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Original Research Article

Comparison of the Neonatal Lipid Profile, Apolipoproteins, and Atherogenic Index in Cases of Vaginal Delivery versus Caesarean Section

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Abstract

Background: The preservation of tissue and numerous internal metabolisms require a significant amount of cholesterol in the human body. Evidence suggested that factors such placental insufficiency, delivery method, and circumstances impacting foetal growth may have an impact on the amount of lipoprotein in cord blood. The goal of the current study was to assess the gender differences in the cord blood lipid profile, apolipoproteins, and atherogenic index across different delivery methods.

Methodology: Cord blood samples from 319 normal vaginal deliveries and 321 caesarean section patients were used in the comparative analytical investigation. When the baby was delivered, the cord blood was taken. The lipid profile, apolipoproteins, and atherogenic index of the blood were evaluated.

Results: The data showed that neonates delivered vaginally normally had considerably decreased cord blood lipid values. In comparison to neonates delivered via caesarean section, the lipid profile, apolipoproteins, and atherogenic index were greater in neonates delivered via normal vaginal birth. Total cholesterol, TG, and HDL-C levels were greater in female NVD and Cesarean infants than male neonates when compared on a sex-by-sex basis. Male neonates had greater LDL levels.

Conclusion: As a result of the investigation, it was concluded that the concentrations of lipid parameters are strongly affected by the route of delivery. For such women, postpartum changes in lipid markers necessitate significant care.

Keywords: Cord blood, Normal Vaginal Delivery, Cesarean section, Atherogenic index

Introduction

A fetus's tissues and organs need develop with a large amount of cholesterol. After birth, the lipid transport system transforms from an adult one with relatively high LDL levels that

continue to climb with advancing age to one with low levels of VLDL and LDL. Cord blood contains all of the adult lipoproteins and apolipoproteins [1]. Elevated ApoB in adults has been associated to atherosclerosis in later life, and abnormal lipid profiles from infancy remain throughout adulthood [2]. According to study, metropolitan areas have greater rates of cardiovascular disease-related morbidity and death than rural ones, as well as atherosclerosis risk factors [3,4]. According to Jain S.'s (2015) study, lipid metabolism differs across tribal and non-tribal populations as well as male and female newborns due to genetic diversity [5]. High levels of total cholesterol, apolipoprotein B (ApoB), and low density lipoprotein (LDL-C) in young people have all been associated with cardiovascular disease [6]. based on information provided by Dirisamer *et al* [7], Children's LDL-C levels, ApoB/apoA-1 ratios, and ApoB levels are sensitive indicators of future coronary heart disease [8]. The ApoB/A-1 ratio, sometimes referred to as the atherogenic index, is a sensitive marker for tracking coronary artery disease and is discovered to be closely tracked throughout the first year of life [9]. The capacity to accurately assess the risk of CAD may be considerably improved by screening patients for ApoA-1 and ApoB levels [10]. As a result, the current study's objective is to analyse the lipid profile and apolioprotein parameters in the cord blood of male and female newborns to determine how the rural and urban environments affect them.

Evidence from past research by Bansal *et al* [11] and Parker CR [12] suggests that placental insufficiency, delivery method, and circumstances affecting foetal growth may all have an impact on cord blood lipoprotein levels. All well-characterized adult lipoproteins and apolipoproteins are present in cord blood sera.

The goal of the current study was to investigate the gender differences in the cord blood lipid profile, apolipoproteins, and atherogenic index in neonates born via caesarean section and normal vaginal delivery.

Methods

The Geetanjali Medical College and Hospital in Udaipur's Obstetrics and Gynecology Department carried out the current cross-sectional study.

640 healthy newborns who had healthy, normotensive pregnancies were enrolled in the study. They were sorted into two groups based on delivery method: normal vaginal delivery (319) and caesarean section (321) and then further divided into two groups based on the newborn's gender (male and females).

Norms of inclusion for mothers: A mother in good health who just takes calcium, folic acid, and iron supplements.

Exclusion criteria for mothers: Mothers who have a history of alcoholism, thyroid conditions, diabetes mellitus, renal diseases, hypercholesterolemia, smoking-induced hypertension, twins, liver conditions, TB and asthma, and pregnancy-induced hypertension are excluded from consideration.

