

Fasting Lipid in Overweight and Obese Children: A Hospital Based Study

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Abstract

Background: Obesity has become one of the most important public health problems in recent years. Childhood obesity increases the risk of morbidities such as dyslipidemia, hypertension, type 2 diabetes (T2DM), metabolic syndrome etc. Dyslipidemia pattern consists of a combination of elevated total cholesterol, triglycerides (TG), low density lipoprotein cholesterol (LDL-C) and decreased high density lipoprotein cholesterol (HDL-C). Aim of this study was to assess fasting lipid profile and pattern of dyslipidemia in overweight and obese children in a hospital setting.

Methods: It was a cross sectional study done in children, aged 5 to 16 years, attending the paediatric endocrine clinic and paediatric outpatient department, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka over a period of 18 months. All overweight and obese children as well as normal weight children were selected after considering inclusion and exclusion criteria. They were categorised as group A (overweight and obese) and group B (normal weight).

Results: In group A, 77.0% of children were obese and 23.0% were overweight. Total cholesterol, LDL and TG were significantly higher in group A ($p<0.05$). HDL was low in 58.0% of group A and 52.0% of group B which was not significantly different ($p>0.05$) between the groups. Most of the overweight and obese children had one or two lipid parameters abnormality but majority of normal weight children had one parameter abnormality. Dyslipidaemia was present in 80.0% and 64.0% among group A and group B respectively, which was significantly different ($p<0.05$).

Conclusion: It was observed that 80.0% patients had dyslipidaemia among the overweight and obese children and total cholesterol, low density lipoprotein and triglyceride level were significantly higher in this group.

Keywords: Overweight, Obesity, Lipid profile, Total cholesterol

Introduction

Overweight and obesity are major health problems worldwide now a days and becoming an epidemic.¹ In last few decades, the prevalence of obesity is increased in both developed and developing countries.² Rapid urbanization and industrialisation are the causes for altering the food habits which results in socio-economic, demographic and cultural changes that leading to nutritional conversion in low-income and middle income countries.³ Genetic factors, lifestyle behaviors and environmental factors are more likely to be related to the increased incidence of overweight problem. Lifestyle and socio demographic factors such as too much TV watching or using electronic games, less physical activity, having overweight parents increase the risk of overweight and obesity.⁴ Obesity in childhood appears to increase the risk of

subsequent morbidities, such as increased incidence of dyslipidaemia, diabetes, hypertension, metabolic syndrome, psychological dysfunction and loss of self-esteem subsequently overall increase in morbidity and mortality in later life.⁵ It is now well recognized that the lipid abnormality is associated with atherosclerotic process and childhood cardiovascular disease.⁶ Dyslipidaemia pattern associated with childhood obesity consists of a combination of elevated total cholesterol, triglycerides (TG), low density lipoprotein cholesterol (LDL-C) and decreased high density lipoprotein cholesterol (HDL-C).⁷ Public health programmes are warranted to increase awareness on the risk factors among children and adolescents in order to reduce the future burden of obesity associated chronic diseases. But limited data are available in the country regarding the fasting lipid profile and pattern of dyslipidaemia in childhood obesity. So

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aim of this study was to assess fasting lipid profile and pattern of dyslipidaemia in overweight and obese children in hospital setting.

Materials and Methods

It was a cross sectional study conducted in paediatric endocrine clinic and paediatric outpatient department, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh from February, 2016 to July, 2017. Children aged 5 to 16 years attending in Department of Paediatrics (both inpatient and outpatient department) of BSMMU, Dhaka for overweight and obesity were included. A total of 100 children were included in the study after considering inclusion criteria. Children who were taking systemic steroid for any cause or any other drugs (eg. oestrogen, progesterone, diuretics, anticonvulsant, antipsychotic etc.) that can alter lipid profile, children suffering from genetic, endocrine or any neurological disease or any other chronic illness that might cause obesity and hyperlipidaemia were excluded from the study. In order to minimize the effect of confounding variables, age and sex matched normal weight children in a ratio of 2:1 were included in the study as control. They came with acute illness like viral fever, common cold or growing pain etc. in paediatric outpatient department. A total of 50 normal weight children were included as control. For study purpose total study population was divided into two groups; Group A (overweight and obese) and Group B (normal weight). Ethical clearance was taken from Institutional Review Board, BSMMU. Informed written consent was obtained from parents or guardians of the children after explaining to them the objectives as well as the method of the study. A structured questionnaire was used to collect data regarding socio-demographic status like position of index case, family members, family structure, family income level and educational status of parents etc. Weight was measured by using electronic weighing machine to a nearest 100g and height was recorded using locally made height board where two horizontal flat wooden boards, one for head-end another for foot-end, was attached with a long vertical scale. After measuring height and weight BMI was calculated and categorized as normal weight, overweight and obese according to Centers for disease control and prevention criteria.⁸ Here

