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STUDY OF LIPID PROFILE AND PREVALENCE OF DYSLIPIDEMIA IN ADOLESCENT SCHOOL CHILDREN FROM KARNATAKA

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ABSTRACT

Background: Early detection of dyslipidemia and long term prevention of atherosclerosis by controlling risk factors should begin in childhood. There are only few regarding the lipid profile study in children from India. Objective: To determine the prevalence of dyslipidemia in adolescent school going children. Methods: This is a cross sectional study which was conducted in 440 children aged 10 to 16 years from three schools of south Bangalore. After taking consent from school children, their parents and school authority, detailed history was taken with a systematically designed proforma and blood samples were analysed for lipid profile. Results: The mean total cholesterol (129.59), HDL-C(38.49mg/dl), LDL-C(71.6mg/dl), and non HDL-C (91.3mg/dl) were significantly lower than studies from western countries, but the reverse was true for triglycerides levels(97.34mg/dl). The mean lipoprotein values were significantly higher in girls and in children having various risk factors. However there was no significant increase in overall prevalence of dyslipidemia in these children. The decreased HDL is the commonest dyslipidemia (64.27%) seen in children. The prevalance of hypercholesterolemia were 0.68% (high) and 5% (borderline). Conclusion: There is a need for further studies to evaluate the lower lipoprotein values observed in our study to facilitate appropriate cut-off levels and to study the future occurrence of dyslipidemic status in children having various risk factors.

KEY WORDS

Dyslipidemia, Coronary artery disease, Atherosclerosis

INTRODUCTION

Coronary artery disease, one of the diseases in adulthood has been defined as the greatest epidemic mankind has ever faced. It has become the major cause of morbidity and mortality throughout the world, accounting nearly 80% of all cardiac morbidity. It is responsible for 30% of all deaths in most countries.[1]

Dyslipidemia, hypertension and in conjunction with poor eating habits, sedentariness, constitute ideal conditions for the development of heart disease. It is known that the pathology of atherosclerosis starts from early age and if risk factors identified early and corrected the process can be delayed [2,3]. To bring about a primary prevention of coronary artery disease in adulthood, detection and intervention for dyslipidemia must begin at an early age, therefore blood lipid profile in adolescent should be screened as early as possible to detect and treatment should be directed towards adoption of healthy lifestyles and reduce total and saturated fat consumption and encouragement of physical activity . The evaluation of blood lipid profiles in adolescents use reference data from American NCEP for children and adolescents

which is not suitable for Indian adolescents.[4] There are few studies from India.[5,6,7,8,9,10,11]

METHODOLOGY

This study is a cross sectional observational study, which was conducted in Bangalore over a period of one year from November 2009 to October 2010. 440 school children between 10 to 16 years were enrolled. Those children who were on steroids, anticonvulsants, diurectics, or familial hypercholesterolemia syndromes, hypothyroidism, nephrotic syndrome were excluded from the study.

Schools from urban Bangalore with diverse socioeconomic status were selected and consent was taken from school authority and parents and children. Detailed history, dietic history, physical activity details, socioeconomic status, were taken with a systematically designed proforma.

Blood samples were drawn from all the children after minimum of 12 hours of complete fasting. Serum was separated within 2 hours of collection and samples were analysed. Serum cholesterol estimation was done by enzymatic endpoint method using cholesterol esterase, cholesterol oxidase and peroxidises (CHOD-PAP). Serum triglyceride estimation was done by enzymatic method. HDL C estimation was done by direct homogeneous assay. LDL-C was estimated with third generation direct homogeneous assay. The cut off levels to identify dyslipidemia were taken from National Cholesterol Education Program's Expert panel on Blood Cholesterol levels in children and adolescents. Total cholesterol >200mg/dl, Triglyceride >140mg/dl, LDL-C> 130mg/dl, HDL-C <40mg/dl.[4]

The data collected was analysed statistically with the help of a statistician using SPSS software. Lipid parameters values are expresses as mean ± SD and percentile for non skewed distributed data, the comparison of the data was performed using student independent samples t test and categorical variables were analysed by chi-square test. p value</=0.005were considered significant.

RESULTS

The study consisted of 440 school adolescents (220 boys and 220 girls) the mean BMI was higher for girls 17.48 ±3.77 (p = 0.022). (Table 1)

Compared to boys, girls showed higher mean values of all lipid and lipoprotein levels. Serum total cholesterol (136.18 ± 21.79), triglycerides (102.75 ± 23.23), LDL Cholesterol (76.74 ± 19.20) and non HDL cholesterol (97.34 ± 21.01mg/dl) levels were significantly higher in girls than in boys (p<0.001) for all except HDL Cholesterol which is nearly equal. (Table 2)

