

# A Prospective Cohort Study of Etiology and Neonatal Outcome of Preterm Labor in a Tertiary-care Hospital Attached to a Medical College

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## ABSTRACT

**Background:** Preterm labor is a major determinant of neonatal mortality and morbidity worldwide, especially in developing countries.

**Aims:** The study aimed at finding out the incidence and the etiological risk factors responsible for preterm labor that could be targeted to reduce its risk.

**Materials and methods:** In this prospective cohort study of 1 year, a total of 440 antenatal patients diagnosed with preterm labor were included and were followed up. In addition to the known risk factors for preterm labor, investigation data, gestational ages, neonatal outcome, and response to tocolysis if given were noted. The collected data were analyzed using descriptive statistics.

**Results:** The incidence of preterm birth for the current study was 6.7%. The majority of patients were multigravida (59%) and mainly were of the age lesser than 30 years (89.3%). A total of 477 babies including 37 twins were delivered by 440 preterm deliveries of which 377 (79.03%) were live births. About 40.90% of babies had a birth weight in the range of 1.6–2 kg. Neonatal morbidity in preterm babies was 49.33% and was high with patients who had not received steroid coverage (90%) and when the gestational age was less than 34 weeks (72.57%). Similarly, neonatal mortality was found to be 26.52% in preterm babies and was higher in patients who did not receive steroid coverage (63.4%) and also when gestational age was less than 34 weeks (44.18%).

**Conclusions:** Early recognition, appropriate management, and early administration of steroid in high-risk pregnancies along with advice on modifiable etiologies and preconception counseling can bring down preterm birth and thereby reduce neonatal morbidity and mortality.

**Keywords:** Preterm birth, Preterm labor, Preterm mothers.

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## INTRODUCTION

Preterm labor is defined as occurrence of regular uterine contraction, four or more in 20 minutes or eight or more in 1 hour and cervical effacement equal or more than 80% and dilatation equal or more than 2 cm in women with intact fetal membranes and gestational age less than 37 weeks. It is a main cause of neonatal mortality and morbidity, especially in developing countries.<sup>1–3</sup> Worldwide data on the incidence of preterm birth are undependable, but incidence ranges between 5% in developed countries and 25% in developing countries.<sup>4</sup> The incidence seems to be raising all over the world because of advanced reproductive medicine, elderly marriages, and carrier-oriented mothers. With the progress in perinatal medicine, fetal viability is now possible even at 20 weeks of gestation in developed countries; however, in developing countries, the rescue is difficult below 28 weeks. Thus, preterm labor is a challenge faced by obstetricians, especially in developing countries.

Based on the above information, this clinical prospective study was carried out in the Department of Obstetrics and Gynaecology of a Tertiary Hospital attached to a Medical College. The study aimed at finding out the incidence and the etiological risk factors responsible for preterm labor that could be identified to decrease the risk, especially in our local area.

## MATERIALS AND METHODS

In this prospective cohort study of 1 year, a total of 440 antenatal patients diagnosed with preterm labor with or without rupture of

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membrane were included. The American College of Obstetricians and Gynecologists criteria (1997) consisting of four uterine contractions in 20 minutes with or without cervical dilatation greater than 2 cm or effacement 80% or greater were considered for diagnosis of preterm labor. The patients included in the study were followed up from admission till delivery and discharge from the hospital. In addition to the known risk factors for preterm labor, an exhaustive history along with general, systemic, and obstetrical examination data was collected. Investigations like complete blood count, urine routine, urine culture, vaginal swab culture, and abdominal ultrasound were done. In addition gestational ages at onset of preterm labor and at delivery, neonatal outcome and response to tocolysis if given were noted.

In cases of ruptured membranes and or with significant growth on urine or vaginal culture, antibiotics were given according to culture report. Two grams of ampicillin intravenously at the time of admission followed by 500 mg 6 hourly was given to all with rupture of membranes. The goal of tocolytic therapy was to prolong pregnancy for at least 2 days in women without membranes and through 36 completed weeks in women with membranes. Tocolytics were not given in pregnancy beyond 36 weeks, when in evident labor and infection. The tocolytic therapy used in the study was nifedipine orally. Steroid cover was given to all those with less than 34 weeks gestation using 12 mg betamethasone by intramuscular route and second dose after 24 hours.

The collected data were entered in Microsoft Excel and analyzed using descriptive statistics.

