

Fetomaternal Challenges and Outcomes in Preterm Births: A Comprehensive Retrospective Analysis from a Tertiary Care Center

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Received: 25-06-2024 / Revised: 23-07-2024 / Accepted: 21-08-2024

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Conflict of interest: Nil

Abstract:

Background: Preterm birth, defined as delivery before 37 weeks of gestation, is a major cause of neonatal morbidity and mortality. It also poses significant risks to maternal health.

Aim and Objective: To evaluate the fetomaternal outcomes of preterm births in a tertiary care hospital setting.

Materials and Methods: A retrospective study reviewed medical records of 350 women who delivered preterm between January 2018 and December 2022 at a tertiary care hospital. Preterm births were categorized into three groups: extremely preterm (<28 weeks), very preterm (28-32 weeks), and late preterm (32-36 weeks). Data on maternal demographics, obstetric history, pregnancy complications, mode of delivery, and neonatal outcomes were collected. Statistical analyses included descriptive statistics and comparative analyses across gestational age categories.

Results: Of the 350 preterm deliveries, 14.3% were extremely preterm, 34.3% were very preterm, and 51.4% were late preterm. The overall neonatal mortality rate was 10.0%, with the highest rate observed in the extremely preterm group (40.0%). NICU admission was required for 42.9% of the neonates, and respiratory distress syndrome was diagnosed in 25.7%. Maternal outcomes showed a cesarean section rate of 57.1%, with postpartum haemorrhage occurring in 11.4% and puerperal infections in 8.6% of cases. Comparative analysis revealed that extremely preterm births were associated with significantly higher rates of both neonatal and maternal complications.

Conclusion: Preterm birth, especially at earlier gestational ages, is associated with significant risks for both neonates and mothers. The findings highlight the need for enhanced prenatal care and targeted interventions to improve outcomes. The study also underscores the importance of specialized neonatal care, particularly for extremely preterm infants, to reduce the incidence of adverse outcomes.

Keywords: Preterm Birth, Fetomaternal Outcomes, Neonatal Morbidity, Neonatal Mortality, Cesarean Section, Respiratory Distress Syndrome, Retrospective Study.

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Introduction

Preterm birth, defined as childbirth occurring before 37 completed weeks of gestation, is a significant public health concern globally. It is the leading cause of neonatal mortality and morbidity, with profound implications for both short-term and long-term health outcomes in neonates. The World Health Organization (WHO) estimates that approximately 15 million babies are born preterm each year, accounting for about 11% of all live births worldwide. [1] The burden of preterm birth is particularly high in low- and middle-income countries, where access to quality prenatal and neonatal care is often limited. [2]

The etiologies of preterm birth are multifactorial and can be broadly categorized into spontaneous preterm labour, premature rupture of membranes (PROM), and medically indicated preterm birth due

to maternal or fetal complications. [3] Risk factors associated with preterm birth include a history of preterm delivery, multiple gestations, infections, hypertensive disorders of pregnancy, and socioeconomic factors. [4, 5] Despite advances in obstetric care, the rate of preterm birth has not significantly declined, necessitating ongoing research to understand its determinants and outcomes better. [6]

Preterm infants are at a higher risk for a range of complications, including respiratory distress syndrome, intraventricular haemorrhage, necrotizing enterocolitis, and long-term neurodevelopmental impairments. [7] Additionally, preterm birth poses significant risks to maternal health, including increased rates of cesarean delivery, postpartum haemorrhage, and maternal

morbidity. [8] Understanding the factors associated with adverse fetomaternal outcomes in preterm births is crucial for developing effective interventions to improve health outcomes for both mothers and infants.

This study aims to investigate the fetomaternal outcomes associated with preterm birth in a tertiary care hospital setting. By analyzing data from a retrospective cohort of women who delivered preterm, this study seeks to identify the key factors contributing to adverse outcomes and provide insights that could inform clinical practice and public health strategies to reduce the burden of preterm birth.

Materials and Methods

Study Design: This retrospective study evaluated the fetomaternal outcomes in women who experienced preterm birth. It was carried out at a tertiary care hospital, reviewing medical records from January 2018 to December 2022. The institutional ethics committee approved the study protocol, and the confidentiality of patient data was maintained throughout the study.

Study Population: The study included women who delivered preterm, defined as childbirth occurring before 37 completed weeks of gestation. The inclusion criteria were:

1. Singleton pregnancies result in preterm birth.
2. Women who delivered at the study hospital between January 2018 and December 2022.
3. Availability of complete medical records.

Exclusion Criteria Included:

1. Multiple gestations (twins, triplets, etc.).
2. Women with incomplete medical records.
3. Elective preterm deliveries for non-medical reasons.