children having BMI for age and sex 5th to <85th percentile of reference population were classified as normal weight, children having BMI for age and sex $\geq 85^{\text{th}}$ and < 95th percentile of reference population were classified as overweight and children having BMI for age and sex $\geq 95^{\text{th}}$ percentile of reference population were classified as obese. After clinical evaluation, patient was advised to do fasting lipid profile. National heart lung and blood institute (NHLBI) panel definition of dyslipidemia in 2011 was used in this study.⁹ So, in this study dyslipidaemia was defined as total cholesterol level 200 mg/dl or more, LDL over 130 mg/dl or more, HDL less than 40 mg/dl, triglyceride 100 mg/dl or more (0-9years) and 130 mg/dl or more (10-19 years). Statistical analysis was performed by using SPSS. Qualitative data were analyzed by Chi square test, Fisher exact test, quantitative data were analyzed by Student's *t* test and descriptive study was analysed by proportion test or frequency distribution table. *p* value ≤ 0.05 with 95.0% confidence interval was considered as the level of statistical significance.

Results

The study included a total number of 150 children, among them 100 were in group A and 50 were in group B. It was observed that 53.0% of group A children belonged to the age group from 10 to 16 years and 60.0% of group B children belonged to 5 to 10 years. Regarding sex of the children, majority were male in both the groups. Index case was the first issue in 62.0% in group A and 32.0% in group B. Family income was <50,000 taka in majority of families in both the groups (table I). In this study 77.0% of children were obese and 23.0% were overweight in group A (table II).

Table I: Distribution of the study children by demographic variable (n=100+50)

Socio-demographic variable	Group A (Overweight/Obese) (n=100)		Group B (Normal weight) (n=50)		<i>p</i> value
	n	%	n	%	
Age (years)					
5-10	47	47.0	30	60.0	0.133
10-16	53	53.0	20	40.0	
Sex					
Male	62	62.0	31	62.0	1.000
Female	38	38.0	19	38.0	
1 st issue	62	62.0	19	38.0	0.005
Family income (taka)					
$\leq 50,000$	82	82%	43	86%	0.535
$> 50,000$	18	18%	07	14%	

Table II: Distribution of the study children by body mass index among group A (n=100)

Body mass index (kg/m ²)	Number of patients	Percentage
≥85 th -<95 percentile (Overweight)	23	23.0
≥95th percentile (Obese)	77	77.0

Acceptable level of total cholesterol (54.0% Vs 76.0%) was more in group B but borderline high (30% Vs 18%) and high total cholesterol level (16% vs 6%) were more in group A. HDL level was not significantly different between the two groups (58% Vs 52%). Fifty six percent children in group A and 78.0% in group B had acceptable LDL. But borderline LDL (25% Vs 12%) and high LDL (19% Vs 10%) were almost twice in group A ($p=0.030$). Most of the children in group B had acceptable TG (56% Vs 19%) but borderline high (27% Vs 18%) and high TG level (54% Vs 26%) were more among group A children ($p=0.001$) (table III).

Table III: Distribution of the study children by fasting lipid profile (n=100+50)

Fasting lipid profile	Group A (Overweight/Obese) (n=100)		Group B (Normal weight) (n=50)		p value
	n	%	n	%	
Total cholesterol					
Acceptable	54	54.0	38	76.0	0.028 ^s
Borderline	30	30.0	9	18.0	
High	16	16.0	3	6.0	
HDL					
Acceptable	17	17.0	12	24.0	0.584
Borderline	25	25.0	12	24.0	
Low	58	58.0	26	52.0	
LDL					
Acceptable	56	56.0	39	78.0	0.030 ^s
Borderline	25	25.0	6	12.0	
High	19	19.0	5	10.0	
TG					
Acceptable	19	19.0	28	56.0	0.001 ^s
Borderline	27	27.0	9	18.0	
High	54	54.0	13	26.0	

It was to be found that 30.0% and 38.0% of group A children had one and two abnormal lipid parameters respectively while 42% of the group B children had one abnormal lipid parameter (table IV).

Table IV: Comparison of lipid profile abnormality in group A and group B

Lipid profile	Group A (Overweight/Obese) (n=100)		Group B (Normal weight) (n=50)	
	n	%	n	%
One parameter abnormality	30	30%	21	42%
Two parameter abnormality	38	38%	08	16%
Three parameter abnormality	09	09%	03	06%
Four parameter abnormality	03	03%	00	00%

It is evident that dyslipidemia was present in 80.0% among group A and 64.0% among group B (table V) and the difference was significant ($p=0.034$).

