



## RESEARCH ARTICLE

## Lipoprotein Heterogeneity at Birth and its Relationship with Gestational Age, Gender, and Birth Weight

Ashutosh Kumar Mishra<sup>1</sup>, Navneet Kumar<sup>1</sup>, Puja Kumari<sup>1</sup>, Sujit Kumar<sup>2\*</sup>

### ABSTRACT

**Background:** Lipoprotein levels at birth are significant indications of early metabolic programming and may affect long-term cardiovascular health. These levels are recognized to fluctuate based on parameters including gestational age, birth weight, and, to a lesser degree, gender, illustrating the influence of intrauterine growth and development on newborn lipid metabolism.

**Objective:** Analyze lipoprotein heterogeneity in neonates and its correlation with gestational age, gender, and birth weight. **Methods:** A cross-sectional study was performed on neonates born at a tertiary care hospital. Cord blood samples were obtained immediately post-delivery and assessed for lipid profile markers, including low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides. Neonates were classified according to gestational age (preterm and term), birth weight (low birth weight and normal weight), and sex. Statistical analysis was conducted to identify significant differences among groups.

**Results:** Preterm and low birth weight neonates exhibited markedly elevated triglyceride levels and reduced HDL levels, indicating underdeveloped lipid metabolism and compromised cardioprotective ability. Conversely, term neonates demonstrated elevated LDL levels, signifying more advanced lipid transport systems. The disparities in lipid profiles depending on gender were negligible and not statistically significant.

**Conclusion:** At birth, lipoprotein levels exhibit considerable variation based on gestational age and birth weight, underscoring early metabolic disparities. These findings corroborate the notion of fetal programming and underscore the significance of early detection of at-risk neonates for subsequent metabolic and cardiovascular problems.

**Keywords:** Lipoprotein, metabolic disparities, cardiovascular problems, foetal programming

Indian J. Pharm. Biol. Res. (2026): <https://doi.org/10.30750/ijpbr.14.1.09>

### INTRODUCTION

Lipoproteins are crucial for lipid transport, encompassing cholesterol and triglycerides, within the bloodstream, and are vital to sustaining metabolic homeostasis. Recent research indicates that lipid metabolism initiates early in life, and changes in lipoprotein profiles at birth may have enduring consequences for cardiovascular health<sup>[1]</sup>. The notion of “fetal programming” posits that prenatal environmental influences might affect metabolic pathways, predisposing individuals to disorders such as dyslipidemia, obesity, and cardiovascular diseases in later life<sup>[2]</sup>

Lipoprotein levels in neonates are affected by various factors, such as gestational age, birth weight, maternal nutrition, and placental function. Preterm and low birth weight newborns frequently display modified lipid profiles owing to underdeveloped enzyme systems responsible for lipid metabolism<sup>[3]</sup>. Moreover, maternal conditions like diabetes, hypertension, and lipid profile can profoundly influence fetal lipid concentrations. Gender differences, however, are less evident at birth

<sup>1</sup>Senior Resident, Department of Pediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India

<sup>2</sup>Professor, Department of Pediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India

**Corresponding Author:** Sujit Kumar, Department of Pediatrics, Nalanda Medical College and Hospital, Patna, Bihar, India.

**How to cite this article:** Mishra, A.K., Kumar, N., Kumari, P., Kumar, S. Lipoprotein Heterogeneity at Birth and its Relationship with Gestational Age, Gender, and Birth Weight. Indian J. Pharm. Biol. Res. 2026;14(1):46-49.

**Source of support:** Nil

**Conflict of interest:** None.

**Received:** 25/01/2026 **Revised:** 10/02/2026 **Accepted:** 15/02/2026

**Published:** 31/03/2026

and may also influence disparities in lipid metabolism<sup>[4]</sup>. Comprehending the variability of lipoprotein profiles at birth is crucial for the early detection of newborns predisposed to future metabolic diseases<sup>[5]</sup>. It may also offer

