Original Article

Lipid Profile of Under-5 Years Children from a Tertiary Care Centre

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ABSTRACT

Introduction: There is a considerable lack of study estimating lipid profile levels in children below 5 years of age. We therefore carried out this cross-sectional study to evaluate the lipid profile level of healthy Indian children under five years of age from a tertiary level hospital in India. **Methodology:** This observational cross-sectional study was conducted in a tertiary care center. We randomly enrolled 119 healthy children aged 1 month to 5 years, in whom Total cholesterol, triglyceride, HDL, LDL, and VLDL were measured in a random venous blood sample via a BA400 automatic analyzer by BioSystems using Glycerol Phosphate Oxidase/Peroxidase method using the principle of spectrophotometry. Total cholesterol was calculated as the sum of all the lipids detected. **Results:** Median age was 16 months (9.5 months - 28 months), and 59.6% were male. The overall mean reference range for Total cholesterol was 132.6±38.3 mg/dL, Triglycerides was 98.5±46.2 mg/dL, LDL was 71.5±25.0 mg/dL, HDL was 42.6±15.8mg/dL and VLDL was 19.6±9.3mg/dL. There was no significant difference in lipid profiles between the sexes. HDL level was significantly higher in those above 24 months (p=0.02), while the other components were similar between various age groups. **Conclusion:** There was no significant difference between the lipid profile of children in our cohort, and previously published studies. Levels of HDL cholesterol increased with age after 24 months of age.

Key words: Lipid profile, Indian children, Dyslipidemia, Under five years children

Nutrients, especially lipids, form the structure of the central nervous system and play some important roles like supporting the growth, migration, and differentiation of neuronal cells. Lipids also form part of gray matter, white matter, nuclei, and synaptogenesis. Breast milk contains certain lipids that are very important for the baby's brain development [1]. Lipid metabolism involves the synthesis of structural and functional lipids (phospholipids, glycolipids, sphingolipids, cholesterol, prostaglandins, etc.) for each tissue of the body and the degradation of lipids to meet metabolic needs of the body such as energy production. Lipid Metabolism is a constant process. This means that some lipids are constantly oxidized to meet the body's metabolic needs, while others are synthesized and stored [2].

Measuring blood lipid profiles can be used to predict cardiovascular risk and has become a routine test nowadays. This test includes four parameters: total cholesterol, HDL cholesterol, LDL cholesterol, and triglycerides. It is usually preferred to test fasting blood samples. Fasting is the complete restriction of food, except for water and medicine, for 12-14 hours. This may be due to two factors: 1) postprandial triglycerides remain high for several hours, and 2) most references of lipid values are determined by fasting blood tests [3]. Dyslipidemia is a common problem in children and adolescents. This disease is defined as abnormalities in triglyceride (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) (4).

Lipid levels vary over time among children and are affected by gender and race; therefore, age percentage should be used to determine dyslipidemia in children (4). It has become a hallmark of atherosclerosis, high blood pressure, heart disease, and stroke. The risk of coronary artery disease constantly increases along with blood cholesterol levels (5). From the age of six months, fatty streaks are seen in aortic endothelial cells (5). There is a considerable lack of studies estimating normal lipid profile levels in pediatric age groups; especially, those below five years of age. We therefore carried out this cross-sectional study to evaluate the lipid profile level of healthy Indian children less than five years of age from a tertiary level hospital.

METHODOLOGY

This observational cross-sectional study was conducted in a

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tertiary care center in central India. 119 healthy children aged 1 month to 5 years attending Paediatric OPD of a tertiary care hospital in Madhya Pradesh India for routine immunisation in May and June 2023 were enrolled in this study. Institutional ethics committee approval was taken for conducting the study. The parents of the children were explained in detail about the study and informed consent was taken from the parents of each child. Blood sampling methods were carried out as per the relevant guidelines and regulations under the Declaration of Helsinki. Data was collected using a pre-designed pretested proforma.

