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STUDY OF UMBILICAL CORD BLOOD LIPID PROFILE IN TERM AND PRETERM BABIES

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ABSTRACT: BACKGROUND: Primordial prevention of non - communicable disease is of clinical and public health importance. According to Barker's hypothesis, preterm babies with altered lipid profile are at risk of adult onset Cardio Vascular Disease (CVD). In this study, we aimed to measure the umbilical cord blood lipid profile in term and preterm babies. **AIM:** The aim of this investigation is to measure and compare the cord blood lipid profile Total Cholesterol (TC), Triglycerides (TGL), HDL-Cholesterol (HDL) and LDL-cholesterol (LDL) in term and preterm newborn babies. **SETTINGS AND DESIGN:** A cross sectional study in which umbilical cord blood samples were collected from 70 neonates delivered by normal labor or LSCS at M.G.M.G.H, Trichy during the period of Feb 2015 to May 2015. **METHODS AND MATERIALS:** The study population were categorized as term (≥ 37 weeks) and preterm (< 37 weeks) babies. Serum was used to measure the Total Cholesterol (TC), Triglycerides (TGL) and HDL-Cholesterol (HDL). LDL-cholesterol (LDL) was calculated by Friedewald equation. **STATISTICAL ANALYSIS:** SPSS 21 software was used for statistical analysis. **RESULTS:** Mean $\pm$ SD values of Preterm and Term babies for TC (83.18 $\pm$ 8.50, 62.42 $\pm$ 7.98), LDL (47.71 $\pm$ 8.15, 24.80 $\pm$ 7.45), HDL (23.96 $\pm$ 3.25, 25.68 $\pm$ 3.48) and TGL (57.53 $\pm$ 7.28, 59.65 $\pm$ 7.38) are given respectively. TC & LDL values are significantly high in the cord blood of preterm babies than that of term babies ($p < 0.01$), but HDL value is significantly low in preterm babies ($p < 0.05$). TGL has no significant changes between the two groups. **CONCLUSION:** Preterm babies cord blood have atherogenic lipid profile with significant elevation of TC, LDL and low HDL than Term babies which supports Barker's hypothesis. Thus to conclude, preterm babies are more prone to develop CVD, in their adult life.

KEYWORDS: Preterm, Term, Cord blood, Lipid profile, Atherogenesis.

INTRODUCTION: Atherosclerosis of coronary arteries commonly causes myocardial infarction (MI) and angina pectoris, is a pathological process that starts early in life and progresses silently for decades and there is a strong independent relationship between the abnormal lipid profile and atherosclerosis.^{[1],[2]} Several investigators believe that the atherosclerotic lesion may have its genesis during childhood. According to Barker's Hypothesis, adverse environment, e.g. under nutrition during fetal development and prematurity, which leads to impaired intrauterine growth, progress later to coronary artery disease (CAD) in adult life.^[3] Hence this study was planned to find any evidence for the association of gestational age with cord blood lipids and this study can serve as a starting point for studying lipids later in life.

AIMS AND OBJECTIVES: The aim of this investigation is to measure and compare the cord blood lipid profile Total Cholesterol (TC), Triglycerides (TGL), HDL-Cholesterol (HDL) and LDL-cholesterol (LDL) in term and preterm newborn babies.

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MATERIALS AND METHODS: A total number of 70 newborn infants were prospectively enrolled in this study during the period of Feb 2015 to May 2015. They were delivered normally, or by caesarean section at MGMGH, Trichy. The infants with congenital anomalies, perinatal asphyxia, twin pregnancy and sick admitted in NICU were excluded from the study. The study samples were divided into two groups according to their gestational age: Preterm babies (<37 weeks) and Term babies (≥37 weeks).

The gestational age was determined according to the date of the last menstrual period, or the early ultrasound in 20 weeks of gestation and modified Ballard scoring system. Following the delivery, blood samples were taken from the umbilical cord immediately, and serum was separated after clotting, for at least 45 min at room temperature. Serum stored at 4°C for maximum 24 hour prior to the analysis. Total Cholesterol, Triglycerides, and HDL were measured by enzymatic method using semi auto-analyzer. LDL was calculated by Friedewald formula $LDL = TC - (HDL + TGL/5)$. Statistical analysis was done using SPSS 21 software. Student 't' test was used to compare the difference between the two means.

RESULTS: The mean gestational age for preterm babies is 33 weeks and term babies are 39 weeks. The mean mother's age for preterm and term babies was 24.1 and 24.8 which has statistically no significance. The highest and lowest value of TC was documented in preterm babies (100mg/dl, 64 mg/dl) and term babies (80mg/dl, 42 mg/dl) are given respectively. Mean±SD values of Preterm and Term babies for TC (83.18±8.50, 62.42±7.98), LDL (47.71±8.15, 24.80±7.45), HDL (23.96±3.25, 25.68 ±3.48) and TGL (57.53±7.28, 59.65±7.38) are given respectively. TC & LDL values are significantly high in the cord blood of preterm babies than that of term babies ($p < 0.01$), but HDL value is significantly low in preterm babies ($p < 0.05$). TGL has no significant changes between the two groups.

