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Original Research Article

Determinants of Preterm Delivery and Associated Neonatal Outcomes: Evidence from a Prospective NICU-Based Study

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Abstract

Background: Preterm birth (PTB) is a leading cause of neonatal morbidity and mortality. India contributes a large proportion of global preterm births. This study assessed the incidence, maternal risk factors, and neonatal outcomes of preterm infants admitted to a tertiary-care NICU.

Methods: A prospective observational study conducted from February 2023 to Dec 2024 in the NICU of a tertiary-care hospital in Bhuj, Gujarat. All admitted preterm neonates (<37 weeks) were evaluated for maternal risk factors, complications, and outcomes.

Results: Among 4,796 deliveries, 562 were preterm (11.7%). Of 100 enrolled neonates, 58% were male and 51% were late preterm. Maternal anemia (52%), PIH (14%), hypothyroidism (10%), GDM (9%), and APH (8%) were common risk factors. Hyaline membrane disease (41%) and sepsis (36%) were the leading complications. Survival was 84%, with 16% mortality.

Conclusion: PTB incidence was high, with anemia and hypertensive disorders as major determinants. Respiratory distress and sepsis contributed significantly to morbidity. Strengthening antenatal care and NICU capacity is essential.

Keywords: Preterm Neonates; Maternal Risk Factors; Neonatal Outcomes; Prematurity; India.

Introduction

Preterm birth (PTB), defined as delivery before 37 completed weeks of gestation, remains a global public health challenge. According to the World Health Organization, nearly 15 million neonates are born prematurely each year, with India alone contributing approximately 3.5 million of these births.

Preterm infants face elevated risks of respiratory distress syndrome, neonatal sepsis, intraventricular hemorrhage, retinopathy of prematurity, and long-term neurodevelopmental impairment. Maternal factors such as anemia, hypertensive disorders of pregnancy, gestational diabetes mellitus (GDM), thyroid dysfunction, infections, and inadequate antenatal care significantly influence the risk of PTB. Despite improvements in neonatal care, preterm-related complications remain one of the leading causes of neonatal mortality in low- and middle-income countries, including India. This study was conducted to determine the local incidence of preterm births in a tertiary-care center, identify prevalent maternal risk factors, and describe neonatal complications and outcomes.

Materials and Methods

Study Design: Prospective observational study.

Study Period: February 2023 – Dec 2024.

Study Setting: NICU, Department of Pediatrics, GAIMS, GK General Hospital, Bhuj.

Sample Size: 100 preterm neonates.

Inclusion Criteria: Neonates born between 26–36+6 weeks of gestation.

Exclusion Criteria: <26 weeks or >37 weeks gestational age.

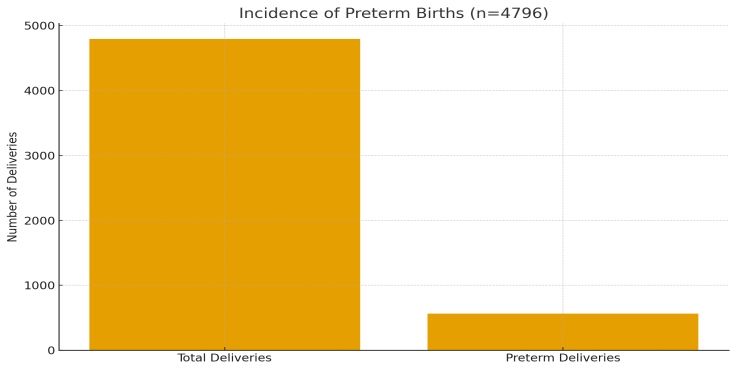
Data Collection: Maternal sociodemographic details, antenatal risk factors, delivery mode, neonatal anthropometry, APGAR scores, complications, and outcomes were recorded. Gestational age was assessed by LMP and Ballard scoring.

Ethical Considerations: Approved by the Institutional Ethics Committee; written informed consent obtained.

Statistical Analysis: Performed using SPSS v25. Results expressed as means, standard deviations, frequencies, and percentages.

