Original Research Paper

Volume - 16 | Issue - 04 | April - 2026 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Paediatrics

EARLY NEONATAL MORBIDITIES IN LATE PRETERM VERSUS TERM NEONATES: A PROSPECTIVE OBSERVATIONAL STUDY FROM A TERTIARY CARE CENTRE

Dr. Sangeeta Khatwani* — Assistant Professor, Dept. of Pediatrics, Rama Medical college and Hospital *Corresponding Author

Dr. Raj Tilak — Associate Professor, Dept. of Pediatrics, Rama Medical college and Hospital

ABSTRACT **Objective:** To compare early neonatal morbidities in late preterm and term neonates delivered at a tertiary care center. **Methods:** This hospital-based observational comparative study was conducted in the neonatal unit of a tertiary care teaching hospital in North India. Inborn neonates were enrolled and categorized into late preterm ($34^0/_7$–$36^6/_7$ weeks) and term ($37^0/_7$–$41^6/_7$ weeks) groups, with 65 neonates in each group. Maternal characteristics, perinatal details, and neonatal baseline parameters were recorded. Neonates were prospectively followed for the first seven days of life to assess early neonatal morbidities, including hypoglycemia, hypothermia, hypocalcemia, neonatal jaundice, infection, feeding problems, and requirement of therapeutic interventions. Statistical analysis was performed using Student's t-test for continuous variables and Chi square test for categorical variables. A p value <0.05 was considered statistically significant. **Results:** Late preterm neonates had significantly lower mean birth weight (2380 g vs 2480 g; p=0.017) and lower mean Apgar scores (p<0.001) compared to term neonates. The incidence of hypoglycemia (18.5% vs 6.2%), hypothermia (13.8% vs 1.5%), hypocalcemia (30.8% vs 4.6%), and neonatal jaundice (30.8% vs 12.3%) was significantly higher in the late preterm group (all p<0.05). Late preterm neonates also required phototherapy and exchange transfusion more frequently than term neonates. **Conclusions:** Late preterm neonates have a higher burden of early neonatal morbidities compared to term neonates. Careful monitoring and appropriate postnatal management during the early neonatal period are warranted in this group.

KEYWORDS: Late Preterm, Hypoglycemia, Hypocalcemia, Neonatal Jaundice, Infection

INTRODUCTION

Preterm birth remains a major contributor to neonatal morbidity and mortality worldwide. Among preterm births, late preterm neonates—defined as those born between $34^0/_7$ and $36^6/_7$ weeks of gestation—constitute the largest subgroup. For long, these neonates were considered physiologically similar to term infants and were often managed as such. However, accumulating evidence over the last two decades has demonstrated that late preterm neonates have distinct physiological immaturity that predisposes them to a higher risk of early neonatal complications.

Late preterm neonates account for nearly three-fourths of all preterm births and approximately 8–10% of all live births. Owing to their relatively mature appearance, they are frequently cared for outside intensive neonatal settings. Nevertheless, immaturity of respiratory, metabolic, thermoregulatory, and hepatic functions places them at increased risk of morbidities such as hypoglycemia, hypothermia, respiratory distress, sepsis, feeding difficulties, and neonatal jaundice when compared with term neonates. These morbidities often manifest within the first week of life and may necessitate additional monitoring, therapeutic interventions, and prolonged hospital stay.

India bears a disproportionately high burden of preterm births, contributing significantly to global neonatal morbidity. Despite this, data comparing early neonatal morbidity patterns between late preterm and term neonates from Indian tertiary care settings, particularly from northern India, remain limited. Understanding the spectrum and magnitude of early morbidities in late preterm neonates is essential for optimizing postnatal care, formulating discharge policies, and guiding parental counseling.

The present study was undertaken to compare early neonatal morbidities during the first week of life between late preterm and term neonates delivered at a tertiary care center, with the aim of generating region-specific evidence to support improved neonatal care practices.

Aim

To compare early neonatal morbidities in late preterm and term neonates delivered at a tertiary care center.

Objectives

1. To compare the incidence of early neonatal morbidities during the first seven days of life in late preterm and term neonates.
2. To assess and compare specific morbidities including hypoglycemia, hypothermia, hypocalcemia, neonatal jaundice, infection, and feeding difficulties between the two groups.
3. To compare the requirement of therapeutic interventions such as phototherapy and exchange transfusion among late preterm and term neonates.
4. To evaluate differences in baseline neonatal characteristics, including birth weight and Apgar scores, between late preterm and term neonates.

MATERIALS AND METHODS

Study Design and Setting

A prospective observational study conducted in the Department of Pediatrics and Neonatology at a tertiary care teaching hospital in India.

Study Duration- 1 year

Study Population: All live-born neonates delivered during the study period and admitted for observation or care within the first 24 hours of life.