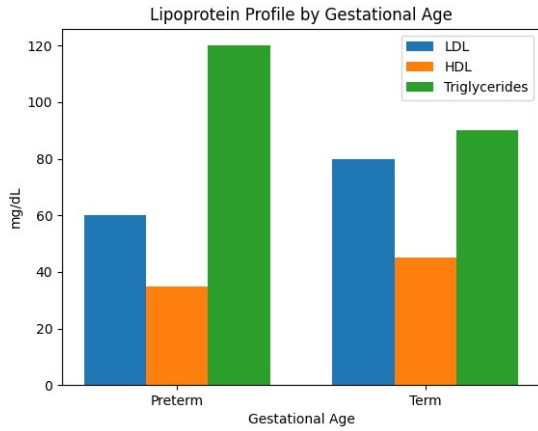


Figure 1: Lipoprotein profile by gestational age

insights into the developmental foundations of health and disease. This study seeks to assess lipoprotein heterogeneity at birth and investigate its correlation with gestational age, gender, and birth weight, thereby aiding in early risk classification and preventive measures<sup>[6]</sup>.

**METHODS**

This cross-sectional study was performed on neonates born at a tertiary care hospital during a specified timeframe. Following the acquisition of institutional ethical approval and informed parental consent, cord blood samples were

obtained shortly post-delivery under aseptic conditions. The samples were examined for lipid profile parameters, including low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides, employing standard laboratory techniques.

Neonates were classified according to

- *Gestational age*  
Preterm (<37 weeks) and term (≥37 weeks)
- *Birth weight*  
Low birth weight (<2.5 kg) and normal birth weight (≥2.5 kg)
- *Gender*  
Male and Female

**Inclusion Criteria**

- All live-born neonates delivered during the study period
- Neonates with available cord blood samples
- Neonates whose parents/guardians provided informed consent

**Exclusion Criteria**

- Neonates with congenital anomalies or genetic disorders
- Neonates born to mothers with significant metabolic disorders (e.g., diabetes mellitus, dyslipidemia)

Table 1: Lipoprotein profile by gestational age

Parameter	Preterm (Mean ± SD)	Term (Mean ± SD)	p-value
LDL (mg/dL)	60 ± 10	80 ± 12	<0.05
HDL (mg/dL)	35 ± 8	45 ± 9	<0.05
Triglycerides	120 ± 20	90 ± 18	<0.05

Table 2: Lipoprotein profile by birth weight

Parameter	LBW (Mean ± SD)	Normal (Mean ± SD)	p-value
LDL	62 ± 11	78 ± 10	<0.05
HDL	34 ± 7	46 ± 8	<0.05
Triglycerides	125 ± 22	92 ± 17	<0.05

Table 3: Lipoprotein profile by gender

Parameter	Male	Female	p-value
LDL	70	72	>0.05
HDL	40	42	>0.05
Triglycerides	105	102	>0.05

- Neonates with perinatal asphyxia or severe illness requiring immediate intensive care
- Inadequate or hemolyzed blood samples

Data were analyzed via suitable statistical tools. Continuous variables were represented as mean  $\pm$  standard deviation. Group comparisons were conducted utilizing Student's t-test or ANOVA as appropriate. A *p*-value of less than 0.05 was deemed statistically significant.

## RESULTS

Results of lipoprotein profiles by gestational age, birth weight and gender are depicted in Tables 1 to 3 and Figure 1.

## DISCUSSION

This study reveals considerable differences in neonatal lipoprotein profiles associated with gestational age and birth weight, underscoring the impact of intrauterine development on early lipid metabolism. Preterm and low birth weight neonates demonstrated elevated triglyceride levels and reduced HDL concentrations, indicating an underdeveloped lipid metabolic system<sup>[7]</sup>. This may be ascribed to diminished activity of essential enzymes such as lipoprotein lipase, which is pivotal in triglyceride clearance. Furthermore, decreased HDL levels in these neonates may indicate impaired reverse cholesterol transport and limited early cardiovascular protection<sup>[8]</sup>. Conversely, term neonates exhibited elevated LDL levels, signifying comparatively better advanced lipid transport and metabolic mechanisms. These findings align with previous research that highlights the significance of fetal growth and maturation in influencing lipid metabolism at birth<sup>[9]</sup>. The disparities noted between preterm and term newborns underscore the notion that lipid regulation systems evolve progressively throughout gestation. The study found no statistically significant gender-based differences in lipid profiles, indicating that hormonal effects on lipid metabolism may not be substantial at birth and likely develop later in life. This conclusion aligns with prior research suggesting no sex-related differences in newborn lipid markers<sup>[10]</sup>.

