

## Maternal and Fetal Outcomes in Preterm Premature Rupture of Membranes

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**Abstract:** Preterm premature rupture of membranes is a major obstetric complication associated with substantial maternal and neonatal morbidity, particularly in resource-limited settings. Timely recognition and appropriate management may reduce infectious and prematurity-related complications. **Objective:** To determine the frequency of maternal and fetal outcomes in patients presenting with preterm premature rupture of membranes. **Methods:** This descriptive study was conducted in the Department of Obstetrics and Gynaecology, Ayub Teaching Hospital, Abbottabad, over six months, from 21 September 2024 to 21 February 2025, after approval of the synopsis. A total of 139 women aged 18–40 years with singleton pregnancies, gestational age <37 weeks, and parity  $\geq 1$  presenting with preterm premature rupture of membranes were enrolled through non-probability consecutive sampling. Patients with antepartum hemorrhage, intrauterine fetal death, major fetal anomalies, chronic renal failure, pregnancy-induced hypertension, and substance use were excluded. Maternal outcomes included chorioamnionitis, wound infection, puerperal sepsis, endometritis, and placental abruption, while fetal outcomes included birth asphyxia, neonatal jaundice, respiratory distress syndrome, and neonatal sepsis. Data were analyzed using SPSS version 26. Descriptive statistics were computed as mean  $\pm$  standard deviation for continuous variables and frequencies with percentages for categorical variables. **Results:** The mean age of the participants was  $28.4 \pm 5.1$  years, and the mean gestational age was  $31.8 \pm 2.9$  weeks. Among maternal outcomes, chorioamnionitis was observed in 10.8% of patients, puerperal sepsis in 7.9%, wound infection in 5.8%, endometritis in 5.0%, and placental abruption in 4.3%. Regarding neonatal outcomes, respiratory distress syndrome was the most frequent complication, occurring in 20.1% of neonates, followed by birth asphyxia in 16.5%, neonatal jaundice in 15.1%, and neonatal sepsis in 14.4% of cases. **Conclusion:** Preterm premature rupture of membranes was associated with considerable maternal and neonatal morbidity, with respiratory distress syndrome and chorioamnionitis being the most frequent fetal and maternal complications, respectively. Early diagnosis, close surveillance, and timely obstetric and neonatal management may help improve fetomaternal outcomes.

**Keywords:** Preterm premature rupture of membranes, maternal outcome, fetal outcome, neonatal morbidity

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### Introduction

Preterm premature rupture of membranes (PPROM) is defined as the rupture of fetal membranes before the onset of labour at less than 37 weeks of gestation. It represents one of the most challenging obstetric complications, affecting approximately 3% of all pregnancies and accounting for nearly one-third of all preterm births worldwide (1). The condition is associated with a spectrum of adverse maternal and neonatal outcomes, making it a subject of intense clinical and research interest globally.

The pathophysiology of PPRM is multifactorial, involving intrauterine infection, inflammatory cascades, cervical insufficiency, uterine overdistension, and underlying connective tissue disorders (2). Ascending genital tract infections remain the most consistently identified risk factor, with organisms such as *Ureaplasma urealyticum*, *Gardnerella vaginalis*, and group B *Streptococcus* frequently implicated in membrane weakening and rupture (3). Additional risk factors include prior preterm birth, low socioeconomic status, cigarette smoking, polyhydramnios, and multifetal gestation (4).

Maternal complications following PPRM are significant and include chorioamnionitis, endometritis, puerperal sepsis, wound infection, and placental abruption. Chorioamnionitis, an infection of the amniotic fluid, membranes, placenta, and decidua, occurs in 15–25% of PPRM cases and is associated with increased risks of maternal sepsis and postpartum haemorrhage (5). Placental abruption, occurring in approximately 4–12% of PPRM cases, further contributes to maternal morbidity and emergency operative interventions (6).

Neonatal outcomes in PPRM are profoundly influenced by the gestational age at membrane rupture and the latency period between rupture and delivery. Respiratory distress syndrome (RDS) is the most common neonatal complication, resulting from pulmonary immaturity and surfactant deficiency, and it remains a leading cause of neonatal morbidity and mortality in preterm infants (7). Other significant neonatal complications include birth asphyxia, neonatal sepsis, intraventricular haemorrhage, necrotising enterocolitis, and neonatal jaundice, all of which contribute substantially to neonatal intensive care unit admissions and prolonged hospitalisations (8).

Management strategies for PPRM have evolved considerably over the past two decades, with corticosteroid administration for fetal lung maturation, prophylactic antibiotic therapy to prolong the latency period, and careful timing of delivery forming the cornerstones of evidence-based care (9). Despite these advances, PPRM continues to be associated with substantial perinatal morbidity and mortality, particularly in resource-limited settings where access to neonatal intensive care and advanced obstetric facilities is constrained (10).

