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Study of Cord Blood Lipid Levels and Its Correlation with Newborn's Birth Weight and Gestational Age

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Abstract

Background and objectives: The genesis of atherosclerotic lesions which is a major cardiovascular risk factor starts in the early life. If the premature development of cardiovascular risk factors can be anticipated during childhood, cardiovascular events can be prevented effectively by taking appropriate measures. The aim of the present study was to know cord blood lipid levels and its correlation with newborn's birth weight and gestational age.

Methods: Present study was conducted in the department of paediatrics, Sanjay Gandhi Memorial Hospital, Mangolpuri, Delhi, from December 2019 to June 2020. In this observational cross sectional study, 105 newborn babies whose gestational age was between 28 to <42 weeks were included with due consideration of inclusion and exclusion criteria as per study protocol.

Results: Cord blood lipid levels were significantly high (P <0.05) in low birth weight babies.

Cord blood lipid levels were high (p<0.05) in preterm except high density lipoprotein

Cord blood levels were significantly high (P <0.05) in small for gestational age babies.

There was no association of lipid profile with gender (p>0.05).

Conclusions: Lipid levels were significantly high in low birth weight babies, preterm babies and small for gestational age babies. Hence, low birth weight babies, small for gestational age babies and preterm babies should be closely monitored for lipid related disorders and co-morbidities.

Keywords: Cord blood lipid levels, Low birth weight, Small for gestational age, Preterm, Atherosclerosis, Newborn

Introduction

Cardiovascular diseases comprising coronary heart diseases and cerebrovascular diseases are the single leading cause of morbidity and mortality globally [1]. An estimated approximately 17.9 million people died from cardio vascular diseases in 2016, representing 31% of all global deaths. Out of this 85% were attributed to heart attack and stroke [2]. The estimated prevalence of cardiovascular diseases ranges from 6-10 % among the Indian population. Further, cardiovascular diseases account for about 52 percent of mortality among Indian individuals <70 years of age [3]. The incidence of cardiovascular disease depends on the variety of genetic and life risk factors

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such as hyperlipidaemia, hypertension, smoking, obesity, and inadequate physical activity. All of these cause cardio vascular diseases by developing atherosclerosis [4]. Hyperlipidaemia is an important risk factor for the development of cardiovascular disease, process of which begins early in life and gradually progresses silently throughout the following decades [5].

An English physician and epidemiologist David James Purslove Barker of the University of Southampton formulated a hypothesis named Barker Hypothesis in 1980. According to this, foetal and early infant conditions have a permanent conditioning effect on the body's metabolism and chronic medical conditions in later life [6, 7].

Barker et al have postulated that impaired foetal growth may predispose the surviving infants with low birth weight to heart diseases in adult life [8,9,10]. He analysed data from Hertfordshire, related to birth weight of all new-borns from 1911 and their development through the infancy period and noted that over a period of 60 years, the people whose birth weight was higher at birth had lower mortality rate from cardiovascular diseases. This was in synchronization with foetal origin hypothesis and reflects the phenomenon in which adverse environment, e.g. under nutrition during foetal development leads to impaired intrauterine growth results in alteration of physiology and metabolism of foetus leading to coronary artery disease (CAD) in adult life [11].

Studies in humans have shown that men and women with low birth weight are at increased risk of coronary heart diseases. It is known that preterm neonates have lost the chance to complete their energy deposits in the later part of pregnancy. Thus, many times these growth-restricted neonates need to use endogenous reserves, thereby activating lipid metabolism that generates energy and promotes gluconeogenesis. Long term consequences of these metabolic adaptations lead to an increase prevalence of Cardio vascular diseases, Hypertension and type 2 Diabetes mellitus with contribution from several other maternal factors such as Obesity, Hypertension and Diabetes mellitus [12].

As per the literature, atherosclerosis is a gradual process that starts early in life to reach adult level. Therefore, it might be beneficial to measure cord blood lipid profile at birth [13].

Deranged lipid profile in newborn may persist into adult life, So young age can be viewed as an opportunity to begin preventable interventions. Hence this study was conducted to correlate umbilical cord blood lipid profile with birth weight and gestational age.