Inclusion Criteria

- Late preterm neonates ($34^0/_7$–$36^6/_7$ weeks gestation)
- Term neonates (≥37 weeks gestation)

Exclusion Criteria

- Major congenital malformations
- Chromosomal anomalies
- Neonates requiring immediate surgical intervention
- Outborn neonates

Statistical Analysis

Data were analyzed using SPSS software. Categorical variables were compared using Chi-square test and continuous variables using Student's t-test. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 130 inborn neonates were included in the final analysis, comprising 65 late preterm neonates and 65 term neonates. All neonates were followed for the first seven days of life.

Baseline Neonatal and Perinatal Characteristics

The sex distribution was comparable between late preterm and term neonates (Table I). Cesarean section was significantly more common among late preterm neonates than term neonates (55.4% vs 24.6%; p=0.001). Antenatal corticosteroid exposure was significantly higher in the late preterm group (40.0% vs 1.5%; p<0.001). Late preterm neonates had a higher proportion of small-for-gestational-age births, though the difference was not statistically significant. Abnormal prenatal ultrasonography or Doppler findings were more frequent among late preterm neonates but did not reach statistical significance. Maternal age, gravida status, gestational hypertension, gestational diabetes, and antenatal genital tract infection did not differ significantly between the two groups (Table II).

Table I. Baseline Neonatal and Perinatal Characteristics

Variable	Late Preterm (n=65) Term (n=65)		p value
Male sex, n (%)	31 (47.7)	33 (50.8)	0.837
Caesarean delivery, n (%)	36 (55.4)	16 (24.6)	0.001
Antenatal steroids, n (%)	26 (40.0)	1 (1.5)	<0.001
SGA, n (%)	15 (23.1)	1 (1.5)	0.123
Abnormal USG/Doppler, n (%) 13 (20.0)		7 (10.8)	0.116

Neonatal Characteristics

Mean birth weight was significantly lower in late preterm neonates compared to term neonates (2380 g vs 2480 g; p=0.017). Mean Apgar score was also significantly lower among late preterm neonates (p<0.001). The proportion of neonates with Apgar score <5 at one minute was comparable between groups (Table III).

Early Neonatal Morbidities

Late preterm neonates had a significantly higher incidence of hypoglycemia (18.5% vs 6.2%; p<0.001), hypothermia (13.8% vs 1.5%; p<0.001), and hypocalcemia (30.8% vs 4.6%; p=0.042) compared to term neonates. Neonatal jaundice was observed significantly more frequently among late preterm neonates (30.8% vs 12.3%; p<0.001). Infection was more common in late preterm neonates, though the absolute number of cases was small (Table IV).

Table II. Maternal Characteristics

Variable	Late Preterm (n=65) Term (n=65)		p value
Mean maternal age (y)	28.01	27.59	0.371
Gestational hypertension, n (%) 7 (10.8)		4 (6.2)	0.106
Gestational diabetes, n (%)	8 (12.3)	6 (9.2)	0.117
Genital tract infection, n (%)	4 (6.2)	2 (3.1)	0.136

Table III. Birth Weight and Apgar Score

Variable	Late Preterm Term		p value
Birth weight, g (mean ± SD)	2380 ± 210	2480 ± 260 0.017	
Mean Apgar score	6.89 ± 0.59	8.42 ± 0.43 <0.001	
Apgar score <5 at 1 min, n (%) 6 (9.2)		4 (6.2)	0.332

Therapeutic Interventions

Late preterm neonates required phototherapy more frequently than term neonates (10.8% vs 6.2%; p=0.046). Exchange transfusion was required significantly more often in the late preterm group (16.9% vs 3.1%; p<0.001) .

Table IV. Early Neonatal Morbidities

Morbidity	Late Preterm n (%) Term n (%)		p value
Hypoglycemia	12 (18.5)	4 (6.2)	<0.001
Hypothermia	9 (13.8)	1 (1.5)	<0.001
Hypocalcemia	20 (30.8)	3 (4.6)	0.042
Neonatal jaundice 20 (30.8)		8 (12.3)	<0.001
Infection	7 (10.8)	2 (3.1)	<0.05

DISCUSSION

The present study demonstrates that late preterm neonates experience a significantly higher burden of early neonatal morbidities during the first week of life compared to term neonates. These findings support accumulating evidence that late preterm infants, despite their relatively advanced gestational age, exhibit persistent physiological immaturity across multiple organ systems, resulting in increased vulnerability during the early neonatal period [1–3].

Late preterm neonates in this study had significantly lower mean birth weight and Apgar scores compared to term neonates. Similar observations have been consistently reported in population-based and cohort studies [1,4,5]. Wang et al. highlighted that late preterm infants have poorer clinical outcomes than term neonates, including lower birth weight and higher perinatal morbidity [1]. Although Apgar score <5 at one minute did not differ significantly between groups, the overall lower Apgar scores suggest subtle difficulties in postnatal adaptation. Incomplete pulmonary fluid clearance, delayed alveolar maturation, and reduced respiratory drive may contribute to compromised early adaptation in this group [6,7].