## RESULTS

The incidence of preterm birth for the current study was 6.7% as during the study period, 6,500 deliveries had occurred in the hospital of which 440 were preterm delivery with 477 preterm births as there were 37 twin births in it. Majority (92.95%) of the patients were from rural areas. About 59% of patients were multigravida. Majority (89.3%) of patients were of the age lesser than 30 years as shown in Table 1. The distribution of preterm labor patients based on their past history of abortion is mentioned in Table 2. Majority (80%) of the preterm delivery were spontaneous in onset. Only 20% of the patients were induced for intrauterine death of fetus, severe pregnancy-induced hypertension (PIH), and antepartum hemorrhage.

A total of 477 babies including 37 twins were delivered by 440 preterm deliveries of which 377 (79.03%) were live birth. About 40.90% neonates had a birth weight in the range of 1.6–2 kg as shown in Table 3. The risk factors for preterm labor during the study are mentioned in Table 4. In our study, majority (80%) of

**Table 4:** Risk factors for preterm labor among the patient

<i>Risk factors</i>	<i>Number of patients n = 440 (%)</i>
Idiopathic	136 (30.90)
Preeclampsia	83 (18.86)
Antepartum hemorrhage	46 (10.45)
PROM	43 (9.70)
Multiple gestation	37 (8.4)
Infections	28 (6.36)
Oligohydramnios	26 (5.9)
Maternal disease	22 (5.0)
Height <135 cm	15 (3.40)
Uterine anomaly	2 (0.45)
Polyhydramnios	2 (0.45)

the preterm delivery were of spontaneous onset. The rest 20% of the patients were induced for intrauterine death of fetus, severe PIH, and antepartum hemorrhage. The mode of delivery in majority of the preterm patients (86.8%) was vaginal delivery. Only 13.1% of the patients required cesarean section.

Of the 477 births, there were 100 intrauterine deaths, hence resulting in 377 live births. Of these 100 intrauterine deaths, 80 patients were of gestational age <34 weeks without steroid coverage and 20 patients were of gestational age >34 weeks. The morbidity and mortality outcomes in neonates are shown in Table 5. Neonatal morbidity was high with patients who had not received steroid coverage (90%) compared to patients who had received steroid coverage (56.6%). Neonatal morbidity was high when the gestational age was less than 34 weeks (72.57%) when compared with gestational age more than 34 weeks. In our study, the total neonatal morbidity in preterm babies was 49.33%. With respect to neonatal mortality, it was found that patients who did not receive steroid coverage had higher (63.4%) compared to patients who received steroid coverage at gestational age <34 weeks (26.6%). Neonatal mortality in our study with age less than 34 weeks is 44.18% and with gestational age more than 34 weeks is 11.7%. Neonatal mortality is high when the birth occurred before 34 weeks of pregnancy. In our study, the total neonatal mortality in preterm babies was 26.52%.

## DISCUSSIONS

Preterm labor is on a rising trend due to factors like increased rate of assisted reproductive technology and increased rate of multiple pregnancies, thus leading to morbidity and mortality in neonates. Among the developing countries, India has high incidence of preterm labor of around 13%.<sup>5–7</sup> The incidence of preterm birth in the study was low (6.7%) compared to the studies done by MC Pheeters ML and Singh Uma et al.<sup>8,9</sup> This may be due to poor awareness of antenatal care facilities, poverty, illiteracy, and extremes of maternal ages among the study populations. The various etiologies of preterm labor found in our study are mentioned in Table 4 showing that the etiology is multifactorial. As suggested by the World Health Organization bulletin, the most common etiology for preterm labor (30.9%) was idiopathic. The second most common etiology was preeclampsia (18.86%) of the cases with preterm delivery had PIH, which is similar to the findings of a study done in a medical college in Telangana.<sup>7</sup>

Studies from Gambia and Zimbabwe support the fact that abruptio placentae and placenta previa are having more risk of preterm birth, and its outcome depends on appropriate timely

**Table 1:** Age-wise distribution of patients

<i>Age-group</i>	<i>Number of patients n = 440 (%)</i>
≤30 years	393 (89.3)
>30 years	47 (10.68)

**Table 2:** Incidence of preterm labor in patients with history of abortion

<i>Number of abortions in the past</i>	<i>Number of patients n = 440 (%)</i>
1	31 (7.04)
2	10 (2.27)
3	2 (0.45)
>4	2 (0.45)
Total	45 (10.22)

