

# Preterm pre-labor rupture of membranes and perinatal outcome: a prospective cohort study

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## Abstract

**Background:** Preterm Prelabor Rupture of Membranes (PPROM) is one of the common causes of increased perinatal morbidity and mortality. **Objectives:** To know the perinatal outcome in antenatal women with Preterm Prelabor Rupture of Membranes. **Methods:** Present prospective cohort study was conducted in rural tertiary center of Northern India over one year (January-December 2018) on 75 antenatal women at gestation  $\geq 28$  weeks with Preterm Prelabor Rupture of Membranes. Onset of labor and mode of delivery was recorded in all participants. Immediately after birth, neonatal Apgar scores, birth weight, gender, NICU admission, need for oxygen or intubation, complications and perinatal mortality (early neonatal deaths and stillbirths) were recorded. **Results:** Of total 3,085 deliveries (at gestation  $\geq 28$  weeks) during the study period, 75 (2.4%) antenatal women had PPRM, of which 72 (96.0%) had preterm delivery and three (4.0%) were managed conservatively and delivered at term. Four (5.6%) had iatrogenic preterm delivery (labor was induced) due to fetomaternal risk factors and 68 (94.4%) went into spontaneous preterm labor. The most common mode of delivery was vaginal (81.3%) followed by Lower segment cesarean section (18.7%). Of 75 neonates delivered, 70 (93.3%) were live, 03 (4.0%) stillbirths and 02 (2.7%) early neonatal deaths. The mean neonatal birth weight was  $2.02 \pm 0.50$  Kg ( $p=0.000$ ). Sixty-seven (89.3%) neonates had poor 1-minute Apgar scores, 17 (22.7%) had 5-minute Apgar score  $< 7$ , 40 (53.3%) required NICU admission, 06 (8.0%) intubated, 45 (60.0%) developed neonatal complications. The most common neonatal complication was prematurity (58.7%) followed by Respiratory distress syndrome (44.0%). **Conclusion:** Preterm Prelabor Rupture of Membranes was significantly associated with adverse perinatal outcome.

**Keywords:** Antenatal; Birth weight; Gestation; Labor; Preterm Prelabor rupture of membranes.

## Introduction

Preterm Prelabor Rupture of Membranes (PPROM) is one of the leading causes of perinatal morbidity and mortality all over the world [1]. PPRM is defined as rupture of membranes before 37 completed weeks of gestation. It complicates an estimated 2-4% of all singleton pregnancies and 7-20% of multifetal gestations and is responsible for around 18-20% of all perinatal deaths [2,3]. The exact cause of PPRM is still not known, but various factors are known to play role in its pathogenesis, of which Choriodecidual infection or inflammation is an important factor,

especially at early gestation [4]. Other causative factors include history of PPRM in previous pregnancy, multifetal gestation, low socio-economic status, polyhydramnion, smoking, vaginal infections or bleeding, amniocentesis, etc [5]. PPRM occurs due to stretching of fetal membranes and microbial infection resulting in release of local inflammatory factors like cytokines and interleukins which in turn leads to collagenolysis mediated mechanical disruption, and weakening of membranes [5-8]. Furthermore, PPRM results in 25-40% cases of preterm births annually [9]. Hence, PPRM is one of the common causes of preterm birth and its complications, like respiratory distress syndrome, necrotizing enterocolitis, neonatal sepsis, bronchopulmonary hypoplasia or dysplasia,

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intraventricular hemorrhage, periventricular leukomalacia, Cord Prolapse all leading to increased risk of perinatal morbidity and mortality [10, 11]. In mothers it leads to increased risk of chorioamnionitis, cervical dystocia, dysfunctional labor, increase operative interference, postpartum hemorrhage, endometritis etc [12].

Hence, the present study was conducted with the aim to know the overall perinatal outcome in antenatal women at gestation  $\geq 28$  weeks with PPRM in a rural tertiary care center of Northern India.

