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Neonatal Outcomes of Preterm Infants <32 Weeks in India: A Single-Centre Prospective Study

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Abstract

Background: Data on neonatal outcomes of preterm infants born before 32 weeks' gestation in India are limited.
Objective: To evaluate neonatal outcomes in preterm neonates below 32 weeks' gestational age.
Methods: This prospective observational study included 205 preterm neonates (26–32 weeks' gestation) admitted to a tertiary care NICU. Neonates were observed for major complications, including bronchopulmonary dysplasia (BPD ≥ stage 2), intraventricular hemorrhage (IVH ≥ grade 2), retinopathy of prematurity (ROP; overall and treatment-requiring), air leaks, and hemodynamically significant patent ductus arteriosus (hsPDA) requiring treatment, along with all-cause mortality.
Results: The mean birth weight was 1237.9 ± 328.9 g, and the mean gestational age was 30.1 ± 1.9 weeks (range 26–32.9). Males constituted 55.6% of the cohort, and 16.6% were small for gestational age. Antenatal steroids and antepartum antibiotics were received by 54.2% and 43.4% of mothers, respectively, while 10.2% had gestational diabetes mellitus. Vaginal delivery occurred in 49% of cases, and 36% of neonates required resuscitation at birth. At 36 weeks' postmenstrual age, 0.5% of infants required supplemental oxygen. Air leaks were noted in 1.5%, hsPDA in 4.4%, and ROP in 3.4% of neonates, with none requiring treatment. There were no cases of IVH or postnatal steroid use. The overall mortality rate was 4.4%, and the mean duration of hospital stay was 34.3 ± 17.2 days.
Conclusions: Preterm neonates born between 26–32 weeks' gestation demonstrated high survival with low rates of major morbidities, reflecting favorable outcomes with optimal tertiary neonatal care in India

Keywords: BPD, preterm, CPAP, ROP, IVH, hsPDA

Introduction

Neonatal morbidity continues to be a major global health burden. However, data on neonatal outcomes from our part of the world remain limited. [1] The burden of newborn deaths worldwide is substantial, with India ranking first among the top ten countries contributing the highest number (in thousands) of neonatal deaths in 2019. [2] Neonatal mortality constitutes the largest share of the infant mortality rate, underscoring the vulnerability of this period of life and the need for optimal care. Neonates represent the most fragile population, requiring meticulous and specialized management. The effectiveness of newborn intensive care has been well established with the advent of evidence-based medicine, leading to significant improvements in survival and outcomes. [3] Targeted epidemiological strategies focusing on perinatal disorders have shown measurable progress. In this context, the World Health Organization (WHO) emphasizes the importance of strengthening health systems, program tracking, and accountability to ensure that every new-born is counted and cared for. [2]

Material and methods

Subjects and settings. The study was conducted over a duration of 20 months, from September 2023 to April 2025 at Lady Hardinge Medical College New Delhi, a tertiary care Neonatal center and included preterm neonates between 26 to 32 weeks of gestation who got admitted for various reasons in neonatal ICU. Gestation was determined as a best estimate by Last Menstrual Period (LMP), first trimester USG or Expanded New Ballard Score.

Outcome variables and their measurements. Common neonatal morbidities [Bronchopulmonary dysplasia stage ≥ 2 as per revised NICHD classification(4), (iv) intraventricular hemorrhage grade (IVH) ≥ grade 2 as per Volpe's classification(5), (v) Retinopathy of Prematurity (ROP)(6),(vii) air leaks (viii), hemodynamically significant patent ductus arteriosus (hsPDA) (7) requiring treatment (ix) all-cause mortality and (x) total duration of hospital stay (in days).

Sample size calculation and statistical analysis

Sample size:
A convenience sampling method was used. All preterm neonates born at <32 weeks' gestation and admitted to the NICU during the study period were consecutively enrolled.

Statistical analysis:
Descriptive statistics were used for data analysis. Continuous variables are reported as mean (± standard deviation), median, and mode, while categorical variables are expressed as numbers and percentages.

Informed consent:
Written informed consent to participate in the study was obtained from the legal guardians of all enrolled neonates.

Results

A total of 205 infants were included in the analysis, with a **mean birth weight of 1237.92 ± 328.89 g** and a **mean gestational age of 30.06 ± 1.85 weeks** (range: **26–32.86 weeks). Male neonates constituted 55.61% (n=114)** of the study population. **Small for gestational age infants accounted for 16.59% (n=4)**. The **mean maternal age was 28.25 ± 4.74 years**, and **50.24% (n=103)** of mothers were booked. **Antenatal steroids were received by 54.15% (n=111)** of mothers, while **43.41% (n=89)** received antepartum antibiotics. **Gestational diabetes mellitus was present in 10.24% (n=21)** of pregnancies. Nearly half of the deliveries were **vaginal (49%, n=49). Fetal distress was noted in 15% (n=15)** of cases, and **36% (n=36)** of neonates required resuscitation at birth.

