipid Profile Among the Overweight and Obese Urban School Children In Chittagong City

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ABSTRACT

Childhood Obesity is a major cause of mortality and morbidity around the world. Its prevalence is increasing dramatically regardless of age and geographical variation becomes a serious public health problem. A cross sectional comparative study was conducted in the Department of Biochemistry, Chittagong Medical College, Bangladesh during the period from July 2013 to June 2014. The aim of the study was to evaluate the relationship between serum lipid profile with childhood overweight and obesity. Total 100 subjects were included in this study. Among them 50 were Case (Group A) whose BMI was ≥85th percentile and 50 were Control (Group B) whose BMI (Body Mass Index) was >5th percentile to 84th percentile. Serum Total cholesterol, LDL-C (Low Density Lipoprotein Cholesterol), HDL-C(High Density Lipoprotein Cholesterol) and TG(Triglyceride) were measured in all samples in fasting state. The test statistics used to analyze the data were descriptive statistics, Chi-square (X^2) test, Student's t-Test and Correlation co-efficient. The average BMI of cases were 25.91±3.67 kg/m^2 and controls were 19.12±2.10kg/m^2. The mean weight of cases were 58.30±12.70 kg and controls were 46.08±8.19kg.The mean serum LDL in cases was 104.28±19.70 mg/dl and control was 77.22±19.14 mg/dl.. The mean serum TG in cases was 120.80±33.20mg/dl and control was 83.78±20.33mg/dl. In cases the mean serum HDL-C was 43.40±4.01 mg/dl and control was 45.56±4.48 mg/dl respectively. Pearson's correlation coefficient(r) showed that there was a positive correlation between BMI and total cholesterol(r=+0.535, p=<0.005) BMI and LDL-C(r=+0.520, p=<0.005), BMI and TG (r=+0.550, p=<0.05) and negative correlation between BMI and HDL-C(r= -0.27, p=<0.005)

Key words: Childhood obesity, Lipid profile, BMI.

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INTRODUCTION

Childhood obesity is one of the major public health problems globally [1]. During 2005, the prevalence of childhood overweight and obesity in developed countries was 10.6% whereas in developing countries the prevalence was 5.2%. [2,3] Childhood obesity is a risk factor for several chronic diseases such as hypertension, hyperlipidemia, type 2 diabetes, respiratory disease, and hepatic abnormalities and coronary heart diseases during adulthood.[4,5] Additionally, overweight and obesity affect self-esteem of children and impair social development.[6, 7]

BMI is a reliable indicator of body fatness for most children and teen. For children and teen BMI is age and sex specific and is referred to as BMI for age. After BMI is calculated for children and teens, the BMI number is plotted on the CDC BMI for age growth charts (for either girls or boys) to obtain a percentile ranking. Percentiles are most commonly used indicator to assess the size and growth patterns of individual in children.

In Bangladesh , nearly 40% of children<5 years are suffering from malnutrition[8]However, in recent years, multiple factors such as rapid urbanization, continually decreasing number of playgrounds, increasing purchasing power, and easy access to new technological devices such as hand-held computer toys probably have lead to less physical activity and more sedentary activity, and thereby have attributed to an emerging overweight and obesity problem among young children in urban settings, especially among affluent families in Dhaka.[9.] The country is now experiencing the double burden of malnutrition, with the existence of both under nutrition and over nutrition, in urban cities. Childhood overweight and obesity is a particular public health concern for Bangladesh because children who are overweight or obese have higher risk of becoming overweight or obese adult. [10] and overweight adults are at increased risk for mortality and morbidity with obesity-associated chronic diseases, which are already a burden to the struggling health system in Bangladesh.[11,12]

The prevalence of overweight and obesity is increasing and obesity is now estimated to be the second leading cause of morbidity and mortality, causing an estimated 2.6 million deaths worldwide and 2.3% of the global burden of diseases.[13]The diseases associated with abdominal obesity includes hypertension, hyperlipidemia, insulin resistance, diabetes mellitus and CVDs.[14, 15] Obesity is associated with high rate of morbidity and mortality if left untreated. Studies indicate that the presence of obesity increases the risk for developing CVD and DM [16, 17]. A 10% increased in weight increases the risk of coronary heart diseases by 38%, a 20% rise in weight by 86%.It is mainly related to associated alteration in lipid profile

and hypertension.[15,18] Various lipid/ Lipoprotein have been observed in obese individuals including elevated Total Cholesterol , LDL-C, TG and lowered HDL-C.[19,20]

Epidemiologic study shown that increasing body mass index is associated with higher Total cholesterol and LDL-cholesterol. Higher BMI is directly associated with TG and inversely associated with HDL-c.[19]. The accumulation of central fat and presence of insulin resistance have both been associated with the dyslipidemia seen in the metabolic syndrome.[21] Cardiovascular diseases, particularly coronary artery diseases, are the leading cause of mortality throughout the world.[20,22].Abnormal serum concentration of lipids such as total cholesterol and LDL-C are strongly correlated with early atherosclerotic lesion.

