Original Article

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Paediatrics Section

Comparison of Lipid Profile in the Cord Blood in the Hypertensive and Non hypertensive Mothers: A Case-control Study

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ABSTRACT

Introduction: Cord blood would be a feasible and simple method for detecting cholesterol level at birth. Neonatal lipids level could serve as a guide to know the physiological levels of lipids required for maintaining the normal bodily mechanisms.

Aim: To compare the cord blood lipid profile of 300 newborn babies born to hypertensive and normotensive mothers.

Materials and Methods: The case-control study was done in the Department of Paediatrics, GCS Medical College, Hospital and Research Centre, Ahmedabad, Gujarat, India, for the period of one year from Jan 2019 to Jan 2020. A total of 300 pregnant ladies were included in the study. They were divided in two groups: group A consisted of 150 newborns who were born to 150 hypertensive mothers and group B consisted of 150 newborns who were born to 150 non hypertensive mothers. Five millilitres of cord blood were collected from the placental end of the umbilical vein, and then the serum was separated by centrifugation. Data was collected and mean±SD were calculated. Chi-square test and Mann Whitney test were done for statistical analysis.

Results: When the cord blood was evaluated for the cholesterol, Triglyceride (TG) (p-value 0.001), High Density Lipoprotein (HDL) (p-value 0.001) and Low Density Lipoprotein (LDL) (p-value 0.001) level; it was found that in group A the levels were more in mean value as compared to the non hypertensive group, where the level was found to be lower than the mean value. The difference was found to be statistically significant.

Conclusion: Hypertensive status of mother could impact neonatal lipid profile; however, larger prospective studies are required to validate these results.

Keywords: Cholesterol, Neonatal lipid, Normotensive, Triglyceride

INTRODUCTION

Cardiovascular Disease (CVD) is the most common cause of disability and death in adults worldwide. Besides genetic tendency, an increased risk of CVD is associated with lifestyle and various medical conditions, such as hypercholesterolemia, hypertension, smoking, obesity, and inadequate physical activity [1]. All of these cause CVD by developing atherosclerosis. Hypercholesterolemia and hyperlipidemia are strongly associated with CVD as they promote atherosclerosis, a precursor to myocardial infarction, stroke, and peripheral vascular disease [2,3].

Lipid profile including Total Cholesterol (TC), HDL and TG serves as a screening tool for dyslipidemia and the risk of CVD. Using these values, LDL and TC/HDL ratio (TC/HDL) are calculated [4]. The function of cholesterol in surfactant has not been established; however, it is believed to facilitate spreading of dipalmitoylphosphatidylcholine at the air-liquid interface in the lung, lowering surface tension. Hass MA and Longmore WJ suggested that lung cholesterol metabolism might be subject to regulation by both LDL and HDL [5].

It is found that there is association between the lipid profile from the cord blood and the change in the metabolic functions of individuals. In pre-eclampsia, there is placental dysfunction, leading to maternal endothelial dysfunction. This maternal endothelial dysfunction contributes to the oxidative stress, dyslipidaemia and the inflammatory process in maternal circulation which is reflected in foetal circulation [6]. The simple method for detection of cholesterol, at the time of birth, is through the evaluation of cord blood. Neonatal lipids level could serve as a guide to know the physiological levels of lipids required for maintaining the normal bodily mechanisms [7]. In the study demonstrated by Almusawi J, there were significant differences between Infants of Diabetic Mother (IDM) and infants of healthy mothers regarding lipid profile and birth weight [8]. Kaur K et al., illustrated that cord blood of term newborns of

hypertensive mothers had statistically higher cord TC, TG and LDL while just cord TC being statistically elevated in preterm neonates of hypertensive mothers [9].

Hence, the aim of the present study was to compare the cord blood lipid profile of newborn babies born to hypertensive and normotensive mothers.