**Table 3:** Distribution of the babies according to their birth weight

<i>Birth weight in kg</i>	<i>Number of babies n = 477 (%)</i>
<1	58 (12.15)
1.1–1.5	139 (29.14)
1.6–2	180 (37.73)
>2	100 (20.96)

**Table 5:** Neonatal morbidity and mortality outcomes in the study

Outcome	Live births in mothers with gestational age <34 weeks (n = 172)		Live births in mothers with gestational age >34 weeks (n = 205)	Total live births (n = 377)
	Steroid covered (n = 90)	Steroid uncovered (n = 82)		
Respiratory distress syndrome	29 (32.2%)	44 (53.60%)	17 (8.29%)	90
Septicemia	13 (14.4%)	13 (15.85%)	20 (9.15%)	46
Hyperbilirubinemia	09 (10.10%)	12 (14.60%)	20 (9.15%)	41
Neonatal encephalitis	0	05 (6.09%)	04 (1.95%)	09
Total of neonatal morbidity (%)	51 (56.60%)	74 (90.20%)	61 (29.75%)	186 (49.33%)
Neonatal mortality (%)	24 (26.6%)	52 (63.40%)	24 (11.70%)	100 (26.52%)

management.<sup>10,11</sup> Although APH is one of the warning signs of pregnancy which are informed to pregnant women during antenatal care, its outcome depends on how quickly the woman reaches a health facility.

In the present study, 9.7% patients had premature rupture of membranes (PROM) preceding preterm labor. The release of pro-inflammatory cytokines in PROM initiates process of preterm labor.<sup>12</sup>

Multiple gestations also carry a substantial risk of preterm delivery and accounted for 8.4% of preterm labor in our study. The advancement of reproductive medicine resulted in increase of high-order pregnancy and thereby incidence of preterm birth.<sup>13</sup> Hence, controlling of multiple gestations may improve neonatal outcome. Although similar studies were done by Uma et al. in Lucknow, Gonclaves et al. and Lamont et al. have found intrauterine infection with or without membrane as a reason for preterm delivery, and in the present study, infection contributed to only 6.36%.<sup>9,14,15</sup> This may be because patient with infection and preterm labor is not timely reporting it to their health-care providers. Hence, during prenatal care screening for genital tract and urinary tract, infections should be advised in high-risk group. Infections stimulate the production of cytokines including interleukin-1 which stimulate labor through prostaglandin production.<sup>16</sup> The risk factors like extremes in the volume of amniotic fluid, height <135 cm, maternal diseases like diabetes, hypertension, bronchial asthma, thyroid disorders, uterine anomaly, malpresentations, and fetal anomaly were less common in the present study.

Also 10.22% patients of preterm labor had history of previous induced abortions, a finding supported by the epidemiologic study on small for gestational age (EPIPAGE) study as shown in Table 2.<sup>17</sup> Perinatal morbidity and mortality is quiet dependent on weight of the neonate at birth. In this study, majority (63.6%) of preterm neonates were of birth weight >1.5 kg and the mode of delivery in majority (86.8%) was by vaginal delivery which is similar to other study done in a tertiary-care hospital.<sup>18</sup> Neonatal morbidity especially of respiratory distress syndrome was higher in steroid uncovered group as shown in Table 5. The other two common causes of neonatal morbidity were septicemia, hyperbilirubinemia and encephalitis, and this mimic other studies.<sup>9,18,19</sup>

Neonatal mortality was more in babies with gestational age <34 weeks especially the steroid uncovered ones as shown in Table 5. This supports the fact that as the gestational age increases, the mortality rate decreases and survival rate increases hence indicating a beneficial role of prolonging pregnancy more than 34 weeks by appropriate use of uterine relaxants. The overall neonatal mortality among preterm babies was lower (26.52%) mostly because our center was a tertiary-care hospital, and this corroborates with other similar studies.<sup>9,19</sup>

## CONCLUSIONS

By vigilant antenatal care and preconceptional counseling, we can prolong pregnancy beyond 34 weeks. Early recognition, appropriate management, and early administration of steroid in high-risk conditions can reduce preterm births. In addition to this, advancement made in neonatal care has significantly enhanced the survival of extremely premature fetus.

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