**Material and Methods**

**Study design, setting and duration:** The present prospective cohort study was conducted in the department of Obstetrics and Gynecology of a rural tertiary care center of Northern India over one year from January 2018 to December 2018 on 75 antenatal women at gestation  $\geq 28$  weeks admitted with features of spontaneous Preterm Prelabor Rupture of Membranes.

**Inclusion criteria:** All antenatal women with singleton pregnancy at gestation  $\geq 28$  weeks with spontaneous PPRM.

**Exclusion criteria:** Antenatal women with gestation  $< 28$  weeks, with multifetal gestation, women with chorioamnionitis, iatrogenic PPRM and those not willing to be a part of study were excluded.

**Methodology-** After obtaining approval from the Institutional Ethical Committee and informed written consent from all the participants in their own language, a total of 75 participants was enrolled in the study with

**Results**

Of total 3,085 deliveries of antenatal women at gestation  $\geq 28$  weeks during the study period, 75(2.4%) women had PPRM. The average (SD) age of these women was  $25.78 \pm 3.81$  years with a minimum of 20 years and maximum of 38 years. The average gestational age at the time of delivery was  $34.50 \pm 2.17$  weeks. Most of the women were multigravida (61.33%). Of total 75 participants, 71(94.7%) women went into spontaneous labor and four (5.3%) were induced for fetomaternal risk factors. There were 72 (96.0%) preterm deliveries and three (4.0%) term deliveries because of successful conservative management. The most common mode of delivery was vaginal (81.3%) followed by Lower segment cesarean section (18.7%). The various demographic features are depicted in Table 1.

The average birth weight of all 75 neonates was  $2.02 \pm 0.50$  Kg with 14(18.7%) having  $> 2.5$  kg, 46 (61.3%) low birth weight, 13 (17.3%) very low birth weight and 02(2.7%) extremely low birth weight ( $p=0.000$ ). The average 1 and 5-minutes Apgar scores of all the neonates was  $4.36 \pm 3.34$  and  $8.09 \pm 1.91$  respectively.

PPROM was significantly associated with adverse perinatal outcome with 40 (53.3%) neonates requiring NICU admission, 06 (8.0%) ventilatory support, 45 (60.0%) developed neonatal complications, 03 (4.0%) stillbirths and 02 (2.7%) early neonatal deaths as depicted in Table 2. The most common neonatal complication was prematurity (58.7%) followed by Respiratory distress syndrome (44.0%) as shown in Figure 1.

spontaneous PPRM, confirmed by history and on per speculum examination (sudden gush or trickle of amniotic fluid seen coming through cervical external os).

A thorough history and physical examination including general, per-abdominal and vaginal examination (per speculum and prevaginal) of all the participants fulfilling the inclusion criteria was recorded. The various demographic features including age, gravidity, parity, gestational age, duration of PPRM, onset of labor, mode of delivery and perinatal outcome were recorded on a preformed data collection sheet.

Immediately after delivery by any route the 1 and 5-minutes Apgar scores, neonatal gender and birth weight were recorded by the pediatrician on duty. Also, the need for resuscitation, NICU admission, intubation, complications and early neonatal deaths were assessed by a senior pediatrician and recorded.

The data thus collected included age, gravidity, parity, onset of labor, mode of delivery, perinatal mortality (including stillbirths and neonatal deaths) and morbidity (preterm birth, low birthweight, NICU admission, need for intubation, complications).

**Statistical analysis-** Statistical analysis of all the data was done using software SPSS version 22.0. Unpaired t test was used for comparison between two continuous variables, Chi-Square test or Fisher's exact test was used to establish correlation of qualitative variables and ANOVA/Kruskal Wallis test was used for comparison between more than two groups. A p value of  $< 0.05$  was considered statistically significant.

Table-1: Socio-demographic parameters.

