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# Maternal and fetal risks associated with pre-mature rupture of membranes: Implications for neonatal health

**Sultana Begum[1], Sajani Islam[2], Mohammad Bablu Mia[3]**

[1]Department of Obstetrics and Gynecology, Faridpur General Hospital, Faridpur, Bangladesh, [2]Department of Pediatrics, Shaheed Suhrawardi Medical College, Dhaka, Bangladesh, [3]Department of Anaesthesiology, Faridpur Medical College, Faridpur, Bangladesh

**Address for correspondence:** Sultana Begum, Department of Obstetrics and Gynecology, General Hospital, Faridpur, Bangladesh. E-mail: sultanalipi07@gmail

## Abstract

**Background:** Pre-mature rupture of membranes (PROM) is a critical obstetric condition characterized by spontaneous membrane rupture before labor onset, affecting 2–8% of pregnancies. This phenomenon can lead to significant maternal and neonatal complications, including increased risks of infection, pre-term delivery, and potential adverse health outcomes for both mother and child.

**Objectives:** To investigate the maternal and fetal risks associated with PROM and its implications for neonatal health in a tertiary care hospital setting.

**Methods:** A cross-sectional observational study was conducted at Mymensingh Medical College over 6 months, involving 100 consecutive cases. Participants were selected based on specific inclusion and exclusion criteria, with gestational age (GA) determined through multiple methods. Membrane rupture was diagnosed via sterile speculum examination and confirmed through ultrasonography.

**Results:** The study of 100 participants revealed a predominantly young adult sample, with 66% aged 21–30 years and a mean age of 27 ± 0.58 years. Economically, 57.0% earned over 10,000 taka monthly, 39.0% earned 5,000–10,000 taka, and only 4.0% earned below 5,000 taka. Parity distribution showed 59.0% multigravida and 41.0% primigravida. GA analysis indicated most PROM cases occurred at 41–42 weeks (56.0%), followed by 37–40 weeks (24.0%), 34–37 weeks (11.0%), and 28–34 weeks (9.0%). Past obstetric history showed that 22.0% had previous PROM, 9.0% experienced pre-term labor, and 10.0% had prior abortions. Regarding sexual activity, 45.0% of PROM cases occurred 48 h to 1 week after intercourse. Membrane rupture to delivery intervals varied, with 63.0% experiencing rupture for over 24 h. Neonatal outcomes indicated that 60.0% had no morbidity, while 40.0% experienced complications, primarily neonatal jaundice (17%), neonatal infections (12%), and a neonatal death rate of 5%.

**Conclusion:** This study highlights the complex nature of PROM, emphasizing the need for comprehensive monitoring and further large-scale research. The findings underscore the importance of early detection, careful management, and continued investigation to improve maternal and neonatal outcomes.

**Keywords:** Maternal risks, neonatal health, obstetrics, pregnancy complications, pre-mature rupture of membranes, pre-mature rupture of membranes

## Introduction

Every woman dreams to be a mother in her lifetime. To be a mother, a woman must have a happy outcome of her pregnancy both for the fetus and herself. Many factors influence the outcome of a pregnancy, pre-mature rupture of membrane (PROM) is one of them. Under normal

circumstances, the fetal membranes rupture during the active phase of labor.

