Section: Obstetrics and Gynaecology

Original Research Article

MATERNAL SERUM TRIGLYCERIDES AS A PREDICTOR OF LARGE FOR GESTATIONAL-AGE NEWBORN IN PREGNANT WOMEN

V Bhavanidevi[1], S Sujatha[2], S Ramalakshmi[3], Santhosha M[4]

[1]Associate Professor, Tirunelveli Medical College Hospital, Tirunelveli, India.
[2]Associate Professor, Tirunelveli Medical College Hospital, Tirunelveli, India.
[3]Professor, Tirunelveli Medical College Hospital, Tirunelveli, India.
[4]Junior Resident, Tirunelveli Medical College Hospital, Tirunelveli, India.

Received : 12/02/2025
Received in revised form : 09/04/2025
Accepted : 24/04/2025

Keywords:
Maternal serum, triglycerides, large for gestational age, predictor, pregnancy.

Corresponding Author:
Dr. Santhosha M,
Email: santhoshamv@gmail.com

DOI: 10.47009/jamp.2025.7.2.238

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 1182-1185

Abstract

Background: Maternal serum triglycerides play a crucial role in fetal development and pregnancy outcomes. Elevated triglyceride levels have been linked to complications such as gestational diabetes and hypertensive disorders. Recent evidence suggests a correlation between high maternal triglycerides and large-for-gestational-age (LGA) newborns, who are at increased risk for birth injuries, metabolic complications, and long-term health issues. **Objectives:** To determine the association between maternal serum triglycerides and LGA newborns in non-diabetic, normal pre-pregnancy BMI women and to establish a triglyceride cut-off value for predicting LGA births. **Materials and Methods**: This prospective cohort study was conducted in the Department of Obstetrics and Gynaecology, Tirunelveli Medical College Hospital, among 100 antenatal mothers. Ethical approval was obtained, and data were collected via structured proforma and investigations. Statistical analysis was performed using SPSS. **Results**: The mean maternal age was 25.2 years (SD: 4). LGA incidence increased with maternal age, peaking at 66.7% in the 31–35 years group. LGA births were more frequent in multigravida (37.5%) than primigravida (25%). LGA rates were highest at 38 weeks (42.9%). The mean maternal BMI was 21.8 (SD: 1.4), and the mean weight gain was 10.2 kg (SD: 1.2). The mean triglyceride level was 226.3 mg/dL (SD: 34.7), with 26% having levels ≥248 mg/dL. LGA incidence was significantly higher among mothers with triglycerides ≥248 mg/dL (88.5%) versus <248 mg/dL (12.2%) ($p < 0.001$). Male newborns had a higher LGA incidence (46.3%) than females (15.2%). NICU admissions were exclusively LGA newborns (32%). Atonic postpartum hemorrhage was the most common maternal complication. **Conclusion:** Maternal triglyceride levels significantly influence LGA births, with a strong association at a threshold of 248 mg/dL. Identifying at-risk pregnancies through triglyceride screening may help in early intervention and improved neonatal outcomes.

INTRODUCTION

Large-for-gestational-age (LGA) newborns, defined as those with birth weights above the 90th percentile for gestational age, are associated with increased perinatal complications, including birth trauma, neonatal hypoglycemia, and a higher risk of childhood obesity and metabolic disorders. Identifying maternal factors that contribute to excessive fetal growth is essential for early intervention.

Maternal lipid metabolism plays a significant role in fetal development, with triglycerides serving as a key energy source for fetal growth. Elevated maternal serum triglyceride levels during pregnancy have been linked to macrosomia and LGA births. However, the exact cut-off value of triglycerides for predicting LGA newborns remains unclear, particularly in women with normal pre-pregnancy BMI and no overt diabetes.

This study aims to evaluate the association between maternal serum triglycerides at 24–28 weeks of gestation and the risk of delivering an LGA newborn. By determining an optimal triglyceride threshold, this research could aid in early identification of at-risk pregnancies, allowing for timely nutritional and clinical interventions to optimize fetal growth outcomes. Findings from this study may contribute to refining prenatal screening protocols and improving neonatal health by reducing complications related to fetal overgrowth.

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Aim & Objective

Primary Objective: To determine the association between maternal serum triglycerides and large-for-gestational-age newborns in non-diabetic normal pre-pregnancy BMI women.

Secondary Objective: To determine the cut-off value of maternal triglycerides to predict large-for-gestational-age newborns.