Neonatal inclusion criteria: gestational age of 35 to 42 weeks. congenital abnormalities are not present.

Exclusion norm for neonates: Congenital abnormalities are a neonatal exclusion norm. Infants born to mothers who are unwell experience perinatal issues such hypoglycemia and pathological jaundice. invasive delivery, which includes extraction. newborns with sepsis and hypoxic ischemic encephalopathy.

Collection of Sample: After delivery and cord clamping, umbilical venous blood was removed from the maternal end. Apolipoproteins and the lipid profile (total cholesterol, HDL-C, LDL-C, triglycerides, and VLDL-C) of the serum were also examined (ApoB, ApoA-1).

Estimations: Roche used reagent to measure the levels of total cholesterol, HDL-C, and triglyceride [13]. The Friedewald formula was used to analyse the LDL- and VLDL-C values [14]. An immunoturbidimetric technique was used to assess apolipoprotein levels [15]. In addition, the assay was carried out using a fully automatic analyzer from Cobas.

Analytical statistics

Data ranges for each group have been defined using the mean and standard deviation. Using an unpaired t test, these data were compared and significance between neonates born via NVD and caesarean section as well as between male and female neonates was assessed. P-values under 0.05 were deemed significant, and values under 0.01 were deemed highly significant. Software called Graph Pad Prism version 6 was utilised for the analysis.

Results

Lipid profile, apolipoproteins and atherogenic index were higher in neonates delivered by normal vaginal delivery. The table 1 reveals lipid parameters levels in NVD and Cesarean delivered neonates. The cholesterol (71.41 ±16.23 mg/dL in NVD, 67.41 ±17.15 mg/dL in cesarean), triglyceride (55.13 ±23.11 mg/dL in NVD, 50.53 ±24.53 in cesarean) and lipoproteins HDL (30.45 ±11.12 mg/dL), LDL (29.93 ±15.67 mg/dL), ApoB (31.74 ± 7.45 mg/dL), ApoA-1 (52.80 ± 8.91mg/dL), ApoB/ApoA-1 (0.62 ± 0.22 mg/dL), were higher in normal vaginal delivered neonates than cesarean section. Sex wise comparison showed ApoB (30.85 ± 7.42 mg/dL NVD female neonates, 30.45 ± 8.53 mg/dL cesarean female neonates), ApoA-1 (53.30 ± 9.24mg/dL in NVD females, 52.98 ± 8.62mg/dL in female cesarean neonates), ApoB/ApoA-1 (0.60 ± 0.22mg/dL, NVD females, 0.60 ± 0.27 mg/dL cesarean female neonates).

If we see sex wise comparison then total cholesterol (72.33 ±15.56 67.51 mg/dL in NVD female neonates ±17.56 mg/dL female cesarean neonates), TG (56.47 ±23.06 mg/dL in NVD female neonates, 51.65 ±24.16 mg/dL female cesarean neonates) and HDL-C (female NVD 31.98 ±11.98 mg/dL and 28.18 ±9.88 mg/dL female cesarean neonates) were higher in females of NVD and Cesarean neonates than male neonates. LDL (30.89 ±16.16 mg/dL in male NVD, 27.78 ±14.82 mg/dL in male cesarean section neonates) was higher in male neonates compared to female neonates in both modes of delivery.

Table 1: Comparison of mean± SD levels of lipid profile, apolipoproteins and atherogenic index in cord blood of normal vaginal delivery and caesarean delivered male and female neonates.

Parameters	Normal vaginal delivery			Cesarean		
	Male (n=153)	Female (n=166)	Total (n=319)	Male (n=193	Female (n=128)	Total (n=321)
Total Cholesterol (mg/dL)	70.4 ± 16.91	72.33 ± 15.56	71.41 ± 16.23	67.41 ± 16.91	67.51 ± 17.56	67.4 ± 17.15
Triglyceride (mg/dL)	53.67± 23.16	56.47 ± 23.06	55.13 ± 23.11	48.92 ± 24.82	51.65 ± 24.16	50.53 ± 24.53
HDL-C (mg/dL)	28.78 ± 10.06	31.98 ± 11.98	30.45 ± 11.12	25.30 ± 10.44	28.18 ± 9.88	26.82 ± 10.22
LDL-C (mg/dL)	30.89 ± 16.16	29.05 ± 15.20	29.93 ± 15.67	27.78 ± 14.82	26.06 ± 15.28	26.48 ± 14.99
VLDL-C	10.73 ±	11.29 ±	11.02 ±	10.33 ±	9.78 ±	10.10 ±