PROM is defined as spontaneous rupture of the chorioamnion before the onset of uterine contraction. The membrane may rupture either at term that is after 37 completed gestational weeks or before term, then it is called pre-term PROM.[1] One of the most critical functions of the fetal membranes is to remain intact until the onset of labor to maintain the protective intrauterine fluid environment.[2] In about 70% of pregnancies without interventions, their spontaneous rupture usually occurs near the end of the first stage of labor. Spontaneous membrane rupture occurs physiologically due to the progressive weakening of the membranes with advancing gestational age (GA). Pre-mature rupture is also common among pregnant women with previous pre-term PROM, previous pre-term delivery, history of cigarette smoking, bleeding during pregnancy, and genitourinary infections.[3,4] It is one of the most common pregnancy complications.[5] The overall incidence of PROM is 2–8%. If more than 24 h have elapsed before onset of labor then it is called prolonged rupture of membrane.[6] The etiology of PROM is largely unknown. The possible causes are either a reduction of membrane strength or an increase in intrauterine pressure or both. It may be associated with an incompetent cervix, unstable lie, polyhydramnios, multiple pregnancies, sexual activity, and infection (Chorioamnionitis, Urinary tract infection, and Lower genital tract infection).[7] Infection is closely associated either as an etiologic factor or as a consequence of PROM. From the maternal point of view, chorioamnionitis is a major problem that can lead to intrapartum and post-partum sepsis and rarely, septicemia. PROM may lead to fatal deformities, neonatal morbidity and mortality, and pre-maturity.[8] Rupture of the membrane leads to fetal and neonatal complications such as distress, respiratory syndrome, and pre-term birth, contributing to more than 40% of pre-term deliveries in some instances.[4,9,10] The risk factors of PROM are low socioeconomic status, malnutrition, over exertion, poor hygiene, stress, high parity, recurrent genito-urinary infection, anemia, smoking, and repeated per vaginal examination. PROM is very often seen in obstetric ward in our country. PROM often leads to neonatal morbidity and mortality. To improve fetal outcome of PROM the present study was undertaken.

## Methods

This observational cross-sectional study was conducted in the Department of Obstetrics and Gynecology at Mymensingh Medical College over a 6-month period from January to July 2007. The research involved 100 consecutive cases selected based on specific inclusion and exclusion criteria. GA was determined through multiple methods including the past menstrual period, previous antenatal records, clinical examination, and ultrasonography.

Membrane rupture was documented via sterile speculum examination or amniotic fluid pooling, with ultrasonographic confirmation of oligohydramnios used as supplementary diagnostic evidence. Management decisions were based on cervical condition, membrane rupture duration, and clinical symptoms. For uninfected patients below 36 weeks gestation, a conservative approach was adopted, involving bed rest and periodic pad inspection. Statistical analysis was performed using the Statistical Packages for the Social Sciences for Windows, with a significance level set at $P < 0.05$. The study included patients with spontaneous membrane rupture before labor onset, GA over 28 weeks, both primi and multigravida status, and fetal distress while excluding cases with antepartum hemorrhage, severe pre-eclampsia, eclampsia, or intrauterine death.

## Results

This observational study was conducted among previous and newly detected individuals attending the outpatient department of Mymensingh Medical College, Mymensingh, Bangladesh, after fulfilling the exclusion and inclusion criteria by purposive sampling method. A total of 100 apparent patients were included in the study.

The study of 100 participants revealed a predominantly young adult sample, with 66%

aged 21-30 years and a mean age of 27 ± 0.58 years. Economically, 57.0% earned over 10,000 taka monthly, 39.0% earned 5,000-10,000 taka, and only 4.0% earned below 5,000 taka [Table 1].

Parity distribution showed 59.0% multi gravida and 41.0% primi gravida [Table 2].

Gestational age analysis indicated most PROM cases occurred at 41-42 weeks (56.0%), followed by 37-40 weeks (24.0%), 34-37 weeks (11.0%), and 28-34 weeks (9.0%) [Table 3].

Past obstetric history showed 22.0% had previous PROM, 9.0% experienced preterm labor, and 10.0% had prior abortions [Table 4].

Regarding sexual activity, 45.0% of PROM cases occurred 48 hours to 1 week after intercourse. [Table 5].

Membrane rupture to delivery intervals varied, with 63.0% experiencing rupture for over 24 hours [Table 6].

Neonatal outcomes indicated 60.0% had no morbidity, while 40.0% experienced complications, primarily neonatal jaundice (17%), neonatal infections (12%), and a neonatal death rate of 5% [Table 7].