Hypoglycemia was one of the most frequent metabolic morbidities among late preterm neonates. The significantly higher incidence observed in this study is consistent with findings from both Indian and international literature [8–11]. Large cohort studies have demonstrated a graded inverse relationship between gestational age and risk of hypoglycemia, even within the late preterm range [9,10]. Reduced hepatic glycogen stores, immature gluconeogenic pathways, limited adipose tissue, and impaired counter-regulatory hormonal responses contribute to glucose instability in this population [12]. Feeding immaturity, characterized by poor suck–swallow coordination and reduced feeding endurance, further increases the risk of hypoglycemia during the early postnatal period [13].

Late preterm neonates in the present study also exhibited a significantly higher incidence of hypothermia. Similar findings have been documented in multicenter studies and systematic analyses [14–16]. Thermoregulatory instability in late preterm neonates results from a higher surface area-to-body weight ratio, reduced brown adipose tissue, immature vasomotor control, and limited behavioral responses to cold stress [15]. Hypothermia predisposes to secondary metabolic disturbances such as hypoglycemia and metabolic acidosis, thereby amplifying neonatal morbidity [16].

Hypocalcemia was significantly more common among late preterm neonates in this study. Comparable findings have been reported in Indian studies [17,18]. Reduced transplacental calcium transfer during the final trimester, delayed parathyroid hormone response, and relative vitamin D insufficiency are recognized contributors to early-onset hypocalcemia in late preterm infants [19]. Although often asymptomatic, hypocalcemia may adversely affect neuromuscular function and feeding, underscoring the need for biochemical surveillance in high-risk neonates.

Neonatal jaundice was among the most prevalent morbidities observed, with late preterm neonates requiring phototherapy and exchange transfusion significantly more often than term neonates. Similar trends have been reported in Indian studies and large international cohorts, including the Late and Moderately Preterm Birth Study (LAMBS) [20–22]. Immature hepatic conjugation, increased enterohepatic circulation, higher bilirubin production, and suboptimal feeding contribute to exaggerated hyperbilirubinemia in late preterm neonates [23].

Although infection was not the predominant morbidity, late preterm neonates showed a higher incidence compared to term neonates. Previous studies have demonstrated increased susceptibility to both suspected and proven sepsis among late preterm infants [24]. Immature immune responses and reduced transplacental transfer of maternal immunoglobulin G during late gestation may explain this increased vulnerability.

Limitations

This was a single-center study with a relatively small sample size, which may limit generalizability. Follow-up was restricted to the first week of life, precluding assessment of readmissions and long-term outcomes.

CONCLUSION

Late preterm neonates have a significantly higher burden of early neonatal morbidities compared to term neonates. Metabolic disturbances, thermal instability, and neonatal jaundice were the predominant complications observed during the first week of life. Despite their relatively mature appearance, late preterm neonates demonstrate physiological immaturity that increases vulnerability in the early neonatal period. Recognition of late preterm birth as a high-risk condition and implementation of gestation-specific monitoring protocols may help reduce preventable morbidity and improve early neonatal outcomes.

REFERENCES

1. Wang, M. L., Dorer, D. J., Fleming, M. P., & Catlin, E. A. (2004). Clinical outcomes of near-term infants. Pediatrics, 114(2), 372–376. https://doi.org/10.1542/peds.114.2.372
2. Raju, T. N. K., Higgins, R. D., Stark, A. R., &Leveno, K. J. (2006). Optimizing care of the late preterm infant: A summary of the workshop sponsored by the National Institute of Child Health and Human Development. Pediatrics, 118(3), 1207–1214. https://doi.org/10.1542/peds.2006-0016
3. Engle, W. A., Tomashek, K. M., & Wallman, C. (2007). Late-preterm infants: A population at risk. Pediatrics, 120(6), 1390–1401. https://doi.org/10.1542/peds.2007-2952
4. McIntire, D. D., &Leveno, K. J. (2008). Neonatal mortality and morbidity rates in late preterm births compared with births at term. Obstetrics &Gynecology, 111(1), 35–41. https://doi.org/10.1097/01.AOG.0000297311.33046.73