Total cholesterol, LDL-C and non HDL-C levels were significantly higher in younger age groups (10-13 years). All other parameters remained unaffected by age in both boys and girls. Significantly higher total cholesterol, triglycerides, LDL Cholesterol, and non HDL Cholesterol levels were found in girls of older (14-16 years) age group compared to boys. There was not much difference in younger age group except for triglycerides, which was higher in girls. (Table 3)

Prevalance of dyslipidemia

The commonest disorder is decreased HDL seen in 62.27% of children and the next common being hypertriglyceridemia seen in 7.14% of the children. The prevalence of hypercholesterolemia (0.68%), elevated LDL-C (1.3%) and elevated non HDL (2.27%) were <2.5% and around 5%, when NCEP standards of 95th (high), 75th(borderline) percentile levels applied. The combined disorder of Hypercholesterolemia (TC>170mg/dl) and low HDL-C was seen in 2.95% of children. There was no significant difference in prevalence of dyslipidemia between boys and girls, although all cases (n=3) of high hypercholesterolemia were seen in girls (Table 4).

Table – 1:.The basic characteristic of the study population is as shown in

	Mean	SD	Mean	SD	t value	p value
	Boys		Girls			
Age(Yrs)	13.33	1.58	13.19	1.68	0.934	0.351
Weight(kg)	38.08	10.05	39.23	9.51	1.240	0.216
Height(cm)	150.31	14.14	147.17	20.37	1.879	0.061
Body mass index(kg/m2)	16.77	3.07	17.48	3.37	2.294	0.022

Table 2: Lipid profile by gender

parameters	Boys		Girls		Total		tvalue	P value
	Mean	S.D	mean	S.D	mean	S.D		
Total cholesterol	123.02	25.84	136.18	21.74	129.6	24.76	5.773	0.001
Triglycerides	91.94	35.33	102.75	23.31	97.34	32.05	3.79	0.001
HDL-C	38.11	5.19	38.83	5.7	38.47	5.45	1.375	0.164
LDL-C	66.46	24.33	76.74	19.20	71.6	23.28	4.922	0.001
VLDL-C	18.47	7.08	20.64	4.66	19.55	6.08	3.788	0.001
Non HDL-C	84.91	24.72	97.34	21.01	91.13	23.74	5.684	0.001

Table – 3: Lipid profile in adolescents

Parameter	percentile	10-13yrs		14-16yrs	
		Boys	Girls	Boys	Girls
Total cholesterol (mg/dl)	5th	100.43	92.28	75.24	101.58
	mean	132.86	135.26	111.91	137.17
	75th	145.70	148.48	128.50	148.50
	95th	176.42	169.25	150.22	186.00
Total triglyceride (mg/dl)	5th	58.00	62.80	54.32	63.75
	mean	97.77	100.49	88.71	105.19
	75th	104.10	120.05	97.8	120.25
	95th	154.99	132.25	148.97	147.00
Low density Lipoprotein (mg/dl)	5th	37.98	46.40	26.49	46.41
	mean	75.23	76.17	56.4	77.36
	75th	88.7	86.04	71.52	87.82
	95th	116.35	106.65	105.01	119.89
Non HDL cholesterol (mg/dl)	5th	58.00	62.30	42.12	65.70
	mean	94.31	92.28	74.24	98.48
	75th	107.45	106.25	89.40	109.10
	95th	136.73	127.73	116.00	148.58
High Density Lipoprotein(mg/dl)	10th	31.30	31.2	32.30	32.00
	mean	38.49	38.97	37.62	38.68
	95th	48.05	50.00	47.14	49.00

Table 4: Prevalance of dyslipidemia

Types of dyslipidemia		Boys		Girls		Total	Percentage
		22%		22%			
Hypercholesterolemia	high	-	-	3	1.36	3	0.68
	borderline	11	5	11	5	22	5.00
Hypertriglyceridemia		18	8.18	12	5.45	30	7.14
	high	3	1.36	3	1.36	6	1.30
Elevated LDL-C	borderline	12	5.5	12	5.5	24	5.50
	<35mg/dl	56	25.45	50	22.75	106	24.09
Decreased HDL-C	<40mg/dl	142	64.54	132	60.00	274	62.27
Elevated Non HDL		4	1.81	6	2.72	10	2.27
Combined decreased HDL-C and Hypercholesterolemia(TC>170mg/dl)		7	3.18	5	2.27	13	2.95

DISCUSSION

The balanced lipid profile is an important factor to maintain health in young age and to avoid early morbidity in later life. Thus blood lipid profiles in adolescents should be screened as early as possible to detect imbalances; furthermore there is limited data available on characterisation of profiles of lipids in children

In our study the triglycerides level were high (boys-92mg/dl, girls-102mg/dl comparable to Bikaner [5] Mexican studies[12]. Elevation of serum Triglyceride levels is probably due to increased carbohydrate consumption in Mexican and Indian children.

