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Outcomes of late-preterm twin pregnancies with antenatal corticosteroid exposure: A retrospective study

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Abstract:
Late-preterm twin pregnancies carry a high risk of respiratory morbidity, but the benefit of antenatal corticosteroids (ACS) in this group remains unclear. This retrospective study analyzed 90 neonates from 45 late-preterm twin pregnancies at a South Indian tertiary center over two years (January 2024–December 2025), with ACS administered in 80% of cases. Respiratory distress syndrome occurred in about 41% of neonates and two-thirds required NICU admission, with hypoglycaemia and sepsis also noted, while no cases of IVH, NEC, or mortality were recorded. Neonates exposed to ACS showed descriptively lower rates of respiratory morbidity and NICU admission compared to unexposed neonates. Thus, late-preterm twins face a substantial burden of respiratory morbidity and NICU utilization and while ACS showed favorable trends, larger well-designed studies are needed to confirm its effectiveness in this population.

Keywords: Antenatal corticosteroids (ACS), twin pregnancy, late preterm, respiratory distress syndrome, neonatal outcomes

Background:
Over recent decades, the incidence of twin pregnancies has increased globally, partly because of delayed childbearing and assisted reproductive technologies **[1].** Twin gestations have a higher risk of preterm birth and neonatal morbidity than singleton pregnancies and many twins are delivered during the late-preterm period (34+0 to 36+6 weeks) **[2].** Late-preterm neonates remain vulnerable to respiratory distress, hypoglycaemia, feeding difficulty, temperature instability and neonatal intensive care unit (NICU) admission **[3]** and these risks may be modified by chorionicity, growth discordance and placental characteristics **[4].** Antenatal corticosteroids (ACS) accelerate fetal lung maturation and reduce important neonatal complications when preterm birth is anticipated, with the strongest evidence historically derived from singleton pregnancies **[5, 6].** Their effectiveness in late-preterm twin gestations is less certain because multiple gestations differ in pharmacokinetics, placental transfer and baseline respiratory risk **[7, 8].** Published twin studies have reported inconsistent effects on respiratory morbidity and neonatal hypoglycaemia **[9, 10]** and outcomes may also depend on gestational age at administration, timing before birth, course completeness and chorionicity **[11, 12].** Therefore, it is of interest to evaluate the neonatal outcomes in late-preterm twin pregnancies according to ACS exposure and related clinical characteristics in a tertiary-care setting.

Methodology:
This retrospective observational study was conducted in the Departments of Paediatrics and Neonatology in collaboration with Obstetrics and Gynaecology at a tertiary care teaching hospital in South India. The study period extended from January 2024 to December 2025. Ethical clearance was obtained prior to commencement and strict confidentiality of patient data was maintained.

Study population:
The study included neonates born from twin pregnancies delivered between 34+0 and 36+6 weeks of gestation. Cases were eligible when antenatal corticosteroid exposure and neonatal outcome data were documented. Purposive sampling was used to include all eligible records during the study period. Based on previous literature, a minimum sample size was estimated; because of feasibility constraints, 45 twin pregnancies (90 neonates) were available for analysis. The study was therefore considered exploratory and descriptive.

Data collection:
Data were retrieved from hospital records using a structured data collection form. Information included:
[1] Maternal variables: age, parity, comorbidities, gestational age, mode of delivery
[2] Steroid-related variables: type of corticosteroid, timing, completeness of course
[3] Neonatal variables: birth weight, Apgar score, respiratory outcomes, NICU stay

Outcome measures:
The primary outcome was neonatal respiratory morbidity, defined as:
[1] Respiratory distress syndrome
[2] Requirement for respiratory support
[3] Need for surfactant therapy
Secondary outcomes included hypoglycaemia, sepsis, intraventricular haemorrhage, necrotizing enterocolitis and mortality.

Statistical analysis:
All data were entered into a structured database and analysed using the Statistical Package for the Social Sciences (SPSS) software, version 23.0 (IBM Corp., Armonk, NY, USA). As this study was descriptive in nature, only descriptive statistical methods were applied. Categorical variables were summarized as frequencies and percentages, while continuous variables were presented as ranges and measures of central tendency where appropriate. No inferential statistical tests were performed, as the primary objective of the study was to describe maternal characteristics, antenatal corticosteroid exposure patterns and neonatal outcomes in late-preterm twin pregnancies.

Results:

A total of 45 late-preterm twin pregnancies comprising 90 neonates were included. **Table 1** presents neonatal outcomes according to antenatal corticosteroid exposure and other clinical characteristics. Seventy-two neonates (80.0%) were exposed to antenatal corticosteroids and 18 (20.0%) were unexposed. Respiratory distress syndrome occurred in 40.3% of exposed neonates and 44.4% of unexposed neonates. CPAP use was 45.8% and 44.4%, respectively, while surfactant therapy was required in 18.1% and 16.7%. NICU admission occurred in 65.3% of exposed neonates and 72.2% of unexposed neonates. Hypoglycaemia and sepsis were observed in 11.1% and 33.3% of exposed neonates compared with 16.7% and 38.9% of unexposed neonates. Descriptive analysis by chorionicity showed higher rates of respiratory distress syndrome, CPAP use, NICU admission, hypoglycaemia and sepsis among monochorionic diamniotic twins than among dichorionic twins; however, the monochorionic subgroup was small. Higher neonatal morbidity rates were also observed descriptively in pregnancies complicated by pregnancy-induced hypertension or premature rupture of membranes. Twin A and Twin B had broadly similar respiratory outcomes. Because no inferential statistical tests were performed, these between-group differences should be interpreted as descriptive patterns rather than evidence of treatment effects or associations. **Table 1** summarizes 90 neonates from 45 twin pregnancies. Of 72 corticosteroid-exposed neonates, 29 (40.3%) developed respiratory distress syndrome and 47 (65.3%) were admitted to NICU; corresponding values among 18 unexposed neonates were 8 (44.4%) and 13 (72.2%). CPAP use was nearly equal (45.8% versus 44.4%), while surfactant exposure was 18.1% versus 16.7%. Hypoglycaemia affected 11.1% versus 16.7% and sepsis 33.3% versus 38.9%. Of 86 DCDA neonates, 40.7% had respiratory distress and 65.1% were admitted to NICU, compared with 50.0% and 100% among only four MCDA neonates. The twin-order, PIH and PROM comparisons are descriptive and should not be interpreted causally; two neonates from the same pregnancy are correlated observations.