Parameters	N (%)	Chi square test	p-value
<b>Age (years)</b>			
<20	02 (2.7%)	4.224	0.121
21-30	65 (85.3%)		
>30	18 (10.7%)		
<b>Parity</b>			
Nulliparous	35 (46.7%)	2.453	0.874
Multiparous	40 (53.3%)		
<b>Gravidity</b>			
Primigravida	29 (38.7%)	0.001	0.976
Multigravida	46 (61.3%)		
<b>Gestation (weeks) at the time of delivery</b>			
Very preterm	09 (12.0%)	325.817	0.000
Late preterm	64 (85.3%)		
Term	02 (2.7%)		
<b>Onset of labor</b>			
Spontaneous	71 (94.7%)	12.943	0.002
Induced	04 (5.3%)		
<b>Mode of delivery</b>			
Vaginal	61 (81.3%)	10.478	0.001
Lower segment cesarean section	14 (18.7%)		
<b>Neonatal gender</b>			
Male	40 (53.3%)	0.004	0.949
Female	35 (46.7%)		
<b>Birth weight (Kg)</b>			
≥2.5	14 (18.7%)	163.922	0.000
<2.5-≥1.5	46 (61.3%)		
<1.5-≥1.0	13 (17.3%)		
<1.0	02 (2.7%)		
<b>Perinatal outcome</b>			
Live	70 (93.3%)	27.683	0.001
Stillbirth	03 (4.0%)	28.238	0.000
Neonatal death	02 (2.7%)	6.721	0.058

**Table-2: Preterm prelabor rupture of membranes and neonatal outcome**

Parameters		N (%)	Chi-square test	p-value	odds ratio	95% CI
Preterm birth	Yes	72 (96.0%)	337.982	0.000	134.769	42.28-429.57
	No	03 (4.0%)				
1-minute Apgar score	<7	67 (89.3%)	4.403	0.036	2.164	1.03-4.53
	>7	08 (10.7%)				
5-minute Apgar score	<7	17 (22.7%)	27.780	0.000	4.032	2.31-7.05
	>7	58 (77.3%)				
Birth weight (Kg)	<2.5	61 (81.3%)	103.746	0.000	11.521	6.41-20.71
	≥2.5	14 (18.7%)				
NICU* admission	Yes	40 (53.3%)	93.897	0.000	7.412	4.64-11.85
	No	35 (46.7%)				
Ventilatory support	Yes	06 (8.0%)	6.473	0.011	2.911	1.23-6.89
	No	69 (92.0%)				
Neonatal complication	Yes	45 (60.0%)	75.913	0.000	6.38	3.97-10.25
	No	30 (40.0%)				
Stillbirth	Yes	03 (4.0%)	28.238	0.000	15.41	4.01-59.31
	No	72 (96.0%)				
Neonatal death	Yes	02 (2.7%)	6.721	0.058	5.772	1.28-25.86
	No	73 (97.3%)				

\*NICU: Neonatal Intensive Care Unit

**Table-3: Neonatal complications associated with preterm pre-labor rupture of membranes.**

Neonatal complications	N (%)	Chi-square test	p-value	Odds Ratio	95% Confidence Interval
Prematurity	44 (58.7%)	298.445	0.000	22.05	13.60-35.76
Respiratory distress	33 (44.0%)	97.098	0.000	7.691	4.79-12.34
Jaundice	06 (8.0%)	0.162	0.687	1.19	0.51-2.77
Hypoxic ischemic encephalopathy	04 (5.3%)	1.978	0.160	2.063	0.74-5.78
Sepsis	03 (4.0%)	0.798	0.429	1.7	0.52-5.52
Seizures	02 (2.7%)	3.552	0.059	3.72	0.85-16.12

## Discussion

Preterm Prelabor Rupture of Membranes is one of the most common cause for preterm deliveries and its associated complications leading to increased risk of perinatal morbidity and mortality worldwide. In the present study PPRM was found to be significantly associated with adverse perinatal outcomes. The average age of all the participants was 25.78±3.81 years with majority belonging to 21-30 years age group (85.3%), average gestation was 34.50±2.17 weeks.

