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Original Research Article

Comparative Study on Umbilical Cord Blood Lipid Profile in Normal and Low Birth Weight Neonates

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Abstract: Altered lipid levels are the recognized factors to cardiovascular disease in adults. This process is considered to begin in early life and progress silently over decades. An increase in low-density lipoprotein cholesterol (LDL-C) and decrease in high-density lipoprotein cholesterol (HDL-C) levels are associated with the atherosclerotic process, with its prodromal stages starting in early life. Objective of study to compare umbilical cord blood lipid profile between normal and low birth weight neonates. This was a cross sectional study carried out at neonatal Units of Department of Pediatrics, SMS Medical College, Jaipur from April 2015 to March 2016 included 110 babies each group of normal and low birth weight babies. Statistically significant difference (P =< 0.001) was found between the mean TG and mean VLDL levels among the normal(TG = 641.61±18.05 mg/dl, VLDL =8.27±3.59mg/dl)and low birth weight babies(TG=60.44±36.63 mg/dl, VLDL = 12.72±8.95 mg/dl). No statistically significant difference was found between the mean values of TC, LDL and HDL among normal (TC=96.04±24.33mg/dl, LDL=64.71±21.02 mg/dl, HDL=23.05±7.043mg/dl) and low birth weight babies(TC=103.30±33.65mg/dl,LDL==67.22±30.93mg/dl,HDL=23.51±7.78mg/dl).Lipid (all types) levels were higher in LBW babies as compared to normal birth weight babies but the difference was statistically significant for TG and VLDL.
Keywords: SGA, AGA, TG, VLDL.

INTRODUCTION:

Hyperlipidemia may cause complications such as stroke, kidney failure, coronary heart disease, and atherosclerosis [1]. Concentrations of the cord blood lipoprotein subtypes are influenced by fetal malnutrition and prematurity [2, 3]. High concentrations of triglyceride-rich lipoproteins, and apolipoprotein B in infants with a low gestational age; and increase of Apo c-1 rich in high-density lipoprotein (HDL) with low birth weight are potential risk factors for cardiovascular disease in the future [4, 5].The fetal origins hypothesis [6] states that fetal under nutrition in middle to late gestation, which leads to disproportionate fetal growth, programmes later coronary heart disease. Studies in humans have shown that men and women whose birth weights were at the lower end of the normal range, who were thin or short at birth, or who were small in relation to placental size have increased rates of coronary heart disease.

Barker *et al* [7, 8] demonstrated that low birth weight is correlated with increased prevalence of cardiovascular diseases, hypertension and type 2 diabetes mellitus. This was in synchronization with 'fetal origins' hypothesis and reflects the phenomenon 'programming' whereby a stimulation or insult during critical period of intrauterine life could result in alteration of physiology and metabolism during adult life.

Atherosclerotic cardiovascular disease (CVD) is a major cause for morbidity and mortality in the adult population. Altered lipid levels are the recognized factors [9].This process is considered to begin in early life and progress silently over decades [10]. An increase in low-density lipoprotein cholesterol (LDL-C) and decrease in high-density lipoprotein cholesterol (HDL-C) levels are associated with the atherosclerotic process, with its prodromal stages starting in early life [6, 11,

12]. Hence this study was conducted to compare umbilical cord blood lipid profile between normal and low birth weight neonates.

MATERIAL AND METHODS:

This study was a Cross sectional study and carried out at Neonatal Units of Department of Pediatrics, SMS Medical College, Jaipur from April 2015 to March 2016. Prior permission from the institutional ethical committee was obtained. Sample size of 110 newborn in each group was calculated at 95% confidence interval at 80% study power to verify the expected difference of 9.8 mg/dl (+/-22.1) in mean triglyceride level among birth weight of <2.5kg and ≥2.5kg birth weight group [13]. Healthy neonates with Gestational age of >28weeks and < 42 weeks with Apgar score >7 at 5 minute were included in the study. Neonates with maternal hypertension either before or during pregnancy, paternal or maternal Hyperlipidemia, Maternal Cardiovascular disease and Diabetes mellitus or gestational diabetes, Maternal history of smoking and neonates with congenital malformations, Hypoxic ischemic encephalopathy, small for gestation age were excluded from the study. A written consent was taken from the parents. Pre design structured Proforma was used for history and data collection. 2.5 ml of Cord blood sample from each of enrolled newborns was collected from the placental end of the cord just after the delivery of the baby in a plane dry test tube and lipid profile was done using enzymatic colorimetric method. Serum LDL was estimated using Friedewald's Formula. For statistatical analysisthe test of normality was done by Kolmogorov-Smirnov test .The Categorical data were presented as numbers (percent) and were compared among groups using Chi square test. Normally distributed variables were summarized using the Mean±SD, and non-normally distributed variables by the median and range. Student T- test was used to compare continuous variables. Correlation analyses were performed using Spearman's rho correlation coefficient. Probability P value <0.05 was considered statistically significant.

RESULTS:

Table-1: Baseline characteristics of newborns studied

Baseline Characteristics		<2.5 kg (Group A)	≥2.5 kg (Group B)	P value
Sex	Male	63(57.3%)	63(57.3%)	0.892NS
	Female	47(42.73%)	47(42.73%)	
Religion	Hindu	87(79.1%)	78(70.9%)	0.213NS
	Muslim	23(20.91%)	32(29.09%)	
Birth order	1	45(40.91%)	43(39.09%)	0.8NS
	2	38(34.55%)	46(41.82%)	0.33NS
	3	15(13.64%)	14(12.73%)	1.0NS
	>3	12(10.91%)	7(6.36%)	0.33NS

In each group, 63(57.3%) newborns were male and 47(42.73%) were female. Among LBW babies, 87(79%) were Hindu and 23(20.9%) were Muslims while in normal weight babies, 78 (70.9%)were Hindu and 32(29.0%) were Muslims. In LBW group, 45 (40.91%) were of 1st gravida, 38 (34.55%) were of 2nd gravida, 15(13.64%) were of third gravida and the rest 12(10.91%) were of more than third gravida. In normal birth weight group, 43 (39.09%) were of 1st gravida, 46 (41.82%) were of 2nd gravida, 14(12.73%) were of third gravida and the rest 7(6.36%) were of more than 3rd gravida.