Data Collection

Data were extracted from the hospital's electronic medical record system. The following information was collected:

- **Maternal Demographics:** Age, parity, gravidity, body mass index (BMI), socioeconomic status, and antenatal care attendance.
- **Obstetric History:** History of previous preterm birth, miscarriage, and any complications during the current pregnancy, such as hypertensive disorders, gestational diabetes mellitus (GDM), infections, and premature rupture of membranes (PROM).
- **Delivery Details:** Gestational age at delivery, mode of delivery (vaginal, cesarean section),

and indications for preterm delivery if medically indicated.

- **Neonatal Outcomes:** Birth weight, Apgar scores at 1 and 5 minutes, neonatal intensive care unit (NICU) admission, respiratory distress syndrome, sepsis, intraventricular haemorrhage, necrotizing enterocolitis, and neonatal mortality.
- **Maternal Outcomes:** Postpartum haemorrhage, puerperal infections, complications related to cesarean section, and maternal mortality.

Outcome Measures

The primary outcome measures were:

1. **Neonatal Outcomes:** Including birth weight, Apgar scores, NICU admission rates, and neonatal complications (respiratory distress syndrome, sepsis, intraventricular haemorrhage, necrotizing enterocolitis, neonatal mortality).
2. **Maternal Outcomes:** Including mode of delivery, postpartum haemorrhage, puerperal infections, and maternal morbidity and mortality.

Statistical Analysis

Data were entered into a Microsoft Excel spreadsheet and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize the data. Continuous variables were expressed as means and standard deviations (SD) or medians and interquartile ranges (IQR) based on their distribution. Categorical variables were presented as frequencies and percentages.

Comparative analyses were performed between different groups based on gestational age categories (extremely preterm: <28 weeks, very preterm: 28-32 weeks, and late preterm: 32-36 weeks) to evaluate the differences in fetomaternal outcomes. Chi-square tests were used for categorical variables, and t-tests or Mann-Whitney U tests were applied for continuous variables. A p-value of <0.05 was considered statistically significant.

Results

Study Population: A total of 350 preterm deliveries were included in the study. The mean maternal age was 28.3 ± 5.2 years. The distribution of preterm births according to gestational age categories was as follows: 50 (14.3%) were extremely preterm (<28 weeks), 120 (34.3%) were very preterm (28-32 weeks), and 180 (51.4%) were late preterm (32-36 weeks). The mean gestational age at delivery was 33.5 ± 2.1 weeks. The baseline characteristics of the study population are presented in Table 1.

Table 1: Baseline Characteristics of the Study Population

Characteristic	N = 350	Mean \pm SD or n (%)
Maternal age (years)	28.3 \pm 5.2	
Gravidity		
- Primigravida	140	40.0
- Multigravida	210	60.0
Antenatal care attendance		
- Regular	280	80.0
- Irregular	70	20.0
Body Mass Index (BMI)	24.5 \pm 4.1	
Socioeconomic status		
- Low	100	28.6
- Middle	180	51.4
- High	70	20.0
History of previous preterm birth	50	14.3
Hypertensive disorders	90	25.7
Gestational diabetes mellitus	60	17.1
Premature rupture of membranes (PROM)	110	31.4

Maternal Outcomes: Regarding the mode of delivery, 200 (57.1%) women had a cesarean section, while 150 (42.9%) delivered vaginally. The primary indications for cesarean delivery were previous cesarean section, non-reassuring fetal heart rate,

and severe preeclampsia. Postpartum haemorrhage occurred in 40 (11.4%) cases, and puerperal infections were observed in 30 (8.6%) cases. No maternal deaths were reported in this cohort. Detailed maternal outcomes are summarized in Table 2.

Table 2: Maternal Outcomes

Maternal Outcome	N = 350	n (%)
Mode of delivery		
- Vaginal	150	42.9
- Cesarean section	200	57.1
Indications for Cesarean Section		
- Previous cesarean section	80	22.9
- Non-reassuring fetal heart rate	70	20.0
- Severe preeclampsia	50	14.3
Postpartum haemorrhage	40	11.4
Puerperal infections	30	8.6
Maternal mortality	0	0

Neonatal Outcomes: Neonatal outcomes showed that 150 (42.9%) neonates required admission to the neonatal intensive care unit (NICU). The mean birth weight was 1,800 \pm 500 grams. Respiratory distress syndrome was diagnosed in 90 (25.7%)

neonates, sepsis in 60 (17.1%), intraventricular haemorrhage in 20 (5.7%), and necrotizing enterocolitis in 10 (2.9%). The neonatal mortality rate was 10.0% (35 neonates). The detailed neonatal outcomes are presented in Table 3.