**Table 1:** Distribution of the respondents according to age and monthly income (*n*=100)

| Variable | *n* | % |
|---|---|---|
| Age | | |
| >20 | 20 | 20 |
| 21–30 | 66 | 66 |
| >30 | 14 | 14 |
| Mean±SD | 27±0.58 | |
| Monthly income | | |
| <5000 taka | 4 | 4 |
| 5000–10000 taka | 39 | 39.0 |
| >10000 taka | 57 | 57.0 |

SD: Standard deviation

**Table 2:** Distribution of the respondents according to incidence of parity (*n*=100)

| Gravida | *n* | % |
|---|---|---|
| Primi | 41 | 41.0 |
| Multi | 59 | 59.0 |
| Total | 100 | 100.0 |

**Table 3:** Distribution of the respondents according to gestational age at delivery (*n*=100)

| Gestational age | *n* (patient with PROM) | Percentage of patients with PROM |
|---|---|---|
| Mean±SD | 41±0.98 | |
| 28–34 weeks | 9 | 9.0 |
| 34–37 weeks | 11 | 11.0 |
| 37–40 weeks | 24 | 24.0 |
| 41–42 weeks | 56 | 56.0 |
| Total | 100 | 100.0 |

PROM: Pre-mature rupture of membranes, SD: Standard deviation

**Table 4:** Distribution of the respondents according to past obstetric history (*n*=100)

| Variable | *n* | % |
|---|---|---|
| Premature rupture of membrane | 22 | 22.0 |
| Preterm labor | 9 | 9.0 |
| Abortion | 10 | 10.0 |
| Multiple pregnancies | 2 | 2.0 |
| Others | 3 | 3.0 |
| No abnormality | 54 | 54.0 |
| Total | 100 | 100.0 |

PROM: Pre-mature rupture of membranes

**Table 5:** Distribution of the respondents according to the interval between past sexual intercourse and PROM (*n*=100)

| Variable | *n* | Percentage |
|---|---|---|
| <48 h | 14 | 14.0 |
| 48 h–1 week | 45 | 45.0 |
| 1 week–1 month | 15 | 15.0 |
| >1 month | 26 | 26.0 |
| Total | 100 | 100.0 |

PROM: Pre-mature rupture of membranes

**Table 6:** Distribution of the respondents according to the interval between rupture membrane and delivery (*n*=100)

| Variable | *n* | Percentage |
|---|---|---|
| <12 h | 20 | 20.0 |
| 12–24 h | 17 | 17.0 |
| >24 h | 63 | 63.0 |
| Mean±SD | 16±0.6 | |

SD: Standard deviation

**Table 7:** Distribution of the respondents according to neonatal outcome

| Fetal outcome | No of babies of PROM patient | Percentage |
|---|---|---|
| No morbidity | 60 | 60 |
| Morbidity | 40 | 40 |
| Neonatal jaundice | 17 | 17 |
| Neonatal infection | 12 | 12 |
| Congenital anomaly | 2 | 2 |
| Birth trauma | 2 | 2 |
| RDS | 1 | 1 |
| Convulsion | 1 | 1 |
| Neonatal death | 5 | 5 |

RDS: Respiratory distress syndrome, PROM: Pre-mature rupture of membranes

## Discussion

PROM is defined as spontaneous rupture of chorioamnion before the onset of uterine contraction. The membranes may rupture either at term, that is after 37 completed gestational weeks or before term, when it is called pre-term PROM. In this study, conducted in Mymensingh Medical College, Mymensingh 80% PROM cases occur in term pregnancy; in which 56% PROM cases were >40 weeks and 24% were ≥37–40 weeks. In this study, 20% of PROM occurred in pre-term pregnancy. A study conducted in 2003 had shown incidence of term PROM as 60% and pre-term PROM as 40% in BSMMU.[9] This discrepancy may be due to the difference in methods of case selection (selection bias) in these two different tertiary hospitals or due to small number of cases. Further studies involving more cases may help. In this study, the majority of the patients (66%) belong to the age group 21–30 years; which is similar to the studies done by Afrina and Ghosh.[9,10]

