

# Lipid Profile in Infant

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## Abstract

**Introduction:** Alteration in lipid parameters at birth has a strong association with the development of cardiovascular disease in later life. **Material and Methods:** Sixty-one infants below the age of 6 months underwent evaluation of lipid parameters. The infants studied were categorized into two groups of  $\leq 4$  and  $> 4$  weeks of age, wherein their lipid parameters were compared. **Results:** The normal distribution of lipid parameters of infants  $< 6$  months was generated. The mean total cholesterol, triglyceride, HDL-cholesterol, LDL-cholesterol was  $126.2 \pm 26.5$ ,  $149.1 \pm 48.6$ ,  $40.7 \pm 14.6$ , and  $69.4 \pm 19.4$  mg/dl, respectively. The total cholesterol and LDL-cholesterol measured in  $\leq 4$  and  $> 4$  weeks of age groups were statistically not different (total cholesterol  $125.0 \pm 30.1$  mg/dl vs  $127.4 \pm 23.4$  mg/dl,  $P = 0.727$ , and LDL-cholesterol  $66.0 \pm 19.2$  mg/dl vs  $75.4 \pm 21.2$  mg/dl,  $P = 0.780$ ). However, the HDL-cholesterol and triglycerides measured at  $\leq 4$  weeks versus  $> 4$  weeks age groups were statistically different (HDL-cholesterol  $44.9 \pm 17.2$  mg/dl vs  $36.9 \pm 10.8$  mg/dl,  $P = 0.031$ , and triglyceride  $147.4 \pm 60.2$  mg/dl vs  $186.5 \pm 75.7$  mg/dl,  $P = 0.030$ ). **Conclusion:** The mean lipid parameters were significantly more atherogenic compared to the Western population. Triglyceride levels and HDL-cholesterol levels change significantly after 4 weeks of age compared to that observed before 4 weeks of age.

**Keywords:** Cholesterol, infants, lipid, lipid profile, neonate

## INTRODUCTION

Atherosclerotic cardiovascular disease (ASCVD) is a major contributor to morbidity and mortality. Dyslipidemia especially elevated LDL-cholesterol is an independent risk factor for the development of ASCVD. It is believed that the pathological process of atherosclerosis starts in life and gradually evolves over decades before clinical manifestation.<sup>[1]</sup> Studies have suggested an independent relationship between childhood and adulthood serum lipid levels.<sup>[2]</sup> The Barker hypothesis postulates that there is an association between intrauterine growth retardation with an increased risk of hypertension, insulin resistance, diabetes, and cardiovascular and coronary heart disease later in life.<sup>[3,4]</sup> It is not clear if such a relationship exists between neonatal lipid profile and development in ASCVD in later life.

The lipid profile of the children in the infantile period is likely to corroborate with lipid profile at the time of birth and subsequent changes in lipid profile occur as a result of changes in dietary habits and lifestyle factors. We undertook this study to assess the lipid parameters in neonatal period and compare it with the lipid profile of the infants between ages  $> 4$  weeks and  $\leq 6$  months.

## MATERIAL AND METHODS

A cross-sectional hospital-based study was undertaken in a tertiary care center. Sixty-one infants (normal vaginal delivery) were included in the study. All of them were exclusively breastfed during the entire neonatal period. The infants were recruited from the nursery unit or the follow-up vaccination clinic. These infants did not have an evidence of diseases/illness on clinical examination. The study was approved by the Institutional Ethics Committee. Written informed consent was taken from the mother of the child. All the neonates were born at term or near term (completed 37–41 weeks), and with weight appropriate for gestational age (birth weight between 10<sup>th</sup> and 90<sup>th</sup> percentile).<sup>[5]</sup> Accordingly, neonate/infants with preterm delivery, low birth weight or small

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for gestational age, any congenital anomalies, history of sepsis, birth asphyxia (APGAR score at 5 min below 7), and neonatal jaundice were excluded. Maternal history of chronic pancreatitis, thyroid disorders, Cushing's disease, primary hypercholesterolemia, intake of drugs that could affect neonatal lipid levels was excluded.

Blood sample was collected before the first feed of the day and at least 2 h after the previous feed between 6 AM and 8 AM. The sample was allowed to clot and centrifuged for collecting the serum. Total cholesterol, LDL-cholesterol, HDL-cholesterol, and triglycerides levels were measured. Total cholesterol levels were determined by cholesterol oxidase/phenol + aminophenazone end-point enzymatic method. High-density lipoprotein (HDL) cholesterol levels were determined by the detergent/bichromatic end-point method while triglyceride levels were determined by lipase/glycerokinase bichromatic end-point method. LDL-cholesterol was determined by the direct LDL estimation method. All measurements were made using kits from Siemens Healthcare Global, Germany.

All analyses were conducted using SPSS (2012, version 21.0.0.0). Continuous data are presented as mean  $\pm$  standard deviation (SD, if normally distributed) or median (interquartile range, if skewed), and categorical variables are presented as proportions. The normality of the data is tested by normal Q-Q plot method. Comparison of the two groups of normally distributed data were done by two-tailed unpaired Student's t-test. And alpha level of significance was assumed to be 0.05.

## RESULTS

Sixty-one infants were included in the study; of them, 29 (47.5%) infants were of <4 weeks and 32 (52.5%) were of the age of >4 weeks and <6 months; 39 were males and 22 were females.