Methods and Materials

This observational cross sectional study was conducted in the Department of Paediatrics, Sanjay Gandhi Memorial Hospital, Mangolpuri, Delhi-110083 between December 2019 to June 2020. A total of 105 newborn babies were included in the study. Consent was taken from the newborn's parents, followed by detailed clinical history and physical examination.

For sample size the study of Nermin Ramy et al which has observed a correlation between birth weight and total cholesterol, triglyceride, high density lipoprotein and low density lipoprotein were -0.398, 0.782, 0.347 and -0.824 respectively. Taking this value as reference, the minimum required sample size with 95% power of study and 5% level of significance was 103 patients so sample size taken was 105.

Inclusion criteria

In present study newborn with 28 weeks to <42 weeks of gestation by normal vaginal delivery or caesarean section were included.

Exclusion

- Twin or multiple births
- Congenital anomaly and syndromes
- Instrumental delivery
- Apgar score <7 at 5 minutes
- Mother with Tuberculosis, Asthma, Thyroid, Diabetes, Hypertension, Preeclampsia, Eclampsia, Gestational diabetes mellitus, Cushing disease, Chronic pancreatitis or any other chronic disease
- Family history of Coronary artery disease and Hypercholesterolemia
- Any regular maternal medication except iron and vitamin supplements.
- Mother has taken Glucocorticoid injection for fetal lung maturation

Method of the Study

Newborn who fulfilled the inclusion criteria were enrolled in this study. 5 ml of cord blood was collected from the umbilical cord immediately after the delivery in a plain yellow topped vacutainer. Cord blood was immediately sent to lab where the samples were centrifuged at 2000 revolution per minute for 10 minutes and then serum was separated and stored at -20°C until analysis. After the delivery, the newborn was examined thoroughly and weight was recorded on electronic weighing scale. Gestational age was calculated from the first day of the last menstrual period and confirmed by clinical assessment using modified New Ballard's score and on the basis of gestational age newborns were classified as term and preterm.

TERM NEONATES - Neonates born in between 37 to <42 weeks of gestation.

PRETERM NEONATES- Neonates born before 37 completed weeks of gestation.

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NORMAL BIRTH WEIGHT NEONATES - Neonates with birth weight between ≥2.5 kg and <4 kg

LOW BIRTH WEIGHT NEONATES - Neonate with birth weight less than 2.5 kg.

APPROPRIATE FOR GESTATIONAL AGE - Neonates with birth weight between 10th percentile and 90th percentile for gestational age.

SMALL FOR GESTATIONAL AGE - Neonates with birth weight less than 10th percentile for gestational age.

Lipid profile was analyzed by using fully automated biochemistry analyzer (Mindray Benesphera BS380). It works on colorimetric (Watson) method.

Statistical Analysis

The categorical variable was presented in number and percentage and the continuous variable was presented as mean ±SD and median. The normality of data was tested by the Kolmogorov-Smirnov test. If the normality was rejected then the nonparametric test was used.

The statistical test were applied as follows-

1. Quantitative variables were compared using ANOVA/ KRUSKAL WALLIS test (when the data sets were not normally distributed) between more than two groups. For two groups, unpaired t-test/Mann-Whitney test were used.
2. The qualitative variables were correlated using the chi-square test/Fischer exact test.
3. Pearson correlation coefficient/spearman rank correlation coefficient (for nonparametric data) was used to correlate quantitative variables with each other.

A p-value of <0.05 was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using statistical package for social sciences (SPSS) version 21.0.

Results and Observations

Present study was having 54 male and 51 female. Normal birth weight babies were 71 and low birth weight babies were 34. 13 babies were preterm and 92 babies were term. 20 Babies were SGA (small for gestation age) and 85 babies were AGA (appropriate for gestational age).