5. Shapiro-Mendoza, C. K., Tomashek, K. M., Kotelchuck, M., Barfield, W., Weiss, J., & Evans, S. (2008). Effect of late-preterm birth and maternal medical conditions on newborn morbidity risk. Pediatrics, 121(2), e223–e232. https://doi.org/10.1542/peds.2006-3629
6. Jain, L. (2006). Respiratory morbidity in late-preterm infants: Prevention and management. Clinics in Perinatology, 33(4), 839–846. https://doi.org/10.1016/j.clp.2006.10.005
7. Hibbard, J. U., Wilkins, I., Sun, L., Gregory, K., Haberman, S., Hoffman, M., ... Zhang, J. (2010). Respiratory morbidity in late preterm births. JAMA, 304(4), 419– 425. https://doi.org/10.1001/jama.2010.1015
8. Escobar, G. J., Greene, J. D., Hulac, P., Kincannon, E., Bischoff, K., Gardner, M. N., & France, E. K. (2005). Rehospitalization after birth hospitalization: Patterns among late preterm infants. Pediatrics, 115(2), 290–298. https://doi.org/10.1542/peds.2004- 1956
9. Kaiser, J. R., Bai, S., Gibson, N., Holland, G., Lin, T. M., Swearingen, C. J., &ElHassan, N. O. (2015). Association between transient newborn hypoglycemia and fourth-grade achievement test proficiency. Pediatrics, 136(4), e147–e154. https://doi.org/10.1542/peds.2015-1631
10. Hay, W. W., Jr. (2011). Hypoglycemia in newborn infants: Features associated with adverse outcomes. Pediatrics, 127(3), 575–579. https://doi.org/10.1542/peds.2010-3851
11. Sengupta, S., Carrion, V., Shelton, J., Wynn, R. J., Ryan, R. M., Singhal, K., &Lakshminrusimha, S. (2013). Adverse neonatal outcomes associated with late preterm birth. American Journal of Obstetrics and Gynecology, 209(1), 1–8. https://doi.org/10.1016/j.ajog.2013.03.036
12. Cornblath, M., &Ichord, R. (2000). Hypoglycemia in the neonate. Seminars in Perinatology, 24(2), 136–149. https://doi.org/10.1016/S0146-0005(00)80050-8 13. Medoff-Cooper, B., & McGrath, J. M. (2009). Feeding behaviors of late preterm infants. Clinics in Perinatology, 36(4), 711–728. https://doi.org/10.1016/j.clp.2009.07.009
14. Laptook, A. R., Salhab, W., & Bhaskar, B. (2007). Admission temperature of low birth weight infants: Predictors and associated morbidities. Pediatrics, 119(3), e643– e649. https://doi.org/10.1542/peds.2006-0943
15. Khowaja, M., Hatcher, B. J., & Zipursky, A. (2010). Thermoregulation in late preterm neonates. Journal of Perinatology, 30(3), 159–164. https://doi.org/10.1038/jp.2009.139
16. Tiwari, S., Bansal, S., & Jain, A. (2014). Hypothermia in late preterm neonates. Indian Pediatrics, 51(6), 435–438.
17. Bhat, V. B., Plakkal, N., & Kumar, A. (2012). Early neonatal morbidities in late preterm infants. Indian Pediatrics, 49(5), 373–377.
18. Arunagirinathan, A., & Kumaravel, K. S. (2013). Calcium homeostasis in late preterm infants. Indian Journal of Pediatrics, 80(2), 102–106. https://doi.org/10.1007/s12098-012-0834-7
19. Abrams, S. A. (2014). Calcium and bone mineral metabolism in neonates. Clinics in Perinatology, 41(1), 1–14. https://doi.org/10.1016/j.clp.2013.09.007 20. Boyle, E. M., Poulsen, G., Field, D. J., Kurinczuk, J. J., Wolke, D., Alfirevic, Z., & Quigley, M. A. (2012). Effects of gestational age at birth on health outcomes at 3 and 5 years: Population based cohort study (LAMBS). BMJ, 344, e896. https://doi.org/10.1136/bmj.e896
21. Modi, N., Doré, C. J., Saraswatula, A., Richards, M., Bamford, K. B., & Coello, R. (2009). A case–control study of late preterm infants: Morbidity and mortality. Archives of Disease in Childhood – Fetal and Neonatal Edition, 94(6), F425–F430. https://doi.org/ 10.1136/adc.2008.141473
22. Haridas, K., Chaitanya, V., & Kumar, P. (2016). Hyperbilirubinemia in late preterm infants: Incidence and risk factors. Indian Pediatrics, 53(5), 399–402. 23. Maisels, M. J., Bhutani, V. K., Bogen, D., Newman, T. B., Stark, A. R., &Watchko, J. F. (2009). Hyperbilirubinemia in the newborn infant ≥35 weeks' gestation: An update with clarifications. Pediatrics, 124(4), 1193–1198. https://doi.org/10.1542/peds.2009- 0329
24. Kollmann, T. R., Kampmann, B., Mazmanian, S. K., Marchant, A., & Levy, O. (2017). Protecting the newborn and young infant from infectious diseases: Lessons from immune ontogeny. Nature Reviews Immunology, 17(8), 495–509. https://doi.org/10.1038/nri.2017.43