MATERIALS AND METHODS

The present case-control study was conducted in the Department of Paediatrics, GCS Medical College, Hospital and Research Centre, Ahmedabad, Gujarat, India, for the period of one year from Jan 2019 to Jan 2020. The Ethical Clearance certificate (Ref:GCS/IEC/65/2020) was obtained prior to commencement of the data collection. A total of around 1200 deliveries were done in study period in the department. Informed consent was given by study participants.

Inclusion criteria: Maternal age of 20-35 years, singleton pregnancies, naturally fertilised females; and those pregnant patients having complete medical records and a clear gestational age confirmed by the first trimester ultrasound were included in the study.

Exclusion criteria: Neonates born to mothers with the conditions like pre-existent medical illness/complications including diabetes mellitus, thyroid disorders, CVDs and Human Immunodeficiency Virus(HIV), family history of CVDs; particularly coronary artery disease, born via instrumental delivery (forceps or vacuum), were excluded from the study.

The study population was followed from recruitment at the first antenatal visit to 28 days postpartum to ensure neonatal survival. Blood pressure measurement, urine dipstick test, weight gain measurement, and other routine examinations were performed at each antenatal visit. Women with blood pressure of ≥140/90 mmHg, measured twice at least 6 hours apart, after 20 weeks of gestation were considered as the gestational hypertension group. Study population were divided into two groups: Group A consisted of 150 newborns who were born to 150 hypertensive mothers and Group B consisted of 150 newborns born to 150 non hypertensive mothers.

The cord blood (5 mL) was collected at the placental end of umbilical vein. For the analysis of lipid profile, the serum was separated through centrifugation. With the help of spectrophotometer (Siemens dimensional Rxl) the lipid profile was analysed. The analytical variables were: TGs, LDL, HDL, TC and very LDL. Evaluation of lipid profile in the cord blood was done in both groups.

The normal levels of the parameters evaluated were as follows [10]:

- Total cholesterol level: lower than 200 mg/dL,
- Triglyceride level: between 10 to 150 mg/dL,
- Low density lipoprotein: between 40 to 60 mg/dL
- High density lipoprotein: between 70 to 130 mg/dL respectively.

STATISTICAL ANALYSIS

Data were analysed with SPSS 13.0 for Windows (SPSS Inc., Chicago, IL, USA). Results were expressed as mean (SD). The Chi-square and Mann-Whitney tests were used to make statistical comparisons. A p-value <0.05 was considered statistically significant.

RESULTS

Higher level of TC was found more in hypertensive mothers (Group A) as compared to non hypertensive mothers (Group B). The difference was found to be statistically significant with p-value ≤0.05 [Table/Fig-1].

Total cholesterol level (mg/dL)	Group A (Hypertensive mothers) (n)	Group B (Non hypertensive mothers) (n)	Total (n)	p-value
<200	9	66	75	0.04*
200-239	12	60	72	
>240	129	24	153	
Total	150	150	300	

[Table/Fig-1]: Total Cholesterol (TC) level in maternal serum in both the groups.
*indicates statistically significance at p≤0.05, test applied Chi-square test

TG levels were deranged in hypertensive mothers belonging to group A as compared to non hypertensive mothers belonging to group B and the difference was found to be statistically highly significant (p-value ≤0.05) [Table/Fig-2].

Triglyceride level (mg/dL)	Group A (Hypertensive mothers) (n)	Group B (Non hypertensive mothers) (n)	Total (n)	p-value
<150	12	78	90	0.02*
150-199	48	63	111	
200-249	90	9	99	
Total	150	150	300	

[Table/Fig-2]: Triglyceride (TG) level in maternal serum in both the groups.
*indicates statistically significance at p≤0.05, test applied Chi-square test

The next serum LDL levels were compared in both the groups. It was observed that the serum LDL levels were higher in hypertensive mothers belonging to group A as compared to non hypertensive mothers belonging to group B and the difference was found to be statistically highly significant (p-value ≤0.05) [Table/Fig-3].