Mean value of total cholesterol (mg/dL), triglyceride (mg/dL), low density lipoprotein(mg/dL), very low density lipoprotein(mg/dL) and high density lipoprotein(mg/dL) of study subjects was 70.17 ± 26.23, 59.47 ± 35.62, 36.15 ± 17.83, 13.78 ± 10.88 and 20.6 ± 7.9 with median(IQR) of 63 (52-82), 50 (35-76), 30 (25-44), 12 (8-16) and 20 (15-25) respectively.

The variable total cholesterol (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. Significant association was seen between total cholesterol (mg/dL) and low birth weight (p value < 0.05). Median (IQR) of total cholesterol (mg/dL) in patients with low birth weight was 95(81.5-112) which was significantly higher as compared to patients with normal birth weight (57(50.25-65)).

The variable triglyceride (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. Significant association was seen between triglyceride (mg/dL) and low birth weight (p value < 0.05). Median (IQR) of triglyceride (mg/dL) in patients with low birth weight was 91 (61.5-112.5) which was significantly higher as compared to patients with normal birth weight (40.5(31.25-55)).

The variable low-density lipoprotein (mg/dL) was not normally distributed. Thus, nonparametric test was used for the association. Significant association was seen between low density lipoprotein (mg/dL) and low birth weight (p value < 0.05). Median (IQR) of low density lipoprotein (mg/dL) in patients with low birth weight was 51 (41.5-62.5) which was significantly higher as compared to patients with normal birth weight (26(23-34)).

The variable very low-density lipoprotein (mg/dL) was also not normally distributed. Thus, non-parametric test was used for the association. Significant association was seen between very low-density lipoprotein (mg/dL) and low birth weight (p value < 0.05). Median (IQR) of very low-density lipoprotein (mg/dL) in patients with low birth weight was 19 (11.5-27) which was significantly higher as compared to patients with normal birth weight (10.5(7-13.75)).

The variable high-density lipoprotein (mg/dL) was normally distributed. Thus, parametric test was used for the association. Significant association was seen between high density lipoprotein (mg/dL) and low birth weight (p value

Table 1: Descriptive statistics of cord blood lipid profile of study subjects.

Cord blood lipid profile	Mean ± SD	Median(IQR)	Range
Total cholesterol (mg/dL)	70.17 ± 26.23	63(52-82)	34-199
Triglyceride (mg/dL)	59.47 ± 35.62	50(35-76)	20-239
Low density lipoprotein (mg/dL)	36.15 ± 17.83	30(25-44)	12-99
Very low-density lipoprotein(mg/dL)	13.78 ± 10.88	12(8-16)	4-98
High density lipoprotein(mg/dL)	20.6 ± 7.9	20(15-25)	7-51

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Table 2: Association of cord blood lipid profile with birth weight.

Cord blood lipid profile	Normal Birth weight (n=74)	LBW (n=31)	Total	P value	Test performed
Total cholesterol (mg/dL)					
Mean ± SD	58.62 ± 13.11	97.74 ± 29.2	70.17 ± 26.23		Mann Whitney test; 182
Median(IQR)	57(50.25-65)	95(81.5-112)	63(52-82)	<.0001	
Range	34-98	40-199	34-199		
Triglyceride(mg/dL)					
Mean ± SD	44.86 ± 19.14	94.32 ± 41.55	59.47 ± 35.62		Mann Whitney test; 241.5
Median(IQR)	40.5(31.25-55)	91(61.5-12.5)	50(35-76)	<.0001	
Range	20-122	35-239	20-239		
Low density lipoprotein(mg/dL)					
Mean ± SD	28.46 ± 8.76	54.52 ± 20.51	36.15 ± 17.83		Mann Whitney test; 220.5
Median(IQR)	26(23-34)	51(41.5-62.5)	30(25-44)	<.0001	
Range	12-54	17-99	12-99		
Very low-density lipoprotein(mg/dL)					
Mean ± SD	10.53 ± 4.33	21.55 ± 16.62	13.78 ± 10.88		Mann Whitney test; 477.5
Median(IQR)	10.5(7-13.75)	19(11.5-27)	12(8-16)	<.0001	
Range	4-24	7-98	4-98		
High density lipoprotein(mg/dL)					
Mean ± SD	19.38 ± 6.41	23.52 ± 10.2	20.6 ± 7.9		t test; 2.092
Median(IQR)	19(15-24.75)	22(17-28.5)	20(15-25)	0.042	
Range	7-34	8-51	7-51		

Table 3: Association of cord blood lipid profile with gestational age.