(mg/dL)	4.63	4.61	4.62	4.96	4.83	4.90
ApoB (mg/dL)	32.77 ± 7.39	30.85 ± 7.42	31.74 ± 7.45	30.85 ± 6.75	30.45 ± 8.53	30.72 ± 7.31
ApoA-1 (mg/dL)	52.20± 8.54	53.30 ± 9.24	52.80 ± 8.91	52.71 ± 10.31	52.98 ± 8.62	52.79± 9.79
ApoB/ApoA-1	0.65 ± 0.22	0.60 ± 0.22	0.62 ± 0.22	0.61 ± 0.22	0.60 ± 0.27	0.61 ± 0.23

Discussion

The present study's findings demonstrated a substantial difference between neonates delivered vaginally normally and those delivered via caesarean section in terms of the levels of TC, TG, HDL-C, LDL-C, and VLDL-C, as well as ApoA-1 and ApoB in the umbilical cord. The findings of our investigation concur with those of Estabraq AR, [16], and Nobuyunki *et al* [17] Late pregnancy hyperlipidemia greatly raises the maternal foetal concentration gradient across the placenta because lipids are delivered to the foetus along this gradient via specialised placental lipid transporters. Transfer through the placenta is improved by an increase in the exchange surface area, an increase in concentration gradients, and a decrease in diffusing distance [9]. The idea that this is because of greater foetal stress may be boosted by factors like a normal vaginal delivery. enhanced hepatic production of triglycerides and mobilisation of fatty acids from fat reserves [10].

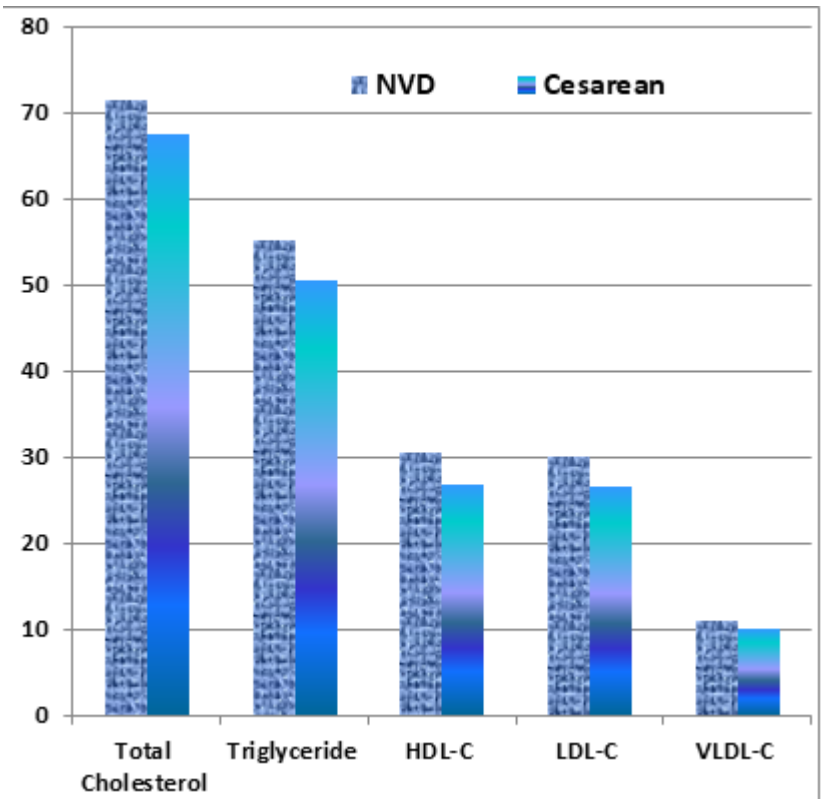

Figure 1(a): Comparison of mean± SD levels of lipid profile in cord blood of normal vaginal delivery and caesarean delivered male and female neonates.