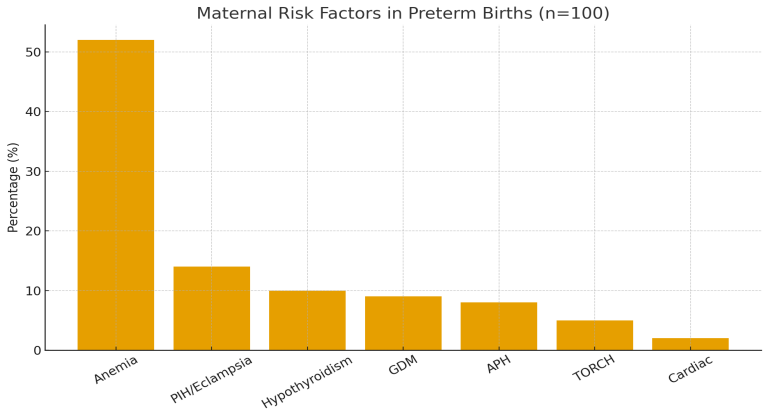
Results

A total of 4,796 deliveries occurred during the study period, of which 562 were preterm, yielding an incidence rate of 11.7%. (Graph1)



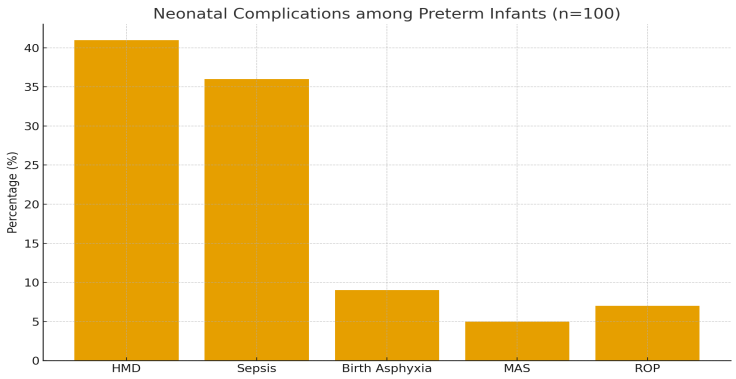
Graph 1: Incidence of Preterm Births

Among the 100 preterm neonates enrolled, 58% were male and 42% female. More than half of the cohort (51%) comprised late-preterm infants (>34 weeks), followed by moderate preterm (32–34 weeks) and very preterm infants (<32 weeks). Maternal risk factors contributing to preterm birth in the study population included anemia in 52% of mothers, pregnancy-induced hypertension (14%), hypothyroidism (10%), gestational diabetes mellitus (9%), and antepartum hemorrhage (8%). TORCH infections were documented in 5% of cases. (Graph 2)



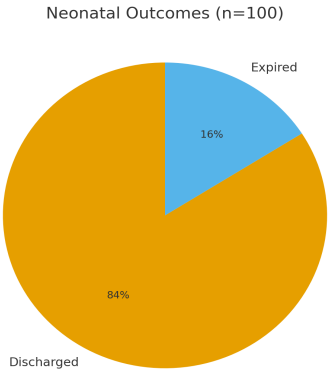
Graph 2: Maternal Risk Factors in Preterm Births

Regarding neonatal morbidity, hyaline membrane disease (HMD) was the most frequently observed complication and was present in 41% of neonates. Sepsis was diagnosed in 36%, while birth asphyxia (9%) and meconium aspiration syndrome (5%) were less common. Retinopathy of prematurity was detected in 7% of infants. Additionally, 11% of neonates required resuscitation at birth. (Graph 3)



Graph 3: Neonatal Complications among Preterm Infants

Overall survival was 84%, whereas the mortality rate among preterm neonates was 16 %. (Graph 4)



Graph 4: Neonatal Outcomes

Discussion

The incidence of PTB in the present study (11.7%) is consistent with previous Indian studies reporting rates between 10–14% (Rao et al., 2014) [2]. The male preponderance observed aligns with findings suggesting increased vulnerability of male neonates due to differential hormonal and immunological responses (Goldenberg et al., 2008) [3]. Maternal anemia was the leading risk factor in our cohort, consistent with Indian data showing high anemia burden among pregnant women and its association with placental insufficiency and PTB (Kalaivani, 2009) [4]. Hypertensive disorders and GDM were also prominent contributors, echoing the findings of Sibai (2012) [5] and Bonomo et al. (2015) [6], who reported increased PTB risk in such high-risk pregnancies.

Respiratory morbidity, particularly hyaline membrane disease, affected 41% of preterm infants, comparable to studies from other low-resource settings (Stoll et al., 2015) [7]. Neonatal sepsis (36%) was another major morbidity, highlighting persistent infection control challenges in NICUs across India (Sharma et al., 2016) [8]. The mortality rate of 16% in this study aligns [9,10] with national estimates for preterm infants in tertiary-care settings. Improvements in antenatal care coverage, early identification of maternal comorbidities, and enhanced NICU infrastructure are vital to reduce PTB-related mortality.

Conclusion

Preterm births accounted for a substantial proportion of neonatal admissions. Maternal anemia, PIH, and GDM were major determinants. Hyaline membrane disease and sepsis were significant contributors to morbidity. Improving antenatal services and NICU capacity remains essential for reducing preterm-related mortality.

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