It was observed that the serum HDL levels were lower in hypertensive mothers belonging to group A as compared to non hypertensive mothers belonging to group B and the difference was found to be statistically highly significant factor (p-value ≤0.05) [Table/Fig-4].

Low density lipoprotein level (mg/dL)	Group A (Hypertensive mothers) (n)	Group B (Non hypertensive mothers) (n)	Total (n)	p-value
Less than 129	81	123	204	0.001*
130-159	12	6	18	
More than 160	57	21	78	
Total	150	150	300	

[Table/Fig-3]: Low Density Lipoprotein (LDL) level in maternal serum in both the groups.
*indicates statistically significance at p≤0.05, test applied Chi-square test

High density lipoprotein level (mg/dL)	Group A (Hypertensive mothers) (n)	Group B (Non hypertensive mothers) (n)	Total (n)	p-value
>60	27	9	36	0.02*
41-59	54	99	153	
<40	69	42	111	
Total	150	150	300	

[Table/Fig-4]: High Density Lipoprotein (HDL) in maternal serum level in both the groups.
*indicates statistically significance at p≤0.05, test applied Chi-square test

In group A, the TC level, TG level, HDL level and LDL level was more than the mean value. The cord level TC, TG level, HDL level and LDL level in the non hypertensive group was found to be lower than the mean value. The difference was found to be statistically significant [Table/Fig-5].

Lipid profile level (mg/dL)	Group A (Hypertensive mothers) (mean±SD)	Group B (Non hypertensive mothers) (mean±SD)	p-value
Total cholesterol	117.76±43.05	64.83±28.30	0.001*
Triglycerides	72.73±36.12	26.47±19.12	0.001*
HDL-C	32.21±19.21	27.32±11.15	0.115
LDL-C	40.23±18.12	22.84±18.31	0.001*

[Table/Fig-5]: Comparison of lipid profile in the cord level in both the groups.
*indicates statistically significance at p≤0.05, test applied Mann-whitney tests

DISCUSSION

During pregnancy, there is requirement of amino acids, lipids and glucose in the fetoplacental unit. The metabolism of a pregnant mother should adapt to ensure its adequate supply. For this, a physiological alteration occurs in the maternal blood. The lipid concentration thus increases [11]. After delivery, it is observed that high lipid level returns back to pre-pregnancy levels [12,13]. The increase in the lipid levels above the normal level leads to the negative health outcomes for the child and the mother. An European cohort study found a high risk of pregnancy-induced hypertension and pre-eclampsia, due to elevated TG concentrations [13].

In the present study, total sample of 300 neonates were recruited with the aim to compare the cord blood lipid profile of 300 newborn babies born to hypertensive and normotensive mothers.

In the present study, maternal lipid profile was compared in both the groups. Higher levels of serum TC, TG, LDL and HDL were observed in hypertensive mothers. Belo LS et al., concluded that higher TG and lower HDL in preeclampsia females compared to normal and concluded that atherogenic lipid profile is enhanced in preeclampsia [14]. Anuradha R and Durga T had done similar kind of study and found that TC, TG and LDL were increased in hypertensive mothers when compared to non hypertensive mothers [15].

Cord TC, TG and LDL were more than mean reference value while cord HDL was lower in hypertensive group. Comparing hypertensive group with reference 95th centile, the values of cord TC was higher in hypertensive group. Cord TC, TG, HDL and LDL were lower in normotensive group compared to reference values (mean and 95th centile) and hypertensive group.

Limitation(s)

Due to small sample size, the authors cannot generalise the findings of the present study.

CONCLUSION(S)

Neonatal lipid levels serve a guide to know the cord lipid levels required for maintaining bodily metabolism. The present study helps us in providing the target population at risk and serving as an indirect guide for lifestyle modifications and use of adult lipid lowering therapy in prevention of future coronary heart disease. It suggests that affected mothers and their children could be targeted for programs aimed at reducing severe clinical CVDs, by lifestyle or pharmacological interventions.

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