Table V: Distribution of the study children by dyslipidaemia (n=100+50)

Dyslipidaemia	Group A (Overweight/Obese) (n=100)		Group B (Normal weight) (n=50)		p Value
	n	%	n	%	
Present	80	80.0	32	64.0	0.034 ^s
Absent	20	20.0	18	36.0	

Regarding mean lipid level of the study children, it was observed that mean total cholesterol (171.21±33.19 Vs 150.20±28.90), LDL (106.59±29.63 Vs 92.27±24.80) and TG (136.21±68.10 Vs 96.04±48.75) level were significantly higher among group A children ($p<0.05$) but mean HDL level was low in both the groups (39.28±9.18 Vs 39.54±10.52) and was not significantly different (table VI).

Table VI: Comparison of mean value of fasting lipid between group A and group B (n=100+50)

Fasting lipid profile	Group A (Overweight/Obese) (n=100)		Group B (Normal weight) (n=50)		p Value
	Mean±SD	Mean±SD	Mean±SD	Mean±SD	
Total Cholesterol (mg/dl)	171.21±33.19	150.20±28.90	0.001 ^s		
HDL (mg/dl)	39.28±9.18	39.54±10.52	0.877		
LDL (mg/dl)	106.59±29.63	92.27±24.80	0.001 ^s		
TG (mg/dl)	136.21±68.10	96.04±48.75	0.001 ^s		

Discussion

The dyslipidaemia associated with obesity is usually characterised by lipid abnormalities including elevated total cholesterol, serum triglyceride, LDL and reduced HDL level.¹⁰ In the present study, most common type of dyslipidaemia was low HDL. Wee et al in their study showed low HDL-C in 19.7% of the overweight/obese and 4.7% of the normal-weight children ($p < 0.001$).¹¹ Minaksi and Chithambaramin their study found that 69.0% of obese or overweight children had low HDL.¹² In the present study second common type of dyslipidemia was high TG. This finding was significantly different among the two groups. Elmaogullari et al in their study found 21.7% and Taheri et al found 14.0% of adolescent had hypertriglyceridemia but our study found very high percentage of hypertriglyceridemia.^{13,14} Taheri et al. also found low HDL and hypertriglyceridemia and significantly more in boys ($p<0.05$) than girls.¹⁴ In the current study lipid profile was not compared between boys and girls. Our study found high LDL in 19% in

group A and 10% in group B children and the difference was significant which is consistent with Elmaoğulları et al study where 13.7% had high level of LDL.¹³ But an Indian study done by Jacob and Reetha found that high LDL cholesterol was the most frequent lipid abnormality which is not consistent with our study. In our study least common type of dyslipidemia was high total cholesterol (table III).¹⁵ Elmaoğulları et al. also found 18.6% hypercholesterolemia in their study which was consistent with our study.¹³ It was to be found that borderline high total cholesterol (30.0%), TG (27.0%) and LDL (25.0%) in high percentage and borderline low HDL in 25.0% of group A children.

In the present study, it was to be found that 38.0% children had two, 30.0% had at least one lipid parameter abnormality among overweight/obese children but among normal weight children one lipid parameter abnormality was most common (42.0%). Ghergerehchi in his study found combined dyslipidemia in 26.1% and isolated dyslipidaemia in 18.7% of obese children.¹⁶

It was observed in the present that dyslipidemia was present among 80.0% of group A and 64.0% of group B children ($p < 0.05$). Ramos et al in their study observed that dyslipidemia was present in 85.3% obese children and low HDL was the most frequent alteration (80.6%) which is consistent with our study.¹⁷ Another study done in India found dyslipidemia in 63% of the study subjects and high LDL was the most frequent alteration.¹⁵

Rizk and Yousef observed that the mean triglyceride levels were significantly higher and HDL-C was significantly lower in overweight or obese children. In their study no significant difference was found in total cholesterol or LDL-C level. Present study result was consistent with Rizk and Yousef¹⁸ regarding TG and HDL level but not with total cholesterol and LDL.¹⁸ The variations of dyslipidemia and its pattern might be due to the differences in dietary patterns, food habit, socioeconomic condition, educational status of parent, life style and also due to inclusion criteria as overweight children was included in this study.

Present study demonstrated that dyslipidaemia was common in overweight and obese children and low HDL-C was the most common.

Conclusion

Eighty percent of overweight and obese children had dyslipidaemia. Total cholesterol, low density lipoprotein and triglyceride level were significantly high in overweight and obese children. HDL level was low in both the groups and did not have any significant difference. Two or more lipid parameters were high in about half of the overweight/obese children. However, further study with large sample size is needed to confirm the findings.

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Conflict of interest: There was no conflict of interest.

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