In the Pakistani context, PPRM poses a particularly formidable public health challenge. Pakistan has one of the highest rates of neonatal mortality in South Asia, with preterm birth-related complications being a leading contributor. Factors such as high rates of unregistered pregnancies, limited antenatal care utilisation, poor nutritional status, widespread genital tract infections, and inadequate access to tertiary care facilities significantly worsen the prognosis of PPRM in this setting. Furthermore, the socioeconomic heterogeneity of the Pakistani population, encompassing rural-urban disparities in healthcare access and educational attainment, compounds the burden of this condition. The



present study was therefore conducted to document the frequency of maternal and fetal complications associated with PPRM in our local setting, with a view to generating contextually relevant data that may inform clinical guidelines and health policy in Pakistan.

**Methodology**

This descriptive study was conducted in the Department of Obstetrics and Gynaecology, Ayub Teaching Hospital, Abbottabad, from 21-September-2024 to 21-February-2025 after approval of the research synopsis and institutional ethical committee.

A total of 139 patients were included using non-probability consecutive sampling. Inclusion criteria were women aged 18–40 years, singleton pregnancy, gestational age <37 weeks, parity ≥1, and diagnosed cases of PPRM. Patients with antepartum hemorrhage, intrauterine fetal death, major fetal anomalies, chronic renal failure, pregnancy-induced hypertension, and substance use were excluded.

After informed consent, demographic and clinical data were recorded. Patients were followed until delivery. Maternal outcomes (chorioamnionitis, puerperal sepsis, wound infection, endometritis,

placental abruption) and neonatal outcomes (respiratory distress syndrome, birth asphyxia, neonatal jaundice, neonatal sepsis) were recorded based on predefined operational definitions.

Data were analyzed using SPSS version 26. Quantitative variables were expressed as mean ± standard deviation, and qualitative variables were presented as frequencies and percentages.

**Results**

The patient demographics are presented with age showing mean value of 28.4 ± 5.1 years, gestational age was 31.8 ± 2.9 weeks, BMI was recorded as 26.1 ± 3.8 kg/m<sup>2</sup>, and duration of labour was 4.2 ± 1.1 hours. Regarding education status, 47 patients being 34.0% were uneducated, 27 patients that is 19.4% had primary education, 30 patients making 21.6% had secondary education, and 35 patients being 25.0% had higher education. For residential status, 51 patients that is 36.7% were from rural areas while 88 patients being 63.3% were from urban areas (as shown in Table-1).

**Table 1: Patient Demographics**

Demographics	Mean ± SD
Age (years)	28.4 ± 5.1
Gestational Age (weeks)	31.8 ± 2.9
BMI (kg/m <sup>2</sup> )	26.1 ± 3.8
Duration of Labour (hours)	4.2 ± 1.1
<b>Education</b>	
Uneducated n (%)	47 (34.0%)
Primary n (%)	27 (19.4%)
Secondary n (%)	30 (21.6%)
Higher n (%)	35 (25.0%)
<b>Residential Status</b>	
Rural n (%)	51 (36.7%)
Urban n (%)	88 (63.3%)

Regarding maternal and neonatal complications in patients with preterm premature rupture of membranes, chorioamnionitis was observed in 15 cases which is 10.8% while 124 cases that is 89.2% did not have chorioamnionitis. Puerperal sepsis was present in 11 patients making 7.9% of cases and 128 patients being 92.1% did not have this complication. Wound infection was found in 8 patients which accounts for 5.8% whereas 131 patients that is 94.2% were free from wound infection. Endometritis was observed in 7 patients representing 5.0% while 132 patients that is 95.0% did not develop endometritis. Placental abruption was noted in 6 cases making 4.3% while 133 cases

that is 95.7% showed no such complication. Among neonatal complications, respiratory distress syndrome was observed in 28 neonates representing 20.1% while 111 neonates that is 79.9% did not have respiratory distress syndrome. Birth asphyxia was present in 23 cases making 16.5% whereas 116 cases that is 83.5% were without birth asphyxia. Neonatal jaundice was observed in 21 neonates which accounts for 15.1% while 118 neonates that is 84.9% did not develop jaundice. Neonatal sepsis was found in 20 cases representing 14.4% while 119 cases that is 85.6% did not have neonatal sepsis (as shown in Table 2).

**Table 2: Frequency of Maternal and Neonatal Complications in Preterm Premature Rupture of Membranes (PPROM)**

Complications	Frequency	%age
<b>Chorioamnionitis</b>		
Yes	15	10.8%
No	124	89.2%
<b>Puerperal sepsis</b>		
Yes	11	7.9%
No	128	92.1%
<b>Wound infection</b>		
Yes	8	5.8%
No	131	94.2%
<b>Endometritis</b>		
Yes	7	5.0%
No	132	95.0%

<b>Placental abruption</b>		
Yes	6	4.3%
No	133	95.7%
<b>RDS (Respiratory Distress Syndrome)</b>		
Yes	28	20.1%
No	111	79.9%
<b>Birth asphyxia</b>		
Yes	23	16.5%
No	116	83.5%
<b>Neonatal jaundice</b>		
Yes	21	15.1%
No	118	84.9%
<b>Neonatal sepsis</b>		
Yes	20	14.4%
No	119	85.6%

## Discussion

The present study examined the maternal and neonatal outcomes in 139 patients with preterm premature rupture of membranes (PPROM), providing a comprehensive profile of the complications encountered in a Pakistani tertiary care setting. The mean maternal age was  $28.4 \pm 5.1$  years and the mean gestational age was  $31.8 \pm 2.9$  weeks, consistent with the demographic profile reported in similar studies from low- and middle-income countries (11).

