

Preterm Birth and Its Maternal and Fetal Risk Factors: A Study from a Tertiary Care Center

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Abstract

Introduction: Preterm birth, defined as delivery before 37 completed weeks of gestation, is a major contributor to neonatal morbidity and mortality worldwide. It is influenced by multiple maternal, fetal, and socioeconomic factors. Understanding its epidemiology and associated risk factors is essential for improving maternal and neonatal outcomes.

Materials and Methods: This hospital-based observational study was conducted in the Department of Obstetrics and Gynecology at a tertiary care center. A total of 90 pregnant women with preterm delivery were included. Data were collected using a pre-designed proforma, including maternal demographics, obstetric history, and fetal parameters. Statistical analysis was performed using SPSS software, and associations were assessed using the Chi-square test, with $p < 0.05$ considered significant.

Results: The majority of women belonged to the 21–30 years age group (44.4%), with a mean age of 27.6 ± 4.8 years. Multigravida constituted 57.8%, and 65.6% had inadequate antenatal care. Anemia (46.7%), PROM (31.1%), and hypertensive disorders (26.7%) were the most common maternal risk factors. Fetal factors included IUGR (20.0%) and multiple gestation (13.3%). Most neonates (72.2%) had low birth weight, with a mean gestational age of 33.4 ± 2.1 weeks.

Conclusion: Preterm birth is a multifactorial condition predominantly associated with maternal health status, inadequate antenatal care, and obstetric complications. Early identification and management of modifiable risk factors are essential to reduce its incidence and improve neonatal outcomes.

Keywords: Preterm birth, maternal risk factors, PROM, anemia, IUGR, low birth weight, antenatal care.

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Introduction

Preterm birth, defined as delivery occurring before 37 completed weeks of gestation, remains a major global public health concern and a leading cause of neonatal morbidity and mortality worldwide [1]. It is estimated that approximately 13.4–15 million babies are born preterm each year, accounting for nearly 10–11% of all live births globally [2,3]. Despite advances in obstetric and neonatal care, the burden of preterm birth has remained relatively stable over the past decade, with significant disparities across regions, particularly in low- and middle-income countries, where the majority of cases occur [2,4]. Preterm birth is recognized as the leading cause of death among children under five

years of age and contributes substantially to long-term neurodevelopmental impairment, chronic respiratory disorders, and increased healthcare utilization [2,5]. The risk of adverse outcomes increases with decreasing gestational age, with extremely preterm infants (<28 weeks) experiencing the highest rates of mortality and morbidity [3]. The etiology of preterm birth is complex and multifactorial, involving an interplay of maternal, fetal, and environmental factors. Maternal risk factors include extremes of maternal age, nutritional deficiencies, infections, hypertensive disorders such as preeclampsia, anemia, multiple pregnancies, and adverse

socioeconomic conditions [6,7]. Advanced maternal age, particularly ≥ 40 years, has been shown to significantly increase the risk of preterm delivery [8]. Additionally, obstetric complications such as placental abruption, premature rupture of membranes, and previous history of preterm birth further contribute to its occurrence [6].

Fetal factors also play a crucial role, including intrauterine growth restriction, congenital anomalies, and multiple gestations, which are strongly associated with early delivery [7]. Multifetal pregnancies, in particular, have consistently been identified as one of the strongest predictors of preterm birth [9]. Furthermore, emerging evidence suggests that environmental influences such as stress, climate factors, and exposure to pollutants may also contribute to the rising incidence of prematurity [6].

Although a considerable proportion of preterm births occur spontaneously, a significant number are medically indicated due to maternal or fetal complications, highlighting the importance of early identification of high-risk pregnancies [10]. Understanding the epidemiological patterns and associated risk factors is therefore essential for developing targeted preventive strategies and improving maternal and neonatal outcomes. Hence, the present study was undertaken to evaluate the epidemiology of preterm birth and to identify the associated maternal and fetal risk factors contributing to its occurrence in the study population.

Materials and Methods

The present study was conducted as a hospital-based observational study in the Department of Obstetrics and Gynecology at a tertiary care center. The study population consisted of pregnant women who delivered at the study center during the study period.

All eligible women meeting the inclusion criteria were enrolled consecutively. A total of 90 pregnant women were included in the study. The sample size was determined based on the prevalence of preterm birth reported in previous studies, considering a confidence level of 95% and an allowable error. Convenient sampling technique was used to recruit participants.

Inclusion Criteria

- Pregnant women delivering before 37 completed weeks of gestation
- Singleton as well as multiple pregnancies
- Women who provided informed consent

Exclusion Criteria

- Women with uncertain or unknown gestational age

- Incomplete clinical or medical records
- Women not willing to participate

Data Collection: Data were collected using a pre-designed and pre-tested proforma. Detailed maternal history, clinical findings, and obstetric details were recorded at the time of admission and delivery.