With the growing prevalence of obesity the prevalence of T_2DM and CVD in our country is also increased. Prevention and management of this dyslipidemic state is critically important for the prevention of coronary artery and macro vascular diseases.[18] In the literature there is a widespread opinion that the reduction of BMI among the children will automatically lead to decrease in cholesterol level.[20] Weight loss is achieved by lowing or exercise has shown a reduction of TG level and elevation of HDL-C level. So early detection and prevention of childhood obesity and abnormal lipid profile can largely reduce morbidity and mortality and alleviate undue burden on our limited health budget.

MATERIALS AND METHOD

This cross sectional comparative study was done in the departmentof Biochemistry, Chittagong Medical College during the period from July 2013 to June 2014. Proper permission was taken for this study from the Ethical Review Committee of Chittagong Medical College, Chittagong. Keeping compliance with Helsinki Declaration for Medical Research Involving Human Subjects 1964, all the subjects were informed verbally about the study design, underlying hypothesis, and right for the participants to withdraw from the project at any time, for any reason, what so ever. Written consent was obtained from each subject. Children aged between 10 to 16 years, diagnosed overweight and obesity from Body mass index-for age percentile of different school of Chittagong city were included in this study. BMI is a reliable indicator of body fatness for most children and teen. BMI does not measure body fat directly but research have shown that BMI correlates to direct measures of body fat such as under water weighing dual energy x-ray absorptiometry (DXA). After BMI is calculated for children and teens, the BMI number is plotted on the CDC BMI-for-age growth charts (for either girls or boys) to obtain a percentile ranking. Percentiles are the most commonly used indicator to assess the size and growth patterns of individual children in the United States. The percentile indicates the relative position of the child's BMI number among children of the same sex and age. The growth charts show the weight status categories used

with children and teens (underweight, healthy weight, overweight, and obese).Total 100 students were included in this study. Among them 50 were Case (Group A)whose BMI was ≥85th percentile and 50 were Control (Group B) whose BMI was >5th percentile to 84th percentile. In Group A inclusion criteria were children aged between 10 to 16 years, diagnosed overweight and obesity from Body mass index-for age percentile and exclusion criteria were overweight and obese children suffering from diseases which causes rising blood lipids such as diabetes mellitus, hypothyroidism, Cushing's syndrome and renal failure. In Group B inclusion criteria were healthy children and exclusion criteria were children whose BMI within normal but suffering from chronic diseases which causes rising blood lipids such as diabetes mellitus, hypothyroidism, Cushing's syndrome and renal failure. A structured questionnaire was developed containing all the variables of interest. Data were collected by interview of the study population by using research instruments.

Statistical Analysis

Data were processed using software SPSS (Statistical Package for Social Science) version 18.0. The test statistics used to analyze the data were descriptive statistics, Chi-square (X^2) test, Student's t-Test and Correlation co-efficient. The categorical data were compared between groups using Chi-square (X^2) test, while the quantitative data were expressed as mean and SEM (standard error of mean) with the help of descriptive statistics. For all analytical tests the level of significance was set at 0.05 and $p < 0.05$ was considered significant. The summarized data were presented in the form of tables and charts.

RESULTS AND DISCUSSION

Table 1: Distribution of *serum lipid profiles* among the study groups (with t - test significance)

	Study Group	N	Mean	± SEM	Range	Sign.
Serum Total Cholesterol (mg/dl)	Group A	50	171.72	21.66	113 – 213	**P** = 0.000 Highly Significant
	Group B	50	139.68	22.56	93 – 185	
	TOTAL	100	155.70	27.26	93 – 213	

Table shows that mean total cholesterol are significantly higher in cases than that of control (171.72 ± 21.55 vs. 139.68±22.56)

	Study Group	N	Mean	± SEM	Range	Sign.
Serum LDL Cholesterol (mg/dl)	Group A	50	104.28	19.70	52 – 145	**P** = 0.000 Highly Significant
	Group B	50	77.22	19.14	42 – 123	
	Total	100	90.75	23.63	42 – 145	

Table shows that mean serum LDL cholesterol is significantly higher in cases than that of control (104.28±19.7 vs. 77.22±19.14)

	Study Group	N	Mean	± SEM	Range	Sign.
Serum HDL Cholesterol (mg/dl)	Group A	50	43.40	4.01	35 – 49	**P** = 0.013 Significant
	Group B	50	45.56	4.48	38 – 55	
	TOTAL	100	44.48	4.37	35 – 55	