Cord blood lipid profile	Preterm (n=13)	Term (n=92)	Total	P value	Test performed
Total cholesterol (mg/dL)					
Mean ± SD	101.15 ±18.43	65.79 ± 24.19	70.17 ± 26.23		Mann Whitney test; 112.5
Median(IQR)	98(88-118)	60(51.75-74.5)	63(52-82)	<.0001	
Range	72-136	34-199	34-199		
Triglyceride(mg/dL)					
Mean ± SD	99.62 ± 30.43	53.79 ± 32.64	59.47 ± 35.62		Mann Whitney test; 135
Median(IQR)	94(84-121)	42.5(33.75-61.25)	50(35-76)	<.0001	
Range	57-151	20-239	20-239		
Low density lipoprotein(mg/dL)					
Mean ± SD	58.85 ± 16.84	32.95 ± 15.55	36.15 ± 17.83		Mann Whitney test; 108.5
Median(IQR)	54(51-61)	29(24-38)	30(25-44)	<.0001	
Range	36-92	12-99	12-99		
Very low-density lipoprotein(mg/dL)					
Mean ± SD	22.77 ± 9.32	12.51 ± 10.52	13.78 ± 10.88		Mann Whitney test; 196.5
Median(IQR)	25(13-30)	11(8-14)	12(8-16)	0.0001	
Range	9-37	4-98	4-98		
High density lipoprotein(mg/dL)					
Mean ± SD	20.23 ± 7.68	20.65 ± 7.97	20.6 ± 7.9		t test;0.179
Median(IQR)	20(14-24)	20(15-25)	20(15-25)	0.858	
Range	10-35	7-51	7-51		

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Table 4: Association of cord blood lipid profile with SGA/AGA.

Cord blood lipid profile	AGA (n=85)	SGA (n=20)	Total	P value	Test performed
Total cholesterol (mg/dL)					
Mean ± SD	63.09 ± 18.58	100.25 ± 32.62	70.17 ± 26.23		Mann Whitney test;206
Median(IQR)	58(51-73)	96(76.75-109)	63(52-82)	<.0001	
Range	34-121	60-199	34-199		
Triglyceride(mg/dL)					
Mean ± SD	51.19 ± 25.57	94.65 ± 49.46	59.47 ± 35.62		Mann Whitney test;352
Median(IQR)	42(33-62)	96(56.75-115)	50(35-76)	<.0001	
Range	20-151	24-239	20-239		
Low density lipoprotein(mg/dL)					
Mean ± SD	31.54 ± 13.16	55.75 ± 21.8	36.15 ± 17.83		Mann Whitney test;231
Median(IQR)	27(24-38)	49.5(40.5-66.75)	30(25-44)	<.0001	
Range	12-89	28-99	12-99		
Very low-density lipoprotein(mg/dL)					
Mean ± SD	11.64 ± 5.86	22.9 ± 19.7	13.78 ± 10.88		Mann Whitney test;445
Median(IQR)	11(8-14)	22(11-26.5)	12(8-16)	0.0009	
Range	4-37	5-98	4-98		
High density lipoprotein(mg/dL)					
Mean ± SD	19.84 ± 7.07	23.85 ± 10.34	20.6 ± 7.9		t test;2.077
Median(IQR)	20(14-25)	22.5(18-28)	20(15-25)	0.04	
Range	7-41	8-51	7-51		

Table 5: Association of cord blood lipid profile with gender.