Regarding outcomes, **oxygen requirement at 36 weeks postmenstrual age was observed in only 0.49% (n=1)** of infants. **Air leak syndromes occurred in 1.46% (n=3)**, while **hemodynamically significant PDA was noted in 4.39% (n=9). Any stage ROP was seen in 3.41% (n=7)**, with **no infant requiring treatment.** Importantly, there were **no cases of IVH** and **no use of postnatal steroids**. The **overall mortality rate was 4.39% (n=9).** The **mean duration of hospital stay was 34.26 ± 17.21 days**, indicating a moderate length of neonatal intensive care admission

DISCUSSION

The gestational age range of the study population was 26-32 weeks. Previous studies on neonatal morbidities have included a broader range of gestational ages, extending from as early as 25 weeks upto 36 weeks like Dargaville et al.(8) (25 to 28 weeks), Anand et al.(9) (26 to 34weeks), Gallup et al.(10) (27 to 36 weeks) and Fanjul et al.(11) (28 to 31 weeks), Gallup et al.(10) (27 to 36 weeks) and Fanjul et al.(11) (28 to 31 weeks).

The birth weight in our study was 1237.92 ± 328 grams which was lesser than that reported by Anand et al.(9) (1368 g), however gestational age range for Anand et al.(9) was greater (26-34weeks). Dargaville et al.(8) observed a mean birth weight of 929 grams in a younger gestational age range of (25-28weeks). Gallup et al.(10) observed a mean birth weight of 1848 grams with gestational age range of (27-36weeks) and Fanjul et al.(11) observed a mean birth weight of 1500 grams with gestational age range of (28 to 31 weeks), hence mean birth weight aligns with the gestational age of cohorts studied.

Antenatal corticosteroids are known to reduce the risk of neonatal morbidities, with coverage rates exceeding 90% in HICs. In our cohort, antenatal steroid use was higher than previously reported rates from LMICs—22% in Mishra et al.(12) and 37.8% in Anand et al.(9) yet remained lower than the 90% coverage reported by Fanjul et al.(11) in HICs. This underscores the

persistent disparity in perinatal care between high- and low-resource settings.

In resource-constrained settings such as those in many developing countries, optimal utilization of hospital resources remains a key limiting factor in the delivery of quality neonatal care. The incidence of BPD was very low (1 case), likely due to the relatively mature gestational age (>26 weeks) and low-risk profile of our cohort. Larger LISA trials with more immature infants reported higher BPD rates (Dargaville et al(8): 26.5%; Kribs et al.(13): 19.4%). No infant developed IVH ≥ Grade II. This may reflect the inclusion of more mature neonates and use of standard neuroprotective strategies. ROP occurred in 3.4% of infants, with no case requiring treatment and no difference between groups. Prior studies reported higher ROP rates, especially in more immature populations (Kribs et al(13); Kanmaz et al(14)). The low incidence here likely reflects shorter oxygen exposure. Pneumothorax was seen in 1.46%, similar to rates in other LISA studies (Mehler et al(15): 1.8%;). There were 9 deaths:(EONS: 7; LONS: 1; NEC: 1). Mean hospital stay was 34 days. Discharge readiness, based on weight (≥1.4 kg), PMA (≥34 weeks), and feeding milestones, appeared to drive discharge timing more than respiratory outcomes

Strengths and limitations of the study:

This study demonstrates strong adherence to standardized protocols within a single-center setting, ensuring uniformity in clinical management and data collection. However, the single-center design and reliance on unit-specific practices limit the generalizability of the findings to other settings.

Conclusion:

Neonatal outcomes at our center are comparable to those reported from other parts of the world, reflecting effective protocol adherence and the application of evidence-based neonatal care.

Table 1: Baseline characteristics of enrolled neonates

Baseline characteristics	**Values**
Weight in grams(Mean ± SD)	1237.92 ± 328.89
Gestational age in weeks Mean ± SD(Range)	30.06 ± 1.85(26-32.86)
Male n(%)	114 (55.61%)
Small for Gestational age n(%)	4 (16.59%)
Maternal age(mean)	28.25 ± 4.74
Booked n(%)	103 (50.24%)
Complete Antenatal steroids n(%)	111 (54.15%)

Antepartum antibiotics n(%)	89 (43.41%)
GDM n(%)	21 (10.24%)
Vaginal delivery n(%)	49 (49%)
Fetal distress n(%)	15 (15%)
Required resuscitation n(%)	36 (36%)

Table 2: Outcomes of the study

Outcome variable	Number(percentage)
Require oxygen at 36 weeks n(%)	1 (0.49%)
Any air leak n(%)	3 (1.46%)
Any HsPDA n(%)	9 (4.39%)
Any ROP n(%)	7 (3.41%)
ROP requiring treatment n(%)	0 (0%)
Postnatal steroids n(%)	0 (0%)
IVH n(%)	0 (0%)
Death n(%)	9 (4.39%)
Hospital stay in days(Mean ± SD)	34.26 ± 17.21

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