Adolescents had lower mean total cholesterol levels (boys 123mg/dl, girls-136mg/dl), HDL (38mg/dl in both sex) which is comparable to Yavuz and Bayraktaroglu,[13] who reported mean TC of 131 mg/dl and in contrast to higher levels in various studies from Bikaner[4], Mexican[12] HELENA[14] and Turkey[15]. The comparatively lower levels of total cholesterol and HDL cholesterol in the current study are in agreement with the observation of generally lower values in less developed countries. Besides the difference in genetic makeup, lifestyle and dietary habits, another reason for difference in HDL cholesterol values may be the difference in the techniques as suggested by Whitehead. He suggested that HDL cholesterol might vary upto 40mg% by the use of different methods and also by the same technique by people in different laboratories.

The most striking results were higher in girls within each of the lipid variables analysed except for HDL-C. This result in accordance with findings in a Mexican study, liped parameters were increased in girls except HDL in European Multinational HELENA project, Brazilian [16] and Turkish study. Higher values were seen in girls within each of the lipid variables analysed including HDL. In the Spanish AVENA study[17] (n-581, age 13-18.5years), however girls had only significant higher HDL and TC levels ($p<0.05$), whereas LDL, TG, non HDL-C levels remained unaffected by gender. In contrast Rajesh Dholapuria et al study from Bikaner, all the lipid variables except HDL were marginally higher in boys than girls.

These inconsistent results may be due to genetic variations and different eating behaviours in Brazil, Turkey, Spain, Bikaner. Moreover different age categorisations may contribute to the different results, because with increasing age the influence of sex hormones become more obvious and is mirrored in altered lipid levels between sexes. The gender specific differences may be

directly related to hormonal status, fat mass and or fat allocation.

In the present Study, significantly lower levels of total cholesterol, triglycerides, LDL, and non HDL-C levels were found in boys of 14-16 years. Most studies[18, 19] also found age dependent changes within the other lipids for boys and girls. In contrast there was not much difference in girls except for TG which was higher in 14-16 years age group. The increase over age may reflect changes in eating habits during growth. The TG increase over age was also found in many studies but not all studies. In Tehranian adolescents serum TG levels were higher in 17-19 years compared to 11-13 year old including higher concentrations 124mg/dlvs105[20].There was no difference in serum HDL-C levels between age groups, except for marginal decrease in boys 14-16 years age group. It is likely that the age associated findings mentioned are related to pubertal progression, Inconsistent findings are probably due to sample size, classification of maturity, and geographic differences based on different genetic backgrounds, food patterns and lifestyles. Most American studies use NHANES data to present percentiles for concentrations of lipids and lipoproteins. Ford et al used NHANES data.[21]

Our study showed lower levels 137/167 mg/dl for boys and 148/178 mg/dl for girls. Similarly our study showed lower levels of LDL-C of 80/87 mg/dl at 75th percentile and 107/113 mg/dl at the 95th percentile in boys and girls. The 75th percentile of LDL was 104 mg/dl in 1400 boys and 1324 girls aged 12-17 years and the 95th centile was 136 and 133 mg/dl in boys and girls in Ford et al study using NHANES data with similar levels in HELENA study.

The TG levels in our study were 104/154 mg/dl (10-13 years), 97/148mg/dl,(14-16years) for girls and are significantly higher, mean HDL levels were also high compared to standard values according to lipid Research Clinics (LRC) data and HELENA study. Anita Khilnani et al found 95th values of TC at 190mg/dl, LDL-C at 130 mg/dl, TG at 150 mg/dl and HDL-C 20 mg/dl, similar to this study[6].

The prevalence of hypercholesterolemia (0.68%, 5%), Elevated LDL-C (1.3%, 5.5% and elevated Non HDL-C (2.27%) were <2.5% and around 5%, when NCEP standards of 95th (high), 75th (borderline) percentile levels applied. The comparatively lower levels of HDL cholesterol in the current study are in agreement with the observation of generally lower values in less developed countries. Rajesh Dholpuria reported hypercholesterolemia (borderline) of 50% In their age group study. The lower prevalence in our study was probably due to lower socioeconomic status of children compared to upper and upper middle class in their

To conclude the mean lipoprotein values and projected percentile cut off levels for dyslipidemia were found to be significantly lower than studies from western countries except for triglyceride levels. The mean lipoprotein values were significantly higher in girls than boys. Boys of 14-16 years age group were found to have significantly lower lipoprotein levels. The mean HDL-C levels were lower than studies from western countries with no significant differences between age, gender, or risk groups. Decreased HDL is the commonest dyslipidemia in children and the prevalence of hypercholesterolemia was low. The mean lipoprotein levels were significantly higher in children having various risk factors. However there was no significant increase in overall prevalence of dyslipidemia in these children. There is need for further studies to evaluate the lower lipoprotein values observed in our study to facilitate appropriate cut-off levels to study the future occurrence of dyslipedemic status in children having various risk factors.

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