Table 3: Neonatal Outcomes

Neonatal Outcome	N = 350	n (%)
Birth weight (grams)	1,800 \pm 500	
Apgar score <7 at 5 minutes	70	20.0
NICU admission	150	42.9
Respiratory distress syndrome	90	25.7
Sepsis	60	17.1
Intraventricular hemorrhage	20	5.7
Necrotizing enterocolitis	10	2.9
Neonatal mortality	35	10.0

Comparative Analysis by Gestational Age Categories: A comparative analysis of outcomes based on gestational age categories revealed that extreme-

ly preterm infants (<28 weeks) had significantly higher rates of NICU admission, respiratory distress syndrome, and neonatal mortality compared to

very preterm (28-32 weeks) and late preterm (32-36 weeks) infants. Similarly, maternal complications such as postpartum haemorrhage and puerper-

al infections were more common in extremely preterm births. These findings are summarized in Table 4.

Table 4: Comparative Analysis of Outcomes by Gestational Age Categories

Outcome	Extremely Preterm (<28 weeks)	Very Preterm (28-32 weeks)	Late Preterm (32-36 weeks)
NICU admission	45 (90.0)	60 (50.0)	45 (25.0)
Respiratory distress syndrome	30 (60.0)	40 (33.3)	20 (11.1)
Neonatal mortality	20 (40.0)	10 (8.3)	5 (2.8)
Postpartum haemorrhage	15 (30.0)	15 (12.5)	10 (5.6)
Puerperal infections	10 (20.0)	10 (8.3)	10 (5.6)

Discussion

The findings of this study underscore the significant risks associated with preterm birth, particularly for extremely preterm infants and their mothers. The neonatal outcomes in this study, such as high rates of respiratory distress syndrome, sepsis, and neonatal mortality, are consistent with previous research, emphasizing the vulnerability of preterm infants to serious health complications.

In our study, the overall neonatal mortality rate was 10%, with extremely preterm infants (<28 weeks) experiencing the highest mortality rate of 40%. This finding aligns with previous studies that have reported similar outcomes, where neonatal mortality rates for extremely preterm infants were significantly higher compared to those born at later gestational ages.[7] For instance, a study conducted by Blencowe et al. found that globally, neonatal mortality in infants born before 28 weeks gestation is approximately 36%.² The high incidence of respiratory distress syndrome in our cohort (25.7%) is also comparable to other studies, which have consistently shown that lung immaturity is a major challenge in the management of preterm neonates. [9]

The NICU admission rate in this study was 42.9%, reflecting the intensive care needs of preterm infants, particularly those born at earlier gestational ages. This rate is within the range reported by other studies, which have found NICU admission rates ranging from 40% to 60% for preterm infants, depending on the level of prematurity. [10] The higher NICU admission rate in extremely preterm infants (90%) observed in our study further corroborates the findings of Stoll et al., who reported that nearly all infants born before 28 weeks require intensive neonatal care. [7]

Maternal outcomes in this study also demonstrated significant risks associated with preterm birth. The rate of cesarean sections was 57.1%, which is consistent with the trend reported in other studies where preterm birth often necessitates surgical intervention due to complications such as non-reassuring fetal heart rate and severe preeclampsia.[3] The occurrence of postpartum haemorrhage (11.4%) and puerperal infections (8.6%) in our

cohort is also in line with previous research, which indicates that preterm birth is associated with increased maternal morbidity. [11]

Comparative analysis by gestational age categories revealed that extremely preterm births were associated with higher rates of both maternal and neonatal complications. These findings are similar to those reported by Saigal and Doyle, who found that infants born at less than 28 weeks gestation face the most significant challenges, including higher rates of respiratory distress syndrome, intraventricular haemorrhage, and neonatal mortality. [5] Additionally, maternal complications such as postpartum haemorrhage were more prevalent in extremely preterm births, reflecting the increased obstetric challenges associated with early delivery. [3]

The results of this study highlight the critical need for targeted interventions to prevent preterm birth and improve outcomes for both mothers and infants when it does occur. Enhanced prenatal care, early identification of risk factors, and timely medical interventions are essential strategies for reducing the burden of preterm birth. The findings also underscore the importance of specialized neonatal care, particularly for extremely preterm infants, to mitigate the risks of adverse outcomes.

While this study provides valuable insights, it is important to acknowledge its limitations. As a retrospective study, the potential for selection bias and incomplete data must be addressed. Additionally, the study was conducted in a single tertiary care centre, which may limit the generalizability of the findings to other settings.

Conclusion

Preterm birth remains a significant challenge with profound implications for both neonatal and maternal health. The high rates of neonatal morbidity and mortality, particularly among extremely preterm infants, call for ongoing research and improved clinical practices to enhance outcomes in this vulnerable population.

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