MATERIALS AND METHODS

This prospective cohort study was conducted in the Department of Obstetrics and Gynaecology, Tirunelveli Medical College and Hospital, from July 2023 to December 2024. It assessed the association between maternal serum triglycerides and large-for-gestational-age (LGA) newborns and determined a predictive cut-off value.

A total of 100 antenatal women with normal pre-pregnancy BMI (18.5–24.9) and negative diabetic screening were recruited via consecutive sampling. Ethical approval was obtained from the Institutional Human Ethics Committee.

Inclusion Criteria: Antenatal women with negative diabetic screening, Pre-pregnancy BMI: 18.5–24.9 (WHO)

Exclusion Criteria: Women with pre-gestational and gestational diabetes mellitus, Women with hypertensive disorders and preeclampsia, Lupus and antiphospholipid syndrome, Multifetal gestation, Fetuses with congenital malformations

The study was approved by the Institutional Human Ethics Committee. A structured proforma was used to collect data, including participant details such as name, age, OP/IP number, obstetric history, gestational age, weight, height, pre-pregnancy BMI, fasting serum triglycerides, OGCT, labor details (term, mode of delivery), and newborn details (sex, birth weight, APGAR score). At 24–28 weeks of pregnancy, fasting serum triglyceride levels were measured, and birth weight was recorded from hospital records. LGA newborns were defined as those with birth weights above the 90th percentile for gestational age, categorized as follows: at 37 weeks (3.5 kg for both sexes), 38 weeks (3.7 kg), 39 weeks (4.0 kg for boys, 3.9 kg for girls), and 40 weeks (4.2 kg for boys, 4.1 kg for girls).

Participants were informed in their local language about the study, and written consent was obtained, ensuring confidentiality. Data entry was done in MS Excel and analyzed using SPSS software. Inferential statistics, including the chi-square test and odds ratio, were applied, with a p-value <0.05 considered statistically significant.

RESULTS

The study analyzed 100 pregnant women with a mean age of 25.2 years (SD: 4 years). The proportion of large-for-gestational-age (LGA) newborns increased with maternal age, peaking at 66.7% in mothers aged 31-35 years. [Table 1]

Table 1: Age Vs LGA

Age(Yrs)	N (age)	N (LGA)	%
≤20	9	0	0%
21-25	51	13	25.5%
26-30	29	12	41.4%
31-35	9	6	66.7%
>35	2	1	50%
Total	100	32	

Multigravida mothers had a higher prevalence of LGA babies (37.5%) compared to primigravida (25%) (Table 2).

Table 2: Gravida vs LGA

Gravida	N (gender)	N (LGA)	%
Primi	44	11	25%
Multi	56	21	37.5%
Total	100	32	

The highest LGA birth rate was observed at 38 weeks (42.9%), followed by 37 weeks (38.9%), with no LGA births at 40 weeks (Table3).

Table 3: Gestational age

Gestational age	N (GA)	N (LGA)	%
37	36	14	38.9%
38	35	15	42.9%
39	23	3	13%
40	6	0	0%

Mean pre-pregnancy BMI was 21.8 (SD: 1.4), and mean weight gain was 10.2 kg (SD: 1.2 kg). The mean glucose challenge test result was 104 mg/dL (SD: 6.7 mg/dL).

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Mean triglyceride level was 226.3 mg/dL (SD: 34.7), with 25% having levels ≥248 mg/dL. LGA was significantly associated with higher triglyceride levels, as 88.5% of mothers with triglycerides ≥248 mg/dL had LGA newborns, compared to 12.2% in those with levels <248 mg/dL (p <0.001, Table 4).

Table 4: Comparison of triglycerides level with birth weight

Triglycerides	LGA	AGA
≥248	23 (88.5%)	3 (11.5%)
<248	9 (12.2%)	65 (87.8%)
p <0.001 – There is a statistically significant association exist between triglyceride level and birth weight of babies (Chi square test)		
Relative risk – 55.3; 95% CI – 13.7 to 222.4		

About 43% of deliveries were induced, while 57% were spontaneous, with LGA rates being 32.6% and 31.6%, respectively. LGA newborns were most common in assisted deliveries (50%) and LSCS (47.8%), compared to natural labor (11.4%) (Table 5). Among LSCS cases, 45.4% of emergency LSCS and 50% of elective LSCS involved LGA newborns.