Table shows that serum HDL cholesterol is significantly lowered in cases than that of controls (43.40±4-01 vs. 45.56±4.48, p=o.013

	Study Group	N	Mean	± SEM	Range	Sign.
Serum TG (mg/dl)	Group A	50	120.80	33.24	60 – 180	**P** = 0.000 Highly Significant
	Group B	50	83.78	20.33	50 – 127	
	TOTAL	100	102.29	33.13	50 – 180	

Table shows that mean serum TG is highly significantly increased in cases than that of controls (120.80±33.24 vs.83.78±20.33 mg/dl , p=<0.001)

Table 2: **Distribution of *serum lipid profiles* among the BMI categories of study group A (with t - test significance)**

	BMI Category	N	Mean	± SEM	Range	Sign.
Serum Total Cholesterol(mg/dl)	Obese	32	177.81	21.07	113 – 213	**P** = 0.007 Highly Significant
	Overweight	18	160.89	18.68	119 – 188	
Serum LDL Cholesterol(mg/dl)	Obese	32	109.63	19.25	52 – 145	**P** = 0.009 Highly Significant
	Overweight	18	94.78	17.13	62 – 118	
Serum HDL Cholesterol(mg/dl)	Obese	32	43.41	4.35	35 – 49	**P** = 0.988 Not Significant
	Overweight	18	43.39	3.47	39 – 49	
Serum TG (mg/dl)	Obese	32	124.50	33.30	62 – 177	**P** = 0.299 Not Significant
	Overweight	18	114.22	33.05	60 – 180	

Table shows that in case of obese category mean serum total cholesterol and LDL cholesterol is highly significantly higher than overweight category(177.81±21.07 vs.160.89±18.68 and 109.63±19.25 vs. 94.78±17.13),there is no significant difference in HDL and TG among obese and overweight category(43.41±4.35vs.43.39±3.47 and 124.50±33.30 vs. 114.22±33.05, p=0.988 & 0.299)

Table 3:Correlations between BMI and serum lipid profiles among the study groups (n = 100)

Correlations Between	Pearson's Correlation Coefficient (r)	P	Significance
BMI & Serum Total Cholesterol	+ 0.535	0.000	Highly Significant
BMI & Serum LDL Cholesterol	+ 0.520	0.000	Highly Significant
BMI & Serum HDL Cholesterol	– 0.217	0.030	Significant
BMI & Serum Triglyceride	+ 0.550	0.000	Highly Significant

Table shows there is positive correlation between BMI & serum Triglyceride, Total Cholesterol, LDL-C and negative correlation between BMI & HDL-C among the study group

RESULTS AND DISCUSSION

The study was undergone with the students aged between10 to 16 years from one govt. and four private school of Chittagong city. In this study average ages of the cases were 12.4±2.54 years and controls were 13.63±1.6 and male and female ratio 2.25:1. The average BMI of cases were 25.91±3.67 kg/m^2 and controls were 19.12±2.10kg/m^2. In the cases 36% are overweight and 64% are obese. The mean weight of cases were 58.30±12.70 kg and controls were 46.08±8.19kg, which is statistically highly significant (p=<0.001). The mean heights of cases were 1.49±0.11meter and the controls were 1.53±0.11meter which is statistically significant. The serum total cholesterol of cases were 171.72±21.66 mg/dl and controls were 139.68±22.56 mg/dl which is statistically highly significant (p=<0.001). The mean serum LDL in cases was 104.28±19.70 mg/dl and that of control was 77.22±19.14 mg/dl with a p value of <0.005. The mean serum TG in cases was 120.80±33.20mg/dl and that of control was 83.78±20.33mg/dl with a p value of <0.001. In cases the mean serum HDL-C was 43.40±4.01 mg/dl and that of control was 45.56±4.48 mg/dl. Pearson's correlation coefficient(r) showed that there was a positive correlation between BMI and total cholesterol(r=+0.535, p=<0.005) BMI and LDL-C(r=+0.520, p=<0.005), BMI and TG (r=+0.550, p=<0.05) and negative correlation between BMI and HDL-C(r= -0.27, p=<0.005).

CONCLUSION

Childhood obesity and overweight are accompanied by unfavorable blood lipid patterns that increase the risk of acquiring coronary heart disease, excess body weight is to be considered as major public health issue. The present study was designed to observe the study of lipid profile of the obese children reading in schools in the township of Chittagong. The habits, socioeconomic profile and pattern of life style may be different and such way that can alter the health status of these children. So, the attempt of this study was to observe such difference with respect to lipid profile and found the results as described above. The indices need to be reconfirmed with cohorts to establish such to prevent the outcome of overweight and obesity.

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