ORIGINAL RESEARCH

Study the cord blood lipid profile in neonates [Total cholesterol (TC), Low density lipoprotein (LDL), High density lipoprotein (HDL) and triglyceride (TG)] at birth using umbilical cord blood

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ABSTRACT
Background: Lipoprotein is a biochemical assembly that contains protein and lipid. Lipids are the derivatives which covalently or non-covalently bind to the proteins. **Objective:** To Study the cord blood lipid profile in neonates [Total cholesterol (TC), Low density lipoprotein (LDL), High density lipoprotein (HDL) and triglyceride (TG)] at birth using umbilical cord blood. **Methods:** The present prospective study was carried out on neonates born at Dr. TMA PAI HOSPITAL, UDUPI. This study Included screening of 137 newborn babies. **Results:** There were 76 males & 61 female with (55% male and 45% female) with gender ratio of 1.24: 1. In this study we studied total of 137 newborn's out of which majority i.e 128 were appropriate for gestational age (AGA), small for gestational age (SGA) were 4, Large for gestational age (LGA) were 5. TG levels were higher in SGA babies in the order SGA > AGA > LGA babies. TC levels were higher in LGA babies in the order LGA > AGA > SGA babies. LDL levels were higher in LGA babies in the order LGA > AGA > SGA babies (Table 4) HDL levels were higher in LGA babies in the order LGA > AGA > SGA babies. In present study mean TG level of SGA group (68.25 ± 33.5) was significantly higher as compared to AGA group (42.36 ± 14.3) (p value = 0.001) however falls between 50th and 95th percentiles of cord blood lipid values for the age. **Conclusion:** LGA babies have higher levels of total cholesterol, LDL, HDL than appropriate for age babies and small for gestational age however it falls within 50th percentile for cord blood reference LDL levels for that age.
Keywords: Cord blood lipid profile, neonates, Total cholesterol, Low density lipoprotein, High density lipoprotein, triglyceride

Introduction

Epidemiological studies have revealed that neonates born with reduced weight, abdominal circumference and length, at birth, have an increased risk for atherosclerosis, coronary heart disease[1,2] and impaired glucose tolerance[3].

Recent findings have suggested that if a fetus receives limited supply of nutrients, during intrauterine life, then this adaptation leads to a permanent change in their physiology and metabolism. This can cause programmed changes which may lead to origin of number of diseases in later life[2,4]. Studies have shown that neonates develop persistent disturbances in lipid cholesterol metabolism[5], when born with short body in relation to head size and small abdominal circumference. Currently there are very few reports stating the exact correlation between anthropometry of neonates at birth with their lipid profile, hence the present study aims to find the correlation between lipid profile and anthropometry at birth in neonates.

Materials & Methods

The present prospective study was carried out on neonates born at Dr. TMA PAI HOSPITAL, UDUPI. This study included screening of 137 newborn babies.

This study was approved by Kasturba Hospital Ethical Committee and it was done with the informed consent from parents of neonates.

Inclusion criteria

1. Neonates without signs of perinatal asphyxia
2. Normal fetal heart rate patterns during labor.
3. One minute APGAR score > 7

Exclusion criteria

Perinatal asphyxia

Congenital anomalies

Information obtained for the present study include

1. Maternal data (age, parity, height, weight at 1st visit and weight at delivery).
2. Neonatal data (Includes anthropometric data and lipid profile at birth). Gestational age calculated from Last menstrual period (LMP), and by Ballard score

Statistical analysis

Pearson correlation coefficient: To analyse the relationship between lipid profile and anthropometric data.

ANOVA: To analyze relationship between neonatal abdominal circumference and lipid profile.

Results

Professor Barker is responsible for "fetal origin" hypothesis, which proposes that causes of adult mortality and morbidity are related to fetal and infant life. Studies of Sheffield showed that the neonates with a short body in relation to size of its head or with a small abdominal circumference at birth, although within the normal range of birth weight , had persistent disturbance of cholesterol metabolism. The present study a prospective one was carried out on neonates born at Dr. TMA Pai Hospital , Udupi and included screening of 137 newborns.