We included all healthy children aged 1 month to 5 years attending Paediatric OPD who had come for routine immunization. Neonates (<28 days), children with hypoglycemia (6), severely underweight (weight for age <-3SD), stunted (height for age <-3SD), wasted (weight for height <-3SD or MUAC <11.5 cm) or obese children (weight for height >3SD) - according to the WHO classification, children with known thyroid disorders (7), or any known chronic illness were excluded from the study. After taking informed consent, data was collected using the proforma. As it is not wise to keep infants fasting before blood sampling, and keeping this in mind that breastfeeding is usually done every 2 to 3 hours, blood samples were collected by a phlebotomy just before the next breastfeeding in infants for lipid profile testing.

For older children, blood sampling was done after a fasting of 6 hours. Total cholesterol, triglyceride, HDL, LDL, VLDL were tested in our study. Triglycerides, HDL, LDL, and VLDL were measured via a BA400 automatic analyzer by BioSystems using the Glycerol Phosphate Oxidase/Peroxidase method using the principle of spectrophotometry. Total cholesterol was calculated as the sum of all the lipids detected. The proforma included blood T3, T4, and TSH test values to determine patients meeting the exclusion criteria. These tests were measured by an automatic analyzer machine by ADIVA Centaur CP using the ELISA technique.

Statistical Analysis: Statistical analysis was done using SPSS v23.0. Categorical variables were analyzed using the chi-square test and continuous variables using the student's t-test. P value <0.05 was considered as significant.

RESULTS

There were 119 children of age 1 month to 5 years of which 71 were male (59.6%) and 48 were female (40.4%) with a median age of 16 months (9.5 months - 28 months). The overall mean reference range for Total cholesterol was 132.6±38.3 mg/dL, Triglycerides was 98.5±46.2 mg/dL, LDL was 71.5±25.0 mg/dL, HDL was 42.6±15.8mg/dL and VLDL was 19.6±9.3mg/dL.

The lipid profile level showed no significant difference between the male and female sex (**Table 1**). The lipid profile range has been determined according to different age groups; 0 to 12 months, 13 to 24 months, and 25 to 60 months. No significant difference has been noted in any age group except HDL, which was significantly higher in those above 24 months of age **(p = 0.02)** as shown in table 2.

Table 1: Lipid Profile as per gender

Lipid Profile (mean±SD**)**	**Male (71)**	**Female (48)**	**P value**
Age (months), median (IQR)	18 (9.5 – 33)	14 (9.7 – 24)	0.66
Total cholesterol (mg/dl)	134.8±45.2	129.3±25.3	0.45
Triglycerides (mg/dl)	97.6±44.0	99.9±49.7	0.26
LDL (mg/dl)	70.2±20.5	73.5±19.0	0.38
HDL (mg/dl)	43.6±13.8	41.3±18.6	0.44
VLDL (mg/dl)	19.5±8.8	19.9±10.2	0.93

Table 2: Lipid Profile as per different age groups

Lipid Profile (mean±SD**)**	**0-12 months (N=52)**	**13-24 months (N=36)**	**25-60 months (N=31)**	**P value**
Male, n (%)	30 (57.6%)	23 (63.9%)	20 (64.5%)	0.86
Total cholesterol (mg/dl)	130.9±40.7	129.5±33.7	138.9±40.0	0.43
Triglycerides (mg/dl)	102.8±45.9	103.1±48.9	86.0±42.4	0.29
LDL (mg/dl)	71.8±25.0	72.3±28.0	70.2±22.1	0.53
HDL (mg/dl)	40.7±14.4	40.4±16.3	48.7±16.5	**0.02**
VLDL (mg/dl)	20.6±9.2	20.6±9.8	16.9±8.8	0.39