Cord blood lipid profile	Female (n=51)	Male (n=54)	Total	P value	Test performed
Total cholesterol (mg/dL)					
Mean ± SD	68.69 ± 22.76	71.57 ± 29.28	70.17 ± 26.23		Mann Whitney test;1338.5
Median(IQR)	60(53-81.5)	66.5(51.2582)	63(52-82)	0.804	
Range	40-136	34-199	34-199		
Triglyceride(mg/dL)					
Mean ± SD	56.53 ± 29.62	62.24 ± 40.57	59.47 ± 35.62		Mann Whitney test;1332.5
Median(IQR)	50(37-74.5)	50(34.25-77.5)	50(35-76)	0.775	
Range	20-151	24-239	20-239		
Low density lipoprotein(mg/dL)					
Mean ± SD	34.88 ±15.85	37.35 ± 19.59	36.15 ± 17.83		Mann Whitney test;1323
Median(IQR)	30(25-43.5)	31.5(25-43.5)	30(25-44)	0.729	
Range	12-92	14-99	12-99		
Very low-density lipoprotein(mg/dL)					
Mean ± SD	13.12 ±6.67	14.41 ± 13.76	13.78 ± 10.88		Mann Whitney test;1305
Median(IQR)	12(8-16)	11(7.25-15.75)	12(8-16)	0.643	
Range	4-30	5-98	4-98		
High density lipoprotein(mg/dL)					
Mean ± SD	20.47 ± 7.73	20.72 ± 8.13	20.6 ± 7.9		t test;0.162
Median(IQR)	20(15.5-25)	20(15-25.75)	20(15-25)	0.871	
Range	8-44	7-51	7-51		

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Table 6: Correlation of cord blood lipid profile with birth weight and gestational age. (Spearman rank correlation coefficient).

Variables	Total cholesterol (mg/dL)	Triglyceride (m g/dL)	Low density lipoprotein(m g/dL)	Very lowdensity lipoprotein(m g/dL)	High density lipoprotein(m g/dL)
Birth weight (kg)					
Correlation coefficient	**-0.554**	**-0.547**	**-0.529**	**-0.365**	-0.156
P value	**<0.0001**	**<0.0001**	**<0.0001**	**0.0001**	0.112
Gestational age(wks.)					
Correlation coefficient	**-0.452**	**-0.268**	**-0.460**	**-0.198**	-0.104
P value	**<0.0001**	**0.006**	**<0.0001**	**0.043**	0.292

Table 7: Various studies and their conclusions.

Study	Year of Study	Conclusion
Kelishadi et al [14]	2007 (Published)	Total cholesterol and high-density lipoprotein were higher in female new born compared to male new born
Seyyed Mohammad Hasan Aletayeb et al [15]	2009-10	• No significant association of cord blood lipid with gender. • Total cholesterol, triglyceride, low density lipoprotein and very low-density lipoprotein were significantly higher in low birth weight babies but no association between high density lipoprotein and birth weight
Kenchappay et al [16]	2011-2013	• No significant association with gender and lipid profile. • All lipid values were higher in low birth weight babies among total cholesterol, triglyceride and low-density lipoprotein were significantly higher • All lipid values were higher in preterm babies among which high density lipoprotein and very low-density lipoprotein were non significantly higher. • All lipid values were significantly higher in small for gestational age babies
Tejashree katragandda et al [17]	2012-2014	Triglyceride level were significantly higher in small for gestational age babies but there was no association between other lipid values and small for gestational age
Limi loreto lobo et al [18]	2013	Triglyceride, total cholesterol and low-density lipoprotein were significantly higher in small for gestational age babies
Pushpendra et al [19]	2015-16	• Triglyceride and very low-density lipoprotein were significantly higher in low birth weight babies. • Total cholesterol, very low-density lipoprotein and low-density lipoprotein were significantly higher in preterm babies.
Nermin Ramy et al [20]	2017 (published)	Triglyceride, total cholesterol, very low-density lipoprotein were on significantly higher side in small for gestational age babies in contrast to high density lipoprotein which was on lower side in small for gestational age babies.
Yashodha H T et al [21]	2016-17	• No significant association between lipid profile and gender. • Lipid values were significantly higher in preterm except high density lipoprotein. • All lipid values were significantly higher in small for gestational age babies.
Present study	2019-2020	• There was no association between lipid values and gender. • All lipid values were significantly higher in low birth weight babies. • All lipid values were significantly higher in preterm babies except high density lipoprotein. • All lipid values were significantly higher in small for gestational age babies.