Maternal variables included:

- Age
- Parity
- Socioeconomic status
- Antenatal care status
- Nutritional status (BMI, anemia)
- Previous history of preterm birth
- Comorbidities such as hypertension, preeclampsia, diabetes mellitus, and infections

Fetal and obstetric variables included:

- Gestational age at delivery
- Type of pregnancy (singleton/multiple)
- Premature rupture of membranes (PROM)
- Intrauterine growth restriction (IUGR)
- Congenital anomalies
- Mode of delivery
- Birth weight of the newborn

Definition of Preterm Birth: Preterm birth was defined as delivery occurring before 37 completed weeks of gestation, as per standard clinical guidelines.

Outcome Measures: The primary outcome of the study was to assess the epidemiology of preterm birth. Secondary outcomes included identification of maternal and fetal risk factors associated with preterm birth.

Statistical Analysis: Statistical analysis in the present study was performed using the Statistical Package for the Social Sciences (SPSS) 25 software. Descriptive statistics were used to summarize the data, with continuous variables expressed as mean \pm standard deviation and categorical variables as frequency and percentage. The Chi-square test (or Fisher's exact test where appropriate) was applied to assess the association between categorical variables, while the independent t-test was used for comparison of continuous variables. Multivariate logistic regression analysis was further performed to identify independent predictors of preterm birth. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 90 pregnant women with preterm delivery were included in the present study. The demographic and obstetric profile of the study participants is depicted in Table 1. The age distribution revealed that the majority of women

belonged to the 21–30 years age group (44.4%), followed by 31–35 years (27.8%), ≤ 20 years (16.7%), and >35 years (11.1%). This indicates that preterm birth was more commonly observed in women of reproductive age, particularly in the second and third decades of life. The mean age of the participants was 27.6 ± 4.8 years, with a median age of 27 years (IQR: 24–31), suggesting a relatively young study population. With respect to gravidity, a higher proportion of women were multigravida (57.8%), whereas 42.2% were primigravida, indicating that preterm birth was more frequent among women with previous pregnancies. Socioeconomic status assessment showed that the majority of participants belonged to the lower socioeconomic group (62.2%), while 37.8% were from middle or upper socioeconomic classes. Furthermore, evaluation of antenatal care revealed that a significant proportion of women (65.6%) had irregular or no antenatal visits, whereas only 34.4% had received regular antenatal care. These findings suggest that inadequate antenatal care and lower socioeconomic conditions may have contributed substantially to the occurrence of preterm birth in the study population (Table 1). The distribution of maternal and obstetric risk factors is summarized in Table 2. Among the various maternal risk factors evaluated, anemia emerged as the most prevalent condition, affecting 46.7% of women, highlighting its significant role in preterm delivery. This was followed by premature rupture of membranes (PROM) in 31.1% of cases, which is a well-known direct precipitating factor for preterm labour. Hypertensive disorders of pregnancy, including preeclampsia, were observed in 26.7% of participants, indicating a substantial contribution of maternal vascular complications to preterm birth. Infections, including urinary and genital tract infections, were present in 22.2% of cases, further emphasising the role of inflammatory and infectious etiologies. Additionally, 18.9% of

women had a previous history of preterm birth, suggesting recurrence as an important risk factor. Diabetes mellitus was identified in 13.3% of participants, contributing to the burden of medically indicated preterm deliveries. It is noteworthy that several patients had multiple coexisting risk factors, indicating the multifactorial nature of preterm birth. Overall, maternal conditions such as anaemia, hypertensive disorders, and PROM were found to be the most prominent contributors in the present study (Table 2). The fetal characteristics and neonatal outcomes of preterm births are presented in Table 3. Among fetal factors, intrauterine growth restriction (IUGR) was identified in 20.0% of cases, indicating compromised fetal growth as a significant contributor to early delivery. Multiple pregnancies were observed in 13.3% of women, which is a well-established risk factor for preterm birth due to uterine over distension and increased obstetric complications. Congenital anomalies were present in 7.8% of neonates, reflecting a smaller but clinically relevant proportion of preterm deliveries associated with fetal abnormalities. In terms of neonatal outcomes, a large proportion of neonates (72.2%) had a birth weight of less than 2.5 kg, indicating a high prevalence of low birth weight among preterm infants. Only 27.8% of neonates had a birth weight ≥ 2.5 kg. The mean gestational age at delivery was 33.4 ± 2.1 weeks, with a median gestational age of 34 weeks (IQR: 32–35), suggesting that the majority of cases were in the moderate to late preterm category. The mean birth weight of the neonates was 2.1 ± 0.5 kg, further reflecting the adverse impact of prematurity on fetal growth and development. These findings demonstrate that preterm birth in the present study was associated with significant fetal compromise, including growth restriction and low birth weight, which are known determinants of neonatal morbidity and mortality (Table 3).