DISCUSSION

In 2019, Schienkiewitz A et al carried out a cross-sectional study in Germany among 1 to 17 years children and adolescents and observed that among children 1–9 years mean serum lipid measures increased with age, with higher mean TC and Non-HDL-C among girls than boys (8). In 2009, Walter M et al showed the trends of lipid profile in all age groups and observed that almost all lipoprotein levels, including HDL, are lower at birth than at puberty and rise during childhood. HDL concentrations in boys decline during adolescence and early adulthood and remain lower thereafter than in girls (9). In 2007, Akuyam SA et al conducted a cross-sectional study determining normal lipid profiles in healthy under-five Nigerian children. It was noted that serum

concentrations of TC, TG, and VLDL-C decrease with increasing age, with a significant decrease between the first and second years of life (10).

In 1995 Khalil A., et al conducted a hospital-based (siblings of hospitalized patients) cross-sectional study on 410 children aged 3 to 12 years to demonstrate Lipid profile norms and cut-off levels to define abnormalities for Indian children and it was noticed that the HDL-C levels were lower than western data (11). No significant difference was found between the sexes in our study found. In 1994, Vipan Chandar et al. conducted a cross-sectional study on 150 healthy Indian children and found that levels of various lipid components were lowest at birth and increased significantly during the first year of life, then the level increased more slowly (5). However, this trend was not noticed in our study. There was no significant difference between men and women in our study (5).

In 1980, Christensen B et al of Prevalence Study of the Lipid Research Clinics (LRC) Program described the lipid profile of 13655 children between the ages 0 to 20 years. The study found that blacks have more cholesterol than whites, but whites have more triglycerides than blacks. For all races, women generally have higher cholesterol and triglycerides than men. Age differences in cholesterol were observed. On average, total cholesterol is highest in early childhood and declines gradually during adolescence. Triglyceride values tend to increase during adolescence (12).

In our study, we estimated the lipid profile of children who are exclusively below 60 months of age. The observed levels of various lipid parameters were like the previously published studies (p=NS). However, the level of HDL cholesterol was higher after the age of 24 months, which has been described in previous studies also, but no biological reason has been found for attribution. Although the sample size of our study population is smaller, we were able to study the lipid profile of children below 60 months of age, data which was lacking from previous literature. Table 3 compares the mean lipid profile parameters with similar studies published previously,

This study has certain limitations such as a small sample size. Being a cross-sectional study, it fails to assess average lipid profile levels for a single child. As it was impossible to keep young children and infants fasting for long hours, we could not delineate fasting lipid profile levels as traditionally described as blood samples taken after 12 hours of fasting. So minor variations may occur. Also, as the sample was taken of children visiting the hospital for immunization, it may not always represent the whole community.

Table 3: Comparing overall mean lipid profile parameters of our study with different studies

Author name, year	Sample size	Age group	TC (mg/dL)	TG (mg/dL)	LDL (mg/dL)	HDL (mg/dL)	VLDL (mg/dL)
S A Akuyam, 2007	115	6 to 36 months	27.9 - 97.56 (52.02 ± 2.16)	16.74 - 61.74 (14.22 ± 2.52)	9 - 59.22 (23.04 ± 2.7)	8.1 - 49.86 (20.16 ± 2.52)	3.06 - 12.96 (6.3 ± 2.52)
A Khalil,1995	410	3 to 12 years	163.6 ± 21.5	117.8 ± 23.3	101.4 ± 20.2	38.8 ± 2.5	23.8 ± 5.6
Our study	119	0 to 5 years	132.6 ± 38.3 mg/dl	98.5 ± 46.2	71.5 ± 25.0	42.6 ± 15.8	19.6 ± 9.3

CONCLUSION

We find no significant difference between the lipid profile of children below 5 years of age, as compared to previously published data in the literature. Levels of HDL cholesterol were higher in those aged above 24 months. Determining the normal lipid profile levels in healthy Indian children will pave the way for future studies on abnormalities of lipid metabolism and evaluation of any cardiovascular risk factors associated with dyslipidemia in children below 5 years.

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