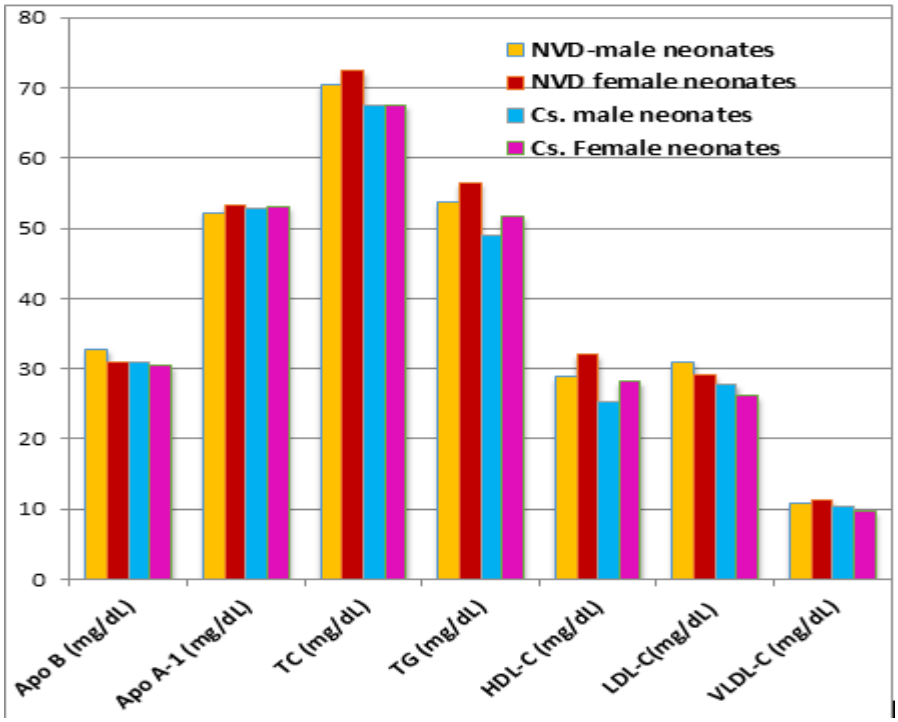

Figure 1 (b): Comparison of mean levels of lipid parameters in cord blood of normal vaginal delivery and caesarean delivered male and female neonates.

As a result, regular deliveries had greater lipid levels than caesarean sections, and this difference has been linked to higher lipid levels overall. The current study's findings are consistent with those of Ose *et al*. [18], who showed that higher foetal serum lipid levels are caused by more lipids being mobilised from fat reserves. Our findings conflict with research by Uberos Fernandez *et al*. [19], which showed that neonates delivered via caesarean section had considerably lower foetal blood triglyceride levels and similar levels of maternal and foetal serum free fatty acids. This can be as a result of surgical vaginal birth being performed alongside caesarean sections. The upkeep of tissue and other metabolic metabolisms in the human body necessitate a significant amount of cholesterol. Evidence from past research by Bansal *et al*. [11] and Parker CR. [12] suggests that circumstances affecting foetal growth, placental insufficiency, delivery method, and cord blood lipoprotein may all have an impact. To ensure that prenatal conditions did not affect the outcomes of our investigation, all cord blood samples were obtained from healthy, term deliveries that were otherwise normal and uncomplicated. All well-characterized adult lipoproteins and apolipoproteins are present in cord blood sera [20] According to our data, the lipid parameters in cord blood were much lower than maternal lipid profiles or the reference levels for adults and children. According to investigations by Pardo *et al*. [21], Jain R. [22], Schefer. [23], and Vaziri E. [24].

The enhanced absorption of LDL-C by the foetal adrenal gland for the generation of steroid hormones may be responsible for the drop in cholesterol that occurs at birth [12]. The human lipid transport system changes from one with low LDL levels at birth to one with relatively high LDL levels in adulthood, and this process gets worse as we get older. The current results are comparable to those of prior studies. When compared to maternal, adult, and baby values, the readings were noticeably low. There is growing proof that

apolipoproteins A-1 and B levels are more accurate indicators of CVD. Additionally, the ratio of ApoB/ApoA-1 in cord blood was determined.

Conclusion

The study's findings concluded that the mode of delivery, particularly a normal vaginal delivery, significantly influences the biochemical parameters of pregnant women after giving birth, particularly those that are related to lipid parameters. Such modifications necessitate the attention and postpartum care of women with NVD and their infants.

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