There were 76 males & 61 female with (55% male and 45% female) with gender ratio of 1.24: 1.

Table : 1 Maternal Data `

	Minimum	Maximum	Mean± SD
Age of Mother(yrs)	**19**	**39**	24.47±4.04
Wt at 1st visit(kg)	**33.8**	**79.5**	53.52±9.48
Wt at Delivery(Kg)	**42**	**87.5**	61.36±9.52
Height(cm)	**141**	**169**	155.96±5.85
POG(wks)	**36**	**40**	38.57±1.04

Table: 2 Cord blood lipid profile in neonates

N=137	References (Centiles) mg/dl	Minimum	Maximum	Mean± SD
TG (mg/dl)	**5th =14 50th =34 95th =86**	**19**	**109**	**43.06**±15.74
TC (mg/dl)	**5th =46 50th =68 95th =103**	**27**	**150**	**54.21**±17.37
LDH (mg/dl)	**5th =17 50th =29 95th =50**	**6.4**	**99.4**	**22.65**±12.08
HDL (mg/dl)	**5th =13 50th =35 95th =60**	**8**	**48**	**22.98**±7.86

In this study we studied total of 137 newborn's out of which majority i.e 128 were appropriate for gestational age (AGA), small for gestational age (SGA) were 4, Large for gestational age (LGA) were 5 .

Table: 3 Comparison of lipid profile of SGA/AGA neonates

Lipid	Gestational Assesment	P value
Triglyceride	SGA AGA	0.001
Total Cholestrol	SGA AGA	0.678
LDL	SGA AGA	0.290
HDL	SGA AGA	0.549

Table: 4 Comparison of lipid profile of AGA/LGA neonates

Lipid	Gestational Assesment	P value
Triglyceride	AGA LGA	0.67
Total Cholestrol	AGA LGA	0.20
LDL	AGA LGA	0.76
HDL	AGA LGA	0.10

TG levels were **higher in SGA babies** in the order SGA > AGA > LGA babies. TC levels were **higher in LGA babies** in the order LGA > AGA > SGA babies. LDL levels were **higher in LGA babies** in the order LGA > AGA > SGA babies (Table 4) HDL levels were **higher in LGA babies** in the order LGA > AGA > SGA babies. In present study mean TG level of SGA group (68.25 ± 33.5) was significantly higher as compared to AGA group (42.36 ± 14.3) (p value = 0.001) **however falls between 50th and 95th percentiles of cord blood lipid values for the age.** Neonates with AC of ≥ 32cms had a mean HDL level of 24.16± 8.91 mg/dl , 0.84mg/dl higher than those with AC of ≤ 29cms or less with p value of 0.730 (not significant). (**However falls between 5th and 50th percentiles for the age.** Mean level of LDL in neonate whose AC at birth was > 32cms had LDL level of 23.33± 6.26 mg/dl which was 2.59mg/dl higher than those with AC 29cms or less with **p value being 0.019 (significant). However falls between 5th and 50th percentiles for the age.** Mean level of TC in neonate with AC at birth greater than 32cms, was 23.33± 6.26 mg/dl which was 2.25mg/dl lower than those with AC 29cms or less with p value of 0.046 significant. Lipid values in both the group are well within 50th percentile for that age. In this study triglycerides are significantly higher in babies with ponderal index of less than 10th percentile as compared to those with ponderal index more than 10th percentile (p value = 0.011). Though there is difference in triglyceride values in between two groups, still all values fall between 50th and 95th percentiles of triglycerides for that age**.** This implies that those who are thin at birth and had low ponderal index had higher triglyceride levels. Maternal Body mass index (BMI) was correlated with Cord blood lipid profile , it was found that babies born to mother with low BMI did not have lower lipid levels than that of those born to mother's with high BMI and value of TG, TC, LDL, HDL are almost comparable.