Table-2: lipid levels of normal and low birth weight neonates

Lipid Level	GROUP A (B wt<2.5kg) (N = 100)		GROUP B(B wt≥2.5kg) (N = 100)		P value
	Mean (mg/dl)	SD	Mean (mg/dl)	SD	
TG	60.44	36.634	41.61	18.057	<0.001
TC	103.30	33.65	96.04	24.33	0.267
VLDL	12.72	8.958	8.27	3.593	<0.001
LDL	67.22	30.935	64.71	21.026	0.86
HDL	23.51	7.788	23.05	7.043	0.58

Mean baby TG level was more in LBW babies (60.08±36.604 mg/dl) as compared to normal birth weight group (41.61±18.057 mg/dl). This difference was statistically significant (P = <0.001).Mean baby TC level was more in LBW babies (103.66±33.592 mg/dl) as compared to normal birth weight babies (96.04±24.333 mg/dl) but this difference was statistically not significant (P = >0.05).Mean baby VLDL level was more in LBW babies (12.66±8.972 mg/dl) as compared to normal birth weight babies (8.27±3.593 mg/dl) this was statistically significant (P = <0.001).Mean LDL level was more in LBW babies (67.61±30.797mg/dl) as compared to normal birth weight babies (64.71±21.026 mg/dl) but this difference was statistically not significant (P <0.48).Mean HDL level was slightly more in LBW babies (23.54±7.817 mg/dl) as compared to normal birth weight babies (23.05±7.043 mg/dl). This difference also statistically not significant (P = <0.63).

DISCUSSION:

LBW is an important risk factor for cardiovascular disease, especially in low income countries, measurement of serum lipids in infancy and childhood could be predictive for lipoprotein disorders and cardiovascular disease in adulthood [14].

In our study, mean baby TG levelwas more in LBW babies (60.44±36.63mg/dl) as compared to normal birth weight babies (41.61±18.057 mg/dl) and difference was statistically significant**.** The similar results were obtained by Mehaboob BashaKalluri *et al* [16], Dr. Manita Duggal *et al* [15], Seyyed Mohammad Hassan Aletayeb *et al* [13] in their studies. In contrast to our study, Roya Kelishadi, et al reported that term neonates had higher TG compared to preterm neonates which was statistically significant. This could be due to the fact that they may have included neonates of varied gestational age i.e. near term and late preterm.In our study, the mean VLDL level was more in LBW babies(12.66±8.972 mg/dl) as compared to normal birth weight babies(8.27±3.593 mg/dl) and the difference was statistically significant. Mehaboob Basha Kalluri *et al* [14], Ryuta Yonezawal *et al* [16], Rakhi Jain *et al* [17], M. Diaz *et al* [18] also reported the same results. Similarly Dr. Manita Duggal *et al* [15], Pushpendra Magon *et al* [19], Seyyed Mohammad Hassan Aletayeb *et al* [13] had also reported that preterms had higher values of VLDL in comparison to term babies which was statistically significant.

In our study, mean baby TC level was more in LBW babies (103.66±33.592 mg/dl) as compared to normal birth weight babies (96.04±24.333 mg/dl). This difference was statistically not significant. Similarly Pushpendra Magon *et al* [19] also concluded that mean serum TC was higher in LBW than in normal birth weight but the difference was not significant. Seyyed Mohammad Hassan Aletayeb *et al* [13], SirleiDonegá *et al* [20], Sreekarthik KP *et a*l [21], concluded that mean serum lipid levels TC was significantly higher in LBW than in normal birth weight. This could be due to different method of sample selection, sample size and period of gestation.

In our study, the mean LDL level was more in LBW babies(67.61±30.797mg/dl) as compared to normal birth weight babies(64.71±21.026 mg/dl).. This difference was statistically not significant.Similar results also reported in studies conducted by Sreekarthik KP *et al* [21], Pushpendra Magon *et al* [19], Mehaboob Basha Kalluri *et al* [14], Ryuta Yonezawal *et al* [16], Rakhi Jain *et al* [17], Dr. Manita Duggal *et al* [15] reported that preterm neonates had higher LDL compared to term neonates which was statistically significant. This could be due to different socio-demographic profile.

In our study, the mean HDL level was slightly more in LBW babies (23.54±7.817 mg/dl) as compared to normal birth weight babies (23.05±7.043 mg/dl). This difference was statistically not significant. Similarly, Sreekarthik KP *et al* [21], Seyyed Mohammad Hassan Aletayeb, *et al* [13], Pushpendra Magon *et al* [19], Ryuta Yonezawal *et al* [16] also found that the serum concentrations of HDL cholesterol were higher in preterm than in term newborns but this difference was statistically not significant. Hence to conclude, Levels of all lipids were found to be higher in LBW babies than normal birth weight babies and this difference was statisticaly significant for TG and VLDL. Earlier workers hypothesized that there may be possible link between fetal and adult lipid profile. Further studies on large number of cases and follow up upto adult life is required to verify our results and to evaluate the impact of high lipids in LBW babies on adult lipid profile and risk of CVD in later life. Our study had certain limitations, number of cases studied was small and follow up was not done to see the changes in lipid levels with age.

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