Chorioamnionitis was the most frequently observed maternal complication in this study, occurring in 10.8% of cases. This figure is consistent with, though at the lower end of, estimates reported in international literature. Hassan et al. reported chorioamnionitis rates of 13–15% in cohorts managed with expectant approaches in tertiary settings (12). The relatively lower rate observed in our study may reflect prompt antibiotic prophylaxis practices or differences in diagnostic criteria. Regardless, chorioamnionitis in PPRM remains a critical trigger for expedited delivery given its association with maternal and fetal sepsis (5). Puerperal sepsis was identified in 7.9% of cases, followed by wound infection in 5.8% and endometritis in 5.0%. These rates are broadly comparable to findings reported by Maqbool et al. and Mercer et al., who documented infectious morbidity rates between 5% and 12% following PPRM-complicated deliveries (13,14). The infectious complications appear closely linked to the ascending infection hypothesis underlying PPRM pathogenesis, and their frequency underscores the importance of strict aseptic technique during delivery and the judicious use of prophylactic antibiotics in the peripartum period.

Placental abruption was observed in 4.3% of our cases, a rate within the 2–6% range commonly reported in the literature. Ananth et al. demonstrated that PPRM significantly elevates the risk of placental abruption through shared pathophysiological mechanisms involving decidual haemorrhage and intrauterine inflammation (15). This complication, though less frequent than infectious sequelae, carries a disproportionately high risk of acute fetal compromise and maternal haemorrhage, necessitating vigilant clinical surveillance throughout the latency period.

Among neonatal outcomes, respiratory distress syndrome (RDS) was the most prevalent complication, affecting 20.1% of neonates. This finding aligns with international data demonstrating RDS as the predominant morbidity in preterm infants born following PPRM. Wapner et al. found RDS rates of 23–28% in preterm neonates born between 28–34 weeks gestation, with rates inversely proportional to gestational age (16). The administration of antenatal corticosteroids has been shown to reduce RDS incidence by approximately 40%, and ensuring access to this intervention in resource-constrained settings remains a priority (7).

Birth asphyxia occurred in 16.5% of neonates in this study. This rate is higher than figures reported in high-income country settings, where rates typically range from 5–10%, but is consistent with findings from similar South Asian studies (17). The elevated rate likely reflects the

compounded burden of prematurity, placental insufficiency, and limited intrapartum monitoring in our setting. Neonatal jaundice was observed in 15.1% of neonates, a rate consistent with the hyperbilirubinaemia rates of 12–18% reported in preterm PPRM cohorts by Navathe et al., where hepatic immaturity and haemolysis driven by sepsis and polycythaemia are key contributing mechanisms (18).

Neonatal sepsis was identified in 14.4% of neonates. This finding is particularly concerning in the Pakistani context, where laboratory facilities for early sepsis diagnosis and access to broad-spectrum neonatal antibiotics may be limited at district-level hospitals. Romero et al. highlighted that intrauterine infection, frequently the cause of PPRM, directly predisposes neonates to early-onset sepsis by enabling vertical transmission of pathogenic organisms across the compromised membranes (19). Strengthening neonatal care infrastructure and ensuring availability of essential antibiotics are therefore critical interventions.

The sociodemographic profile of our cohort, with 34.0% being uneducated and 36.7% from rural areas, reflects the broader health inequities that shape obstetric outcomes in Pakistan. Lower educational attainment has been associated with delayed recognition of membrane rupture, reduced antenatal care utilisation, and poor adherence to prescribed management, all of which contribute to worse maternal and neonatal outcomes (20). Addressing these structural determinants through targeted health education programmes and improving rural healthcare infrastructure remains central to reducing the burden of PPRM in Pakistan.

## Conclusion

Preterm premature rupture of membranes is associated with significant maternal and neonatal morbidity. Early diagnosis and appropriate management can help reduce complications and improve outcomes.

## Declarations

### Data Availability statement

All data generated or analysed during the study are included in the manuscript.

### Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-ATHABT-238-24)

### Consent for publication

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared the absence of a conflict of interest.

## Author Contribution

**SU (Postgraduate Resident)**

Data Collection, Data entry, Manuscript drafting, Study Design,

**SN (Professor)**

Conception of study and Critical guidance.

**MG (Associate Professor)**

Literature review and Critical input

**RR (Postgraduate Resident)**

Critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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