< 0.05). Mean ± SD of high-density lipoprotein (mg/dL) in patients with low birth weight was 23.52 ± 10.2 which was significantly higher as compared to patients with normal birth weight (19.38 ± 6.41).

The variable total cholesterol (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. Significant association was seen between total cholesterol (mg/dL) and gestational age (p value < 0.05). Median (IQR) of total cholesterol (mg/dL) in preterm was 98(88-118) which was significantly higher as compared to term (60(51.75-74.5)).

The variable triglyceride (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. Significant association was seen between

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triglyceride (mg/dL) and gestational age (p value < 0.05). Median (IQR) of triglyceride (mg/dL) in preterm was 94(84-121) which was significantly higher as compared to term (42.5(33.75-61.25)).

The variable low-density lipoprotein (mg/dL) was not normally distributed. Thus, nonparametric test was used for the association. Significant association was seen between low density lipoprotein (mg/dL) and gestational age (p value < 0.05). Median (IQR) of low-density lipoprotein(mg/dL) in preterm was 54(51-61) which was significantly higher as compared to term (29(24-38)).

The variable very low-density lipoprotein (mg/dL) was not normally distributed. Thus, nonparametric test was used for the association. Significant association was seen between very low-density lipoprotein (mg/dL) and gestational age (p value < 0.05). Median (IQR) of very low-density lipoprotein (mg/dL) in preterm was 25(13-30) which was significantly higher as compared to term (11(8-14)).

The variable high-density lipoprotein (mg/dL) was normally distributed. Thus, parametric test was used for the association. No significant association was seen between high density lipoprotein (mg/dL) and gestational age (p value > 0.05). Mean ± SD of high-density lipoprotein (mg/dL) in preterm was 20.23 ± 7.68 and term was 20.65 ± 7.97 with no significant association between them.

The variable total cholesterol (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. Significant association was seen between total cholesterol (mg/dL) and SGA (p value < 0.05). Median (IQR) of total cholesterol (mg/dL) in SGA was 96(76.75-109) which was significantly higher as compared to AGA (58(51-73)).

The variable triglyceride (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. Significant association was seen between triglyceride (mg/dL) and SGA (p value < 0.05). Median (IQR) of triglyceride (mg/dL) in SGA was 96(56.75-115) which was significantly higher as compared to AGA (42(33-62)).

The variable low-density lipoprotein (mg/dL) was not normally distributed. Thus, nonparametric test was used for the association. Significant association was seen between low density lipoprotein (mg/dL) and SGA (p value < 0.05). Median (IQR) of low-density lipoprotein (mg/dL) in SGA was 49.5(40.5-66.75) which was significantly higher as compared to AGA (27(24-38)).

The variable very low-density lipoprotein (mg/dL) was not normally distributed. Thus, nonparametric test was used for the association. Significant association was seen between very low-density lipoprotein (mg/dL) and SGA (p value < 0.05). Median (IQR) of very low-density lipoprotein (mg/dL) in SGA was 22(11-26.5) which was significantly higher as compared to AGA (11(8-14)).

The variable high-density lipoprotein (mg/dL) was normally distributed. Thus, parametric test was used for the association. Significant association was seen between high density lipoprotein (mg/dL) and SGA (p value < 0.05). Mean ± SD of high-density lipoprotein(mg/dL) in SGA was 23.85 ± 10.34 which was significantly higher as compared to AGA (19.84 ± 7.07).

The variable total cholesterol (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. No significant association was seen between total cholesterol (mg/dL) and gender (p value > 0.05). Median (IQR) of total cholesterol (mg/dL) in female was 60(53-81.5) and male was 66.5(51.25-82) with no significant association between them.

The variable triglyceride (mg/dL) was not normally distributed. Thus, non-parametric test was used for the association. No significant association was seen between triglyceride (mg/dL) and gender (p value > 0.05). Median (IQR) of triglyceride (mg/dL) in female was 50(37-74.5) and male was 50(34.25-77.5) with no significant association between them.