Table 1 shows baseline parameters and Table 2 shows the mean and SD along with the percentile distribution (2.5, 50, and 97.5 percentile) chart and interquartile range (25<sup>th</sup>–75<sup>th</sup> percentile) of the lipid parameters, namely, total cholesterol, triglyceride, HDL-cholesterol, and LDL-cholesterol. Table 3 shows the comparison of serum lipid parameters in both the groups.

The mean ( $\pm$  SD) of total cholesterol measured in  $\leq$ 4 weeks of age was 125.0 mg/dl ( $\pm$  30.1) and in >4 weeks of age was 127.4 mg/dl ( $\pm$  23.4), which were not statistically different ( $P = 0.727$ ). The mean of LDL-cholesterol was 66.0 mg/dl ( $\pm$  19.2) in  $\leq$ 4 weeks of age group and 75.4 mg/dl ( $\pm$  21.2) in >4 weeks of age group, which were not statistically significantly different either ( $P = 0.078$ ). However, the HDL-cholesterol was found to be 44.9 mg/dl ( $\pm$ 17.2) in  $\leq$ 4 weeks of age group and 36.9 mg/dl ( $\pm$ 10.8) in >4 weeks of age group, which were statistically different ( $P = 0.031$ ). And the serum triglycerides measured were 147.4 mg/dl ( $\pm$ 60.2) in the age group of  $\leq$ 4 weeks and 186.5 mg/dl ( $\pm$ 75.7) in the

**Table 1: Baseline parameters normally distributed ( $n=61$ )**

Parameters	Mean	SD
Age (weeks) (M=39, F=22)	8.3	5.36
Birth weight (kg)	2.81	0.32
Length (cm)	53.85	1.94
Head circumference (cm)	36.50	1.15

\*\*Note: All children were born appropriate for gestational age

age group of >4 weeks, which were once again statistically different ( $P = 0.030$ ).

## DISCUSSION

Abnormal lipid levels are an important risk factor for the development of ASCVD in later life. Studies from high-income countries have reported tracking of individual risk factors including lipid profiles from childhood to adulthood.<sup>[6]</sup> Therefore, it may be reasonable to assess childhood cardiovascular risk factors in early life. Data on the lipid profile in the early phase of life from this country is sparse.<sup>[7]</sup> It may also be important to track changes in the risk factors especially lipid profile parameters from very early phase of life. Data from the Western populations suggest that there is a considerable ethnic difference in the lipid profile parameters.<sup>[8]</sup> The average lipid parameters reported from the Western population in the neonates and from Indian populations are widely different. The data from one Indian study shows that the average total cholesterol, HDL-cholesterol, LDL-cholesterol, and triglycerides measured on day 3 or 4 were (total cholesterol  $103.92 \pm 47.79$  mg/dl, triglycerides  $187.62 \pm 144.44$  mg/dl, HDL-cholesterol  $23.35 \pm 11.41$  mg/dl, and LDL-cholesterol  $51.70 \pm 23.03$  mg/dl)<sup>[9]</sup> is nearly twice as higher as measured from a similar Western population measured just after birth (total cholesterol  $53.9 \pm 14.6$  mg/dl, triglycerides  $29.5 \pm 16.0$  mg/dl, HDL-cholesterol  $21.9 \pm 6.3$  mg/dl, and LDL-cholesterol  $26.2 \pm 10.1$  mg/dl).<sup>[10]</sup> Similar trends were also noted while comparing another Indian population data versus an Western population data.<sup>[11,12]</sup> The average total cholesterol, HDL-cholesterol, LDL-cholesterol, and Triglycerides measured in our study is considerably higher than that published from the Western population but in consonance with the average parameters published from this country probably reflecting strong ethnic differences. Data published from this country had shown that feeding patterns might have significant influence on the lipid profiles of the infants. One particular study compared the lipid profile of breastfed versus mixed-fed babies and found considerable difference between them implying thereby the possible influence of feeding.<sup>[11]</sup> In our study, we also noted that there is a statistically significant difference between the exclusively breastfed and mixed-fed babies in their HDL-cholesterol and triglycerides concentration. This early change of lower HDL and higher triglyceride noted in our study might signify a possible influence of insulin

**Table 2: Lipid parameters normally distributed (n=61)**

Parameters	Mean±SD (mg/dl)	Normative distribution (mg/dl)			Interquartile range (mg/dl)
		2.5 Percentile	50 Percentile	97.5 Percentile	
Total cholesterol (mg/dl)	126.2±26.5	74.7	123.0	180.0	108.0-146.0
Triglyceride (mg/dl)	149.1±48.6	56.0	154.0	244.6	114.0-185.0
HDL-cholesterol (mg/dl)	40.7±14.6	15.5	38.0	77.9	31.0-51.5
LDL-cholesterol (mg/dl)	69.4±19.4	32.0	69.0	106.5	55.0-84.0

**Table 3: Comparison of lipid parameters in two groups**

Parameter	Age ≤4 weeks (29/61)	Age >4 weeks (32/61)	Significance (P)
Total cholesterol	125.0±30.1	127.4±23.4	0.727
Triglyceride	147.4±60.2	186.5±75.7	0.030 *
HDL-cholesterol	44.9±17.2	36.9±10.8	0.031 *
LDL-cholesterol	66.0±19.2	75.4±21.2	0.780

resistance in very early phase of life. Indian children are known to have been born with a higher level of body fat percentage and insulin resistance compared to their Western counterparts.<sup>[13,14]</sup>

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#### Conflicts of interest

There are no conflicts of interest.

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