Most of the women were multigravida (61.33%). PPRM was associated with 72 (96.0%) cases of preterm delivery, poor Apgar scores at birth (89.3% having <7 1-minute score), 40 (53.3%) NICU admissions, 06 (8.0%) neonatal intubations, 45 (60.0%) neonates having complication with prematurity (58.7%) as most common complication followed by Respiratory distress syndrome (44.0%) and Jaundice (8.0%). Furthermore, PPRM was found to be associated with

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an overall perinatal mortality of 6.7% with 03 (4.0%) still births and 02 (2.7%) early neonatal deaths. Similar results were reported by a recent study which observed that PPRM was associated with a neonatal mortality of 7.4%, major neonatal complications in 40%, and increased rate of NICU admission in 72.9% neonates [1].

Similar to our results another study observed that PPRM was associated with adverse perinatal outcome with most common reason for perinatal mortality being prematurity and its complications. Also, the most common mode of delivery was vaginal (79%) followed by cesarean section (21%) [12]. A recent study observed that PPRM was more common in primigravida and most of the cases delivered vaginally (70.91%). Furthermore, they found that PPRM was associated with higher maternal morbidity (27.8%) and perinatal mortality (4.5%) and morbidity (26.4%) [13].

A recent study reported that PPRM was significantly associated with an increased risk of neonatal morbidity. They reported an overall neonatal survival to discharge rate of 33.8% and similar to the present study the most common neonatal morbidities were respiratory distress syndrome (78.7%) and bronchopulmonary dysplasia (84.4%) [14]. Similarly, a study observed a live birth rate of 63.6% and survival-to-discharge rate of 44.9% in women with PPRM at gestation <24 weeks, with respiratory distress syndrome, bronchopulmonary dysplasia and sepsis being the most common neonatal morbidities [15].

Another study observed similar results of 51.7% neonates as males and 48.3% female delivered to women with PPRM. 65% of women had vaginal delivery and 35% caesarean section. They also observed that Respiratory distress syndrome was the most common complication (36.7%) followed by septicemia (8.3%), meningitis (1.7%) and pneumonia (1.7%) [16]. Another study also reported similar results with maximum patients of PPRM (59.0%) belonging to 21-25 years age group with mean age of 23.52±3.70 years.

As opposed to the present study they found it more common in primigravida (50%) as compared to multigravida. In their study also, vaginal delivery (85.5%) was more common followed by cesarean section (14.5%). They also concluded that PPRM was associated with adverse neonatal outcome with most common complication being Respiratory distress syndrome followed by neonatal sepsis [17]. Many other studies also reported a significant correlation between

PPROM and adverse perinatal outcome [18-21]. On contrary to this, a recent study reported that PPRM per se was not associated with adverse perinatal outcome, neither was it associated with increased risk of sepsis [5].

**Limitations-** The present study was conducted for a shorter duration and on a small sample of women with PPRM. Furthermore, the outcome was assessed for late PPRM only. In future an attempt will be made to conduct a study on larger sample including those with early PPRM (<28 weeks).

**Conclusion**

Hence, PPRM significantly resulted in an increased risk of preterm deliveries and its associated complication, making it one of the most important causes for perinatal morbidities (including preterm births, low birth weight, poor Apgar scores at birth, increased NICU admission rates, need for intubation and neonatal complications) and mortality.

**What the study adds to existing knowledge?**

The present study depicts the impact of PPRM on overall perinatal outcome. It was observed that PPRM was associated with an overall perinatal mortality of 6.7% with Respiratory distress syndrome (44.0%) and Jaundice (8.0%) as most common neonatal morbidities. PPRM was significantly associated with poor Apgar scores at birth and increased NICU admission rates.

**Author's contribution**

**Dr. Naina Kumar:** Concept, Design, Literature search, Data analysis, Compilation and final check of manuscript.

**Dr. Ashu Yadav:** Literature search, Data analysis, Compilation and final check of manuscript.

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