Socioeconomic status was considered by the per-month income of the family. The majority of participants reported monthly incomes exceeding 10,000 taka, comprising 57.0% of the total sample. A substantial secondary group earned between 5,000 and 10,000 taka, representing 39.0% of respondents. Those with monthly incomes below 5,000 taka constituted the smallest segment, accounting for only 4.0% of the study population. These results are not very different in comparison to other studies.[9,10] Wideman *et al*. found the relationship between low plasma ascorbic acid levels and PROM in patients from lower socioeconomic classes.[11] PROM in a prior pregnancy is an identified risk factor for PROM. Recurrence rate in this study was 22% compared to 21% shown by Naeye, 18.8% by Ghosh.[8,9]

Coitus is suggested as a risk factor for amniotic infection. Hence, the chance of PROM significantly increases when coitus occurs among cases within the previous 7 days. Coitus may facilitate microbial pathogen entrance into the upper reproductive tract.[10]

This study demonstrated a substantial association between PROM and the time since the past sexual encounter. Approximately 59% of PROM patients reported having their past sex during the previous week (48 h–1 week = 45%; <48 h = 14%). The majority of patients (80%) who have a term pregnancy with PROM will experience spontaneous labor and delivery. In this research, 20% instances had delivery after 24 h of PROM, 63% cases had spontaneous delivery within 24 h, and 17% cases had spontaneous delivery within 12 h. These findings are consistent with the previous study.[9,10]

In this study, 60% of cases had no neonatal morbidity. 40% of cases had neonatal morbidity. The most common neonatal outcome and morbidity was neonatal jaundice which was 17%. The second most common outcome was neonatal infection (12%), which included septicemia, meningitis,

pneumonia, umbilical sepsis, pyoderma, and conjunctivitis followed by neonatal death, which was 5%. There were a few cases of congenital anomaly and birth trauma. There was also a case of respiratory distress syndrome and a case of convulsion of neonate. Study focusing on neonatal outcome should be done in trials with larger no of cases. Our study has a lower no of morbidity comparing to other studies, though the mortality rate is higher comparing to Afrina.[10] This variation in result may due to the availability of facility in two different hospitals or because of the small number of cases. Further study should be done to evaluate this outcome difference in two different hospitals including a larger group.

Because of the scarcity of hospital bed, PROM patients with normal delivery were discharged earlier and follow-up of patients was not possible after their discharge. The real number of mortality and morbidity could not be estimated from this study. We need both hospital and community-based large-scale studies on PROM to know the exact incidence of PROM (term and pre-term), etiology of PROM, and neonatal outcome of PROM.[10] Creating a national registry for hospital admitted PROM patients can help regarding this. To assess the outcome of infants delivered after PROM a longer period will help to evaluate the prognosis of these infants at the highest risk of adverse events, especially pulmonary hypoplasia.

## Conclusion

The study on PROM provides critical insights into this complex obstetric condition, revealing significant patterns in maternal and neonatal health. Predominantly affecting women aged 21–30 years, with a higher incidence in term pregnancies and multi-gravida women, the research highlights the multifaceted nature of PROM. The findings demonstrate that the majority of participants earned moderate to high monthly incomes, challenging previous socioeconomic assumptions. While most cases showed no neonatal morbidity, a substantial proportion experienced complications, with neonatal jaundice and infections being the most common, and a notable neonatal death rate. The recurrence of PROM in previous pregnancies and the temporal relationship with sexual activity underscore the complexity of this condition. Despite the study's limitations, including a small sample size, the results emphasize the critical need for comprehensive maternal monitoring, early intervention strategies, and further large-scale research to develop more effective prevention and management protocols for PROM.

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