Discussion

Our results are in agreement with the study done in Israel by Ella Ophir etal[6] which showed gender ratio of 1.28:1 with 270 male newborn and 210 female babies In the present study, HDL ranged from 8 to 48mg/dl with mean value of 23mg/dl which falls between 5th & 50th percentile of cord blood lipid reference standards. These findings are in agreement with mean HDL value of 26.75mg/dl in the study done by Pardo, B Geloneze etal[7]. The LDL ranged from 6.4 to 99.4mg/dl with mean value of 22.6mg/dl which falls between 5th & 50th percentile of cord blood lipid reference standards. As per Pardo, B Geloneze[7] etal the mean LDL value was 34.3mg/dl in 110 newborns. The total cholesterol (TC) ranged from 27 to 150mg/dl with mean value of 54.1 mg/dl which falls between 5th & 50th percentile of cord blood lipid reference standards. In other studies by Pardo, B Geloneze etal[7] & Fosbrooke & Wharton etal[8] the mean TC value was 70.4mg/dl & 97.2mg/dl respectively. Our studies are in agreement with the reports of the study done by Fosbrooke AS & Wharton BA et al in Institute of Child health , London on 49 newborn constituting 19 term babies, 16 preterm and 14 light for date babies during 1971 to 1972 showed plasma concentration of triglyceride are significantly higher in term babies than in preterm babies and was highest in SGA babies[8] Study done by O Huter, C Brezinka, D Koelle, H Drexel and J R Patsch etal at Innsbruck University Hospital , Austria on 151 newborns including 56 Appropriate for gestational babies (AGA), 45 large for gestational age babies (LGA), 50 small for gestational babies (SGA). Study results revealed significantly higher triglyceride levels in SGA group[9]. The triglyceride (TG) ranged from 19 to 109mg/dl with mean value of 43 mg/dl which falls between 50th & 95th percentile of cord blood lipid reference standards. Fosbrooke & Wharton etal[8] study showed mean TG value of 29.6mg/dl and Ella Ophir etal[6] mean of TG of 31.1mg/dl. Our study is in agreement with study done by D J P B arker, CN Martyn, C Osmond , CN Hales, CHD Fall at Jessop and Northern General Hospital Sheffield . 219 men and women who had small abdominal circumference at birth had raised serum concentration of total and LDL cholesterol. Serum concentration of total cholesterol fell by 0.25mmol/l with each 2.54cm increase in abdominal circumference. Serum LDL was 0.26mmol/l[10]. One explanation of our findings is that impaired liver growth in late gestation leads to permanent changes in LDL metabolism. The liver is thought to be the main site for the synthesis of LDL cholesterol in late gestation, and the human fetus requires the large quantities at this time to sustain metabolic activities which include higher rate of synthesis of steroid hormones by adrenals. Persistent reduction of LDL

receptor activity associated with failure of growth of fetal liver is possible explanation of our findings Ella Ophir, M.D.et al in their study conducted on 480 newborn with 165 newborn babies group <10th percentile group and 315 babies >10th percentile group, found to have no significant difference among trglyceride levels with p value of 0.13[6]. The present also concurrs with the Ella Ophir, M.D.etal the p value being insignificant.

Conclusion

Triglyceride levels are significantly higher in those who are thin at birth and with ponderal index less than 10 th percentile SGA babies have significantly higher levels of triglycerides than appropriate for age babies, however it falls, between 50th and 95th percentiles of cord blood reference standard for that age. LGA babies have higher levels of total cholesterol, LDL, HDL than appropriate for age babies and small for gestational age however it falls within 50th percentile for cord blood reference LDL levels for that age. Mean HDL levels higher in neonates with bigger Abdominal Circumference but not statistically significant

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