The variable low-density lipoprotein (mg/dL) was not normally distributed. Thus, nonparametric test was used for the association. No significant association was seen between low density lipoprotein (mg/dL) and gender (p value > 0.05). Median (IQR) of low-density lipoprotein (mg/dL) in female was 30(25-43.5) and male was 31.5(25-43.5) with no significant association between them.

The variable very low-density lipoprotein (mg/dL) was not normally distributed. Thus, nonparametric test was used for the association. No significant association was seen between very low-density lipoprotein (mg/dL) and gender (p value > 0.05). Median (IQR) of very lowdensity lipoprotein (mg/dL) in female was 12(8-16) and male was 11(7.25-15.75) with no significant association between them.

The variable high-density lipoprotein (mg/dL) was normally distributed. Thus, parametric test was used for the association. No significant association was seen between high density lipoprotein (mg/dL) and gender (p value > 0.05). Mean ± SD of high-density lipoprotein (mg/dL) in female was 20.47 ± 7.73 and male was 20.72 ± 8.13 with no significant association between them.

Significant negative correlation was seen between birth weight (kg) and very low-density lipoprotein (mg/dL), total cholesterol (mg/dL), triglyceride (mg/dL), low density lipoprotein(mg/dL) with correlation coefficient of -0.365, -0.554, -0.547, -0.529 respectively. Non-significant mild negative correlation was seen between birth weight (kg) and highdensity lipoprotein (mg/dL) with correlation coefficient of -0.156.

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Significant negative correlation was seen between gestational age (wks.) and triglyceride (mg/dL), very low-density lipoprotein (mg/dL), total cholesterol (mg/dL), low density lipoprotein (mg/dL) with correlation coefficient of -0.268, -0.198, -0.452, -0.46 respectively. No correlation was seen between gestational age (wks.) with high density lipoprotein (mg/dL) and correlation coefficient of -0.1.

Discussion

Intrapartum changes and their effect on the cord blood lipid levels and progress of dyslipidemic changes of neonate in to adult life leading to cardiovascular diseases have been a prominent topic of interest since the acceptance of barker's foetal origin hypothesis.

It is observed that lipid profile values in the newborn are much different from adults. All the values are lower than the adult lipid profile values. In newborn, liver cells and its enzyme are not well developed for lipid metabolism and so can contribute to lower values in lipid profile. So, it is possible that lipid profile values of preterm and low birth weight may similar or lower than term and normal birth weight babies. However, our results have shown higher lipid profile in preterm and low birth weight.

In present study cord blood lipid levels in low birth weight, preterm and small for gestational age babies were elevated.

Conclusion

- Birth weight- Lipid levels were significantly high in low birth weight babies.
- Gestational age- Lipid levels were significantly high in preterm babies except high density lipoprotein.
- Small for gestational age – Lipid levels were significantly high in small for gestational age babies.
- Gender- There was no association between cord blood lipid levels and gender.

Hence, low birth weight babies, small for gestational age babies and preterm babies should be closely monitored for lipid related disorders and co-morbidities.

Limitations

The current study has some limitations

1. The various factors affecting neonatal birth weight like maternal nutrition, pre pregnancy weight, and weight gain during pregnancy were not considered in this study.
2. The Present study was cross sectional study with small sample size.
3. Another major limitation of our study was its inability to determine the cut-off lipid levels for cardiovascular risk stratification.

Strength

1. Babies with acute perinatal stress events or whose mother were having chronic maternal disease were excluded from study.
2. Sanjay Gandhi Memorial Hospital is a tertiary care centre where approximately 1000 babies deliver every month. This study is first of its kind study which conducted in this institute where cord blood lipid profile has been compared with birth weight and gestational age.

Recommendations

1. Preterm, low birth weight babies and small for gestational age babies are exposed to a more hypercholesterolemic and potentially more atherogenic environment. So early life style modifications may be required to prevent their progression to coronary artery disease.
2. Future longitudinal study with long term follows up need to be done to verify the clinical implications.
3. Further studies are required to determine cut off values of lipid in neonates for categorization into higher, lower and no risk level for developing cardiovascular disease.
4. Various maternal factors and their correlation with lipid profile need to be assessed.
5. Multicentric studies with larger sample size need to be done to revalidate our findings.