The modified lipid profiles found in preterm and low birth weight newborns may carry significant long-term consequences. The notion of fetal programming posits that unfavorable prenatal environments can predispose individuals to metabolic illnesses, including dyslipidemia, obesity, and cardiovascular diseases in adulthood. Consequently, the prompt detection of lipid abnormalities may prove beneficial for risk assessment and preventive measures. This work emphasizes the significance of

gestational age and birth weight as determinants of neonatal lipid profiles and indicates the necessity for more longitudinal research to investigate their long-term therapeutic implications<sup>[11]</sup>.

## CONCLUSION

Lipoprotein levels at birth exhibit considerable variation based on gestational age and birth weight, signifying that intrauterine growth is pivotal in influencing early lipid metabolism. Preterm and low birth weight neonates typically display adverse lipid profiles, marked by elevated triglyceride levels and diminished HDL concentrations, potentially indicative of immature enzymatic function and compromised lipid metabolism. These preliminary modifications indicate diminished efficacy in lipid transport and metabolism, potentially heightening susceptibility to metabolic disorders.

The lack of notable gender differences suggests that hormonal effects on lipid metabolism are negligible at birth and probably emerge later in life. Identifying differences in newborn lipid profiles is crucial, as they may indicate future metabolic and cardiovascular concerns. Identifying these disparities at birth can enable early surveillance and preventive measures, ultimately enhancing long-term health outcomes.

## REFERENCES

1. Janet M. Catov, Rachel H. Mackey, Christina M. Scifres, Marnie Bertolet and HNS. Lipoprotein Heterogeneity Early in Pregnancy and Preterm Birth. *Am J Perinatol*. 2018;34(13):1326–32.
2. Zamojska J, Niewiadomska-jarosik K, Kierzkowska B, Gruca M, Wosiak A. Lipid Profile in Children Born Small for Gestational Age. *Nutrients*. 2023;15(4781):1–13.
3. Aghaie Z, Hajian S, Abdi F. The relationship between lipid profiles in pregnancy and preterm delivery : a systematic review *Biomed Press. Biomed Res Ther*. 2018;5(8):2590–609.
4. Waage CW, Mdala I, Stigum H, Jenum AK, Birkeland KI, Shakeel N, et al. Lipid and lipoprotein concentrations during pregnancy and associations with ethnicity. *BMC Pregnancy Childbirth* [Internet]. 2022;22(246):1–12.
5. J JS, Gupta NR, Stanley H. Study of Cord Blood Lipid Levels and Its Correlation with Newborn's Birth Weight and Gestational Age. *J Pediatr Perinatol Child Heal*. 2022;6(4):475–83.
6. Sequeiros EB, Tuomaala A, Tabassum R, Bergman PH, Koivusalo SB, Huvinen E. Early ascending growth is associated with maternal lipoprotein profile during mid and late pregnancy and in cord blood. *Int J Obes*. 2023;47:1081–7.
7. Mohammad S, Aletayeb H, Dehdashtian M, Aminzadeh M,

- Moghaddam AE, Mortazavi M, et al. Correlation between umbilical cord blood lipid profile and neonatal birth weight. *Otolaryngol Pol [Internet]*. 2013;88(6):521–5.
8. Nayak CD, Agarwal V, Nayak DM. Correlation of Cord Blood Lipid Heterogeneity in Neonates with Their Anthropometry at Birth. *Ind J Clin Biochem*. 2013;28(June):152–7.
  9. Chukwudi NK, Adiele DK, Adizua UC, Onu JU. Cord Blood Lipid Profile of Term and Preterm Newborns in a Tertiary Hospital in South East Nigeria : Relationship with Gestational Age and Birth Weight. *Niger Heal J*. 2023;23(1):478–88.
  10. Kumari A, Kumar V, Kumar A, Narayan JP, Niesha S. Lipoprotein Heterogeneity at Birth and its Relationship with Gestational Age , Gender and Birth Weight : A Cross-Sectional Study from a Rural Teaching Hospital of Central India. *Int J Pharm Clin Res*. 2024;16(7):1750–4.
  11. Smita Priyadarshan Jategaonkar, Kancham Gawde MJ. Lipoprotein heterogeneity at birth and its relationship with gestational age, gender and birth weight: A cross-sectional study from a rural teaching hospital of central India. *NIJP*. 2019;8(4):158–66.