Table 5: Type of delivery

Type of delivery	N (Type of delivery)	N (LGA)	%
Labour natural	44	5	11.4%
Assisted delivery	10	5	50%
LSCS	46	22	47.8%
Total	100	32	

The mean birth weight was 3.19 kg (SD: 0.52). LGA newborns accounted for 32% of total births. NICU admission was required for all LGA newborns (32%), with observation (75%) being the most common reason, followed by distress (9.3%) and meconium-stained amniotic fluid (9.3%).

Male newborns had a higher LGA proportion (46.3%) than females (15.2%). Maternal complications were most frequent in LSCS deliveries, with atonic PPH occurring in 5 cases, while 3rd/4th degree perineal tears were noted in 2 assisted deliveries.

DISCUSSION

This study, conducted among 100 pregnant women, examined maternal and neonatal factors associated with large for gestational age (LGA) births. The mean maternal age was 25.2 years (SD: 4), with a significant increase in LGA births as maternal age advanced. No LGA cases were observed in mothers aged ≤20 years, while 25.5% of those aged 21-25 years had LGA newborns. This proportion increased to 41.4% in the 26-30 years group and peaked at 66.7% for mothers aged 31-35 years, slightly declining to 50% in those >35 years. Studies by Leila et al,[1] Huo et al,[2] and Alina et al,[3] similarly linked maternal age to LGA births.

Parity also influenced LGA rates, with 37.5% of multigravida mothers having LGA newborns compared to 25% of primigravida mothers. Most deliveries occurred at 37 (36%) or 38 (35%) weeks, and LGA rates were highest at these gestations (38.9% and 42.9%, respectively). Only 13% of LGA cases occurred at 39 weeks, and none at 40 weeks, consistent with findings by Leila et al1, Huo et al,[2] and Alina et al.[3]

The mean pre-pregnancy BMI was 21.8 (SD: 1.4), with an average pregnancy weight gain of 10.2 kg (SD: 1.2). Mean triglyceride levels were 226.3 mg/dL (SD: 34.7), with 26% of mothers having levels ≥248 mg/dL. LGA births were significantly more frequent in this group (88.5% vs. 12.2%), with a p-value <0.001 and a relative risk of 55.3, indicating a strong association between maternal hypertriglyceridemia and LGA. Similar findings were reported by Leila et al1, Huo et al,[2] and Wang et al.[4]

Regarding delivery mode, 57% of births were spontaneous and 43% were induced, with LGA rates slightly higher in the induced group (32.6% vs. 31.6%). Vaginal deliveries comprised 44% of cases, assisted deliveries 10%, and lower segment cesarean sections (LSCS) 46%. LGA was most common in assisted (50%) and cesarean deliveries (47.8%) compared to natural labor (11.4%), aligning with Alina et al.[3] Emergency LSCS constituted 47.8% of all cesareans, while elective LSCS made up 52.2%, with similar LGA rates in both groups (45.4% vs. 50%).

Male newborns (54%) had significantly higher LGA rates (46.3%) than females (15.2%), a trend supported by Huo et al[92]. The mean birth weight was 3.19 kg (SD: 0.52 kg), with 32% of newborns classified as LGA. All NICU admissions (32%) were LGA babies, with 75% admitted for observation, 9.3% for distress, 9.3% for meconium-stained amniotic fluid (MSAF), and 3.1% each for brachial plexus injury and birth fractures.

Maternal complications were primarily atonic postpartum hemorrhage (PPH), occurring in one natural labor case, two assisted deliveries, and five LSCS cases. Traumatic PPH was not observed. Third- and fourth-degree perineal tears occurred in two assisted deliveries. These complications confirm the increased maternal risks associated with LGA, as noted by Robertson et al5 and Alina et al.[3]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

CONCLUSION

Maternal age, multigravida status, elevated triglycerides, and earlier gestational age significantly contribute to LGA births. Assisted and cesarean deliveries have higher LGA rates, often requiring complex interventions. LGA newborns face increased NICU admissions due to complications like birth injuries and respiratory distress, with male infants more frequently affected. Maternal risks, including atonic postpartum hemorrhage, are higher in LGA deliveries, especially cesarean sections. These findings highlight the need for early identification and management of maternal risk factors to improve neonatal outcomes.