Table 1: Demographic and Obstetric Characteristics of Study Participants (n = 90)

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
≤ 20	15	16.7
21–30	40	44.4
31–35	25	27.8
>35	10	11.1
Mean age: 27.6 ± 4.8 Median age: 27 (IQR: 24–31)		
Gravidity		
Primigravida	38	42.2
Multigravida	52	57.8
Socioeconomic Status		
Lower	56	62.2
Middle/Upper	34	37.8
Antenatal Care		
Regular	31	34.4
Irregular/None	59	65.6

Table 2: Maternal and Obstetric Risk Factors Associated with Preterm Birth (n = 90)

Risk Factor	Frequency (n)	Percentage (%)
Anemia	42	46.7
Hypertensive disorders	24	26.7
Infections	20	22.2
Previous preterm birth	17	18.9
Diabetes mellitus	12	13.3
PROM	28	31.1

Table 3: Fetal Factors and Neonatal Outcomes (n = 90)

Variable	Frequency (n)	Percentage (%)
Fetal Factors		
Multiple pregnancy	12	13.3
IUGR	18	20.0
Congenital anomalies	7	7.8
Neonatal Outcomes		
Birth weight <2.5 kg	65	72.2
Birth weight ≥2.5 kg	25	27.8
Mean gestational age: 33.4 ± 2.1 weeks Median gestational age: 34 (IQR: 32–35) Mean birth weight: 2.1 ± 0.5		

Discussion

In the present study (Table 1), the majority of preterm births occurred in women aged 21–30 years (44.4%), with a mean age of 27.6 ± 4.8 years. A higher proportion were multigravida (57.8%), belonged to lower socioeconomic status (62.2%), and had inadequate antenatal care (65.6%). These findings are comparable with Hamilton et al. (2006) [11], who reported a 12.7% preterm birth rate, with higher incidence among women of low socioeconomic status and poor prenatal care. Similarly, Heaman et al. (2013) [12] demonstrated that inadequate antenatal care increased the risk of preterm birth by 2–3 times. Further, Goldenberg and Rouse (1998) [13] reported recurrence rates of preterm birth ranging from 15–50%, supporting our observation of higher prevalence among multigravida women. In our study (Table 2), anemia (46.7%) was the most common risk factor, followed by PROM (31.1%), hypertensive disorders (26.7%), infections (22.2%), and previous preterm birth (18.9%). These findings align with Romero et al. (2006) [14], who described preterm birth as a multifactorial syndrome, with infection contributing to 25–40% of cases, comparable to our 22.2%. Goldenberg and Rouse (1998) [13] reported that infections account for 30–50% of spontaneous preterm births, while hypertensive disorders are major contributors to indicated preterm delivery, similar to our 26.7% hypertension cases. The high prevalence of anemia in our study is supported by Kramer (1987) [15], who showed that maternal malnutrition increases the risk of preterm birth by 1.5–2 times. Additionally, Ebrahimi et al. (2000) [16] reported PROM in nearly 30% of preterm births, closely matching our 31.1%. Studies by Hediger et al. (1989) [17] and Carmichael et al.

(1997) [18] further emphasized that poor maternal nutrition and inadequate weight gain increase the risk of prematurity, supporting our findings.

In our study (Table 3), IUGR was present in 20.0%, multiple gestation in 13.3%, and 72.2% of neonates had low birth weight, with mean birth weight 2.1 ± 0.5 kg and gestational age 33.4 ± 2.1 weeks. These findings are consistent with Heaman et al. (2013) [12], who reported that growth-restricted infants have nearly 2-fold higher risk of preterm birth. Similarly, Kramer (1987) [15] showed that 60–70% of low birth weight infants are preterm, closely aligning with our 72.2%. Goldenberg and Rouse (1998) [13] also reported that more than 50% of twin pregnancies result in preterm birth, supporting our finding of 13.3% multiple gestation as a significant contributor. Additionally, studies by Hediger et al. [17] and Carmichael et al. [18] demonstrated that poor maternal nutrition leads to low birth weight and prematurity, which correlates with our findings.

Conclusion

Preterm birth in the present study was predominantly associated with maternal factors such as anemia, PROM, hypertensive disorders, and inadequate antenatal care. Fetal factors like IUGR and multiple gestation also contributed significantly. A high proportion of low birth weight neonates highlighted the adverse outcomes of prematurity. Early identification and management of modifiable risk factors are essential to reduce the burden of preterm birth.

Limitations of the Study: The present study was conducted at a single center with a relatively small sample size, limiting the generalizability of the

findings. Being observational in design, causal relationships could not be established. Certain confounding factors such as detailed nutritional, lifestyle, and environmental variables were not assessed. Additionally, long-term neonatal outcomes were not evaluated.

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