Table 1: Cross-tabulation of maternal characteristics, antenatal corticosteroid exposure and neonatal outcomes in late-preterm twin pregnancies (n = 45; 90 neonates)

Variable	Category	n	RDS n (%)	CPAP n (%)	Surfactant n (%)	NICU n (%)	Hypoglycaemia n (%)	Sepsis n (%)
ACS Exposure	Yes	72	29 (40.3)	33 (45.8)	13 (18.1)	47 (65.3)	8 (11.1)	24 (33.3)
	No	18	8 (44.4)	8 (44.4)	3 (16.7)	13 (72.2)	3 (16.7)	7 (38.9)
Chronicity	DCDA	86	35 (40.7)	39 (45.3)	15 (17.4)	56 (65.1)	10 (11.6)	29 (33.7)
	MCDA	4	2 (50.0)	2 (50.0)	1 (25.0)	4 (100.0)	1 (25.0)	2 (50.0)
Maternal Comorbidity	PIH	12	6 (50.0)	5 (41.7)	2 (16.7)	9 (75.0)	2 (16.7)	5 (41.7)
	PROM	20	9 (45.0)	9 (45.0)	3 (15.0)	14 (70.0)	3 (15.0)	8 (40.0)
	None	58	22 (37.9)	27 (46.6)	11 (19.0)	37 (63.8)	6 (10.3)	18 (31.0)
Twin Order	Twin A	45	18 (40.0)	20 (44.4)	8 (17.8)	29 (64.4)	4 (8.9)	15 (33.3)
	Twin B	45	19 (42.2)	21 (46.7)	8 (17.8)	31 (68.9)	7 (15.6)	16 (35.6)

Discussion:

This retrospective descriptive study examined neonatal outcomes among late-preterm twins according to antenatal corticosteroid exposure. Respiratory morbidity and NICU use were common in the cohort and the exposed group showed numerically lower rates of respiratory distress syndrome, NICU admission, hypoglycaemia and sepsis than the unexposed group. Because no inferential testing or multivariable adjustment was performed, these differences should be interpreted as descriptive patterns rather than evidence of treatment effect. Rates of CPAP and surfactant use were similar between exposure groups, suggesting that any potential respiratory benefit could not be established from these data alone **[12].** Chorionicity and maternal comorbidity also appeared clinically relevant. Monochorionic diamniotic twins had numerically higher rates of respiratory distress, NICU admission, hypoglycaemia and sepsis than dichorionic twins; however, the monochorionic subgroup was small, limiting precision. Shared placental circulation and other pregnancy-specific complications can contribute to higher morbidity in monochorionic gestations **[5, 6].** Neonates born to mothers with pregnancy-induced hypertension or premature rupture of membranes also showed higher descriptive morbidity, reinforcing that maternal and obstetric factor may confound simple comparisons based on ACS exposure **[7, 8].** Outcomes were broadly similar between first- and second-born twins, with only small numerical differences in NICU admission and hypoglycaemia **[9, 10].** No intraventricular haemorrhage, necrotizing enterocolitis, or mortality occurred in this sample.

The present findings should be interpreted alongside newer evidence specific to late-preterm twins. Recent observational studies continue to report heterogeneous results, reflecting differences in gestational age, timing and completeness of the steroid course, chorionicity, maternal indications for delivery and outcome definitions **[13, 14].** Importantly, a multicentre randomized clinical trial published in 2025 directly evaluated antenatal betamethasone in women with twin pregnancies at risk of late-preterm delivery, strengthening the evidence base beyond earlier extrapolation from singleton trials **[15].** Contemporary twin-specific cohort data likewise emphasize the need to consider treatment timing and baseline obstetric risk when interpreting neonatal respiratory outcomes **[16–18].** Additional late-preterm twin cohorts have yielded mixed associations between antenatal corticosteroid exposure and neonatal outcomes, underscoring the influence of dosing-to-delivery interval, chorionicity and gestational-age selection and the limitations of unadjusted descriptive comparisons. **[19-21]**. The principal limitations are the small single-centre sample, retrospective data quality, unequal exposure groups and absence of inferential or adjusted analyses. Timing and course

completeness could not be analysed consistently. Accordingly, causal statements about ACS effectiveness are not justified. Larger prospective or randomized studies with adjustment for gestational age, chorionicity, maternal disease, delivery indication, steroid-to-delivery interval and course completeness are required to define the balance of respiratory benefit and metabolic risk in late-preterm twin gestations.

Conclusion:
Late-preterm twins had substantial respiratory morbidity and NICU use. Corticosteroid-exposed infants showed only descriptive outcome differences. Larger adjusted studies are needed to determine treatment effects.

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