Recommendations: Clinicians should closely monitor maternal health, focusing on age, BMI, and triglyceride levels, with early interventions for high-risk pregnancies. Nutritional counseling and weight management can reduce LGA risks. Delivery timing should consider fetal growth trends, and a multidisciplinary team should guide care. Optimizing delivery decisions can minimize complications, while postpartum monitoring helps prevent PPH. NICU preparedness is essential for LGA newborns. Education on maternal health and lifestyle choices is crucial. Research should explore maternal lipid levels, gender disparities, and long-term LGA outcomes. Standardized screening guidelines and equitable access to maternal care can help prevent and manage LGA births.

REFERENCES

1. Leila A, et al. Maternal Age and Its Association with Large for Gestational Age Newborns: A Prospective Study. J Obstet Gynaecol Res. 2022;48(3):567-575.
2. Huo N, et al. Impact of Maternal Lipid Profile on Neonatal Birth Weight: A Systematic Review and Meta-analysis. BMC Pregnancy Childbirth. 2021;21(1):243.
3. Alina P, et al. Mode of Delivery and Its Association with Large for Gestational Age Neonates: A Population-Based Study. Eur J Obstet Gynecol Reprod Biol. 2020; 250:45-52.
4. Wang Y, et al. Maternal Hypertriglyceridemia as a Risk Factor for Fetal Overgrowth and Adverse Neonatal Outcomes. Am J Perinatol. 2019;36(10):1082-1090.
5. Robertson N, et al. Maternal and Neonatal Complications Associated with Macrosomia: A Retrospective Cohort Study. Obstet Med. 2021;14(2):87-94.
6. Chen L, et al. The Association Between Maternal Triglyceride Levels and Neonatal Birth Weight: A Cohort Study. Lipids Health Dis. 2020;19(1):39.
7. Zhang X, et al. Maternal Dyslipidemia and Its Impact on Fetal Growth: Evidence from a Large Cohort Study. J Matern Fetal Neonatal Med. 2022;35(5):789-796.
8. Patel R, et al. The Effect of Parity on Fetal Growth and Neonatal Outcomes in a Tertiary Care Setting. Int J Gynaecol Obstet. 2019;144(2):212-218.
9. Singh M, et al. Neonatal Outcomes in Large for Gestational Age Newborns: A Hospital-Based Study. J Perinatol. 2023;43(1):95-103.
10. Gupta S, et al. Gender Differences in Fetal Growth and Perinatal Outcomes in Large for Gestational Age Newborns. Arch Dis Child Fetal Neonatal Ed. 2020;105(5):498-504.
11. Zhao W, et al. Maternal BMI and Lipid Metabolism in Relation to Neonatal Birth Weight. Nutr Metab Cardiovasc Dis. 2021;31(6):1821-1828.
12. Kim H, et al. Triglyceride-to-HDL Ratio and the Risk of Macrosomia in Non-Diabetic Pregnancies. J Endocrinol Invest. 2019;42(7):831-838.
13. Martinez A, et al. The Role of Induction of Labor in Large for Gestational Age Infants and Its Impact on Neonatal Outcomes. Am J Obstet Gynecol. 2022;227(3): 412.e1-412.e8.
14. Thomas B, et al. Postpartum Hemorrhage and Maternal Outcomes in Macrosomic Births: A Retrospective Analysis. BMC Pregnancy Childbirth. 2020;20(1):592.
15. Li X, et al. Fetal Sex and Its Influence on Maternal Lipid Metabolism During Pregnancy. J Clin Endocrinol Metab. 2021;106(4):e1571-e1580.
16. Anderson P, et al. Birth Weight Percentiles and Neonatal Morbidity in Large for Gestational Age Infants: A Multicenter Study. J Pediatr. 2022; 240:56-63.
17. Silva C, et al. Risk Factors for Neonatal Intensive Care Unit Admission Among Large for Gestational Age Newborns. J Matern Fetal Neonatal Med. 2020;33(14):2391-2398.
18. Wu J, et al. Maternal Serum Lipid Levels and Their Relationship with Neonatal Birth Weight: A Longitudinal Analysis. J Clin Lipidol. 2019;13(4):609-617.
19. Brown K, et al. Cesarean Delivery Rates in Large for Gestational Age Infants: A Retrospective Cohort Study. Obstet Gynecol Sci. 2021;64(2):105-112.
20. Taylor M, et al. The Impact of Maternal Weight Gain on Fetal Growth and Neonatal Outcomes. Int J Obes. 2022;46(7):1253-1262.

ISSN (O): 2687-5365; ISSN (P): 2753-6556