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References

1. Diet, nutrition and prevention of chronic diseases. Geneva: World Health Organization/FAO; (2002).
2. WHO facts sheet- Cardiovascular diseases; 17 May (2017).
3. Nag T, Ghosh A. Cardiovascular disease risk factors in Asian Indian population: A systematic review. Journal of cardiovascular disease research 1 (2013): 222-228
4. Santos MG, Pegoraro M, Sandrini F, Macuco EC. Risk factors for the development of atherosclerosis in childhood and adolescence. Arq Bras Cardiol 90 (2008): 276-283.
5. Hong YM. Atherosclerotic cardiovascular disease beginning in childhood. Korean circulation journal 40 (2010): 1-9.
6. Cooper C. David Barker (1938-2013). Nature 502 (2013): 304.

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DOI:10.26502/jppch.74050132

7. Pincock S. David Barker. The Lancet 382 (2013): 1170.

8. Stein CE, Fall CH, Kumaran K, Osmond C, Barker DJ, Cox V. Fetal growth and coronary heart disease in south India. The Lancet. 348 (1996): 1269-73.

9. Law CM, Shiell AW. Is blood pressure inversely related to birth weight? The strength of evidence from a systematic review of the literature. Journal of hypertension 14 (1996): 935-4141.

10. Koupilova I, Leon DA. Birth weight and mortality from ischaemic heart disease and stroke in Swedish men aged 50-74 years. J Epidemiol Community Health 50 (1996): 592.

11. Barker DJ. Fetal and infant origins of adult disease. Monatsschrift Kinderheilkunde 149 (2001): S2-6.

12. Barker DJ, Hales CN, Fall CH, Osmond C, Phipps K, Clark PM. Type 2 (non-insulindependent) diabetes mellitus, hypertension and hyperlipidaemia (syndrome X): relation to reduced fetal growth. Diabetologia 36 (1993): 62-67.

13. Nayak CD, Agarwal V, Nayak DM. Correlation of cord blood lipid heterogeneity in neonates with their anthropometry at birth. Indian Journal of Clinical Biochemistry 28 (2013): 152-157.

14. 14.Kelishadi R, Badiee Z, Adeli K. Cord blood lipid profile and associated factors:baseline data of a birth cohort study. Paediatric and perinatal epidemiology 21 (2007): 518-524.

15. Seyyed Mohammad Hassan Aletayeb et al, Correlation between umbilical cord and blood lipid profile and neonatal birth weight. Elseviera paediatric polska. 2013;88:521-525

16. Kenchappa Y, Behera N. Assay of neonatal cord blood lipid levels and its correlation with neonatal gestational age, gender and birth weight: A single centre experience. Int J Contemp Pediatr 3 (2016): 718-724.

17. Katragadda T, Mahabala RS, Shetty s, Baliga S. Comparison of cord blood lipid profile in preterm small for gestational age and neonatal birth weight. J Med Sci Clin Res 5 (2017): 18709-18705.

18. Lobo LL, Kumar HU, Mishra T, Sundari T, Singh A, Kumar CV, Rao GK, Jahangir B, Misale V, Prashant P, Gajiwala NL. Small for gestational age vrsus appropriate foe gestational age: Comparison of cord blood lipid profile & insulin levels in term newborns (SAGA-ACT study). The Indian journal of Medical research 144 (2016): 151.

19. Magon p, Bharatwaj RS, Verma M, ChatwalJ. Cord blood lipid profile at birth at birth among normal Indian newborns and its relation to gestational maturity and birth weight. A cross sectional study . Indian J Res 7 (2013): 215-218.

20. Ramy N, Zakaria M, EL Kafoury M, Kamal M. Cord blood lipid profile in relation to anthropometric measures of newborns. Kasr Al Ainy Medical Journal 23 (2017): 54.

21. Yashodha HT, Anjum SK. Cord blood lipid profile in late preterm and term neonates. IJCP 4 (2018): 542-546.