	Preterm babies n = 32 Mean ± SD	Term babies n =38 Mean± SD	p value
Mother's age	24.18±3.02	24.89±4.01	p=0.404

Table 1: Mother's age in both study groups

Sl. No.	Variables (mg/dl)	Preterm babies n = 32 Mean ± SD	Term babies n =38 Mean ± SD	p value
1.	TC	83.18 ± 8.50	62.42 ± 7.98	p < 0.01
2.	LDL	47.71 ± 8.15	24.80 ± 7.45	p < 0.01
3.	HDL	23.96 ± 3.25	25.68 ± 3.48	p = 0.038
4.	TGL	57.53 ± 7.28	59.65 ± 7.38	p = 0.231

Table 2: Comparison of lipid profile in study groups

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Fig. 1: Comparison of lipid profile in study groups

DISCUSSION: The present study demonstrated that the preterm babies had the high concentration of Total Cholesterol, LDL ($p < 0.01$) and Low concentration of HDL ($p = 0.038$) compared to term babies. Pardo et al., showed that total cholesterol, LDL-C, and HDL-C of cord blood were higher in preterm neonates compared with term neonates, with statically significant difference in total cholesterol and LDL-C levels, but the corresponding figure was not significant for HDL-Cholesterol.^[4]

Mathur et al. reported that total cholesterol was significantly high in preterm neonates.^[5] Donegá et al., concluded that total cholesterol, LDL-C, and HDL-C levels of cord blood, in preterm infants were significantly higher; also the triglycerides level was lower in preterm babies.^[6] But in our study TGL level shows no significant changes between the preterm and term babies.

Seyyed Mohammad Hassan Aletayeb et al. found that TC, TGL and LDL values are significantly high in Low Birth Weight babies when compared to Normal Birth Weight Babies, but the HDL values showed no significant changes between the two groups.^[7] The TC levels in adults are higher than that of umbilical cord blood which suggests the possibility of TC levels of preterm neonates are similar to or lower than those in term babies. However, in our study TC of preterm babies are significantly higher than term babies which correlates with study of Kherkeulidze P et al.^[8]

High levels of TC & LDL in preterm babies could be explained by the fact that preterm babies lack both hepatic carbohydrate and subcutaneous adipose stores. It may also reflect the metabolic adaptation to provide adequate energy especially to vital organs like brain.^[9]

It is suggested that increase lipoprotein concentrations in preterm babies than term babies is due to the low level of lipoprotein lipase, hepatic lipase, and lecithin cholesterol acyl transferase enzymes activity in preterm babies.^[10] Barker et al. showed an inverse correlation of birth weight and neonatal abdominal circumference with adult serum cholesterol, LDL-C and Apo B levels which explain the association between aberrant lipoprotein metabolism and low birth weight is present by the time intrauterine growth restriction is clinically evident.^[11] High values of TC & LDL along with low values of HDL is a marker of an underlying cardiovascular status and direct correlation exists between the abnormalities in lipid profile and incidence of many chronic diseases. Increased TC & LDL are considered to be of most important factor in the development of atherosclerosis which begins early in life and the studies conducted on cord blood lipid profile had consistent findings.

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STUDY LIMITATIONS: The main limitation of our study is its cross-sectional nature. Future longitudinal studies with long-term follow up are necessary to verify the clinical implications of the current findings.

CONCLUSION: Our study has shown that atherogenic lipid profile, with high TC & LDL level is more likely to be observed in preterm babies. So the study recommends close follow up of preterm babies which would help in early intervention and prevent the complications of atherosclerosis in their adulthood.

REFERENCES:

1. Peter Libby. The Pathogenesis, Prevention and Treatment of Atherosclerosis. In: Dan L. Lango, Anthony S. Fanci, Dennis L. Kasper, Stephen L. Hanser, J. Larry Jameson, Joseph Loscalzo (eds.) Harrison's Principles of Internal Medicine. Volume II. 18th ed. Mcgraw Hill Medical Publishers; 2012: P.1983
2. Rajasekhar D, Saibaba KSS, Srinivasa Rao PVLN, Latheef SAA, Subramanyam G. Lipoprotein (a): Better assessor of coronary heart disease risk in South Indian population. Ind J Clin Biochem. 2004; 19:53-9.
3. Barker DJ, C Osmond, P. D Winter, B Margetts, S. J Simmonds, et al. Weight in infancy and death from ischaemic heart disease. The Lancet, Volume 334, No. 8663, p577-580, 9 September 1989.
4. Pardo IM, Geloneze B, Tambascia MA, Barros-Filho AA. Atherogenic lipid profile of Brazilian near-term newborns. Braz J Med Biol Res. 2005; 38:755-60.
5. Mathur PP, Prasad R, Jain SK, Pandey DN, Singh SP. Cord blood cholesterol in term and preterm new borns. Indian Pediatr. 1986; 23:103-6.
6. Donegá S, Oba J, Maranhão RC. Concentration of serum lipids and apolipoprotein B in newborns. Arq Bras Cardiol. 2006; 86:419-24.
7. Seyyed Mohammad Hassan Aletayeb et al. Correlation between umbilical cord blood lipid profile and neonatal birth weight. Pediatría Polska Volume 88, Issue 6, November-December 2013, Pages 521-525.
8. Kherkeulidze P, Johnsson J, Carlson LA. High density lipoprotein particle size distribution in cord blood. Acta Paediatr Scand 1991; 80:770-779.
9. Sedigheh Ghaemi, Raziye Najafi, and Roya Kelishadi. Cord blood lipoprotein profile in term, preterm, and late preterm newborns. J Res Med Sci. 2014 Nov; 19(11): 1038 -1040.
10. Hamosh M. Lipid metabolism in premature infants. Biol Neonate. 1987; 52:50-64.
11. Barker DJP, Marlyn CN, Osmond C, Hales CN, Fall CHD. Growth in utero and serum cholesterol concentrations in adult life. Br Med J. 1993; 307:1524-7.

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