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## Original Research Article

## Maternal and fetal outcome in premature rupture of membrane

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## ABSTRACT

**Background:** Premature rupture of membranes is the most challenging obstetric dilemma which occurs even in low risk pregnancies and can convert a traditional pregnancy into a high risk pregnancy. This study aims to determine outcome, especially in the context of developing countries to help in formulating intervention strategies.

**Materials and Methods:** A hospital based observational, prospective study was conducted with 100 patients with diagnosis of PROM at or more than 37 weeks of gestation to study maternal and fetal outcome.

**Results:** The rate of maternal morbidity was 28%, commonest cause was febrile illness (12%). Perinatal morbidity was seen in 31% of cases. Clinical early onset neonatal infection was the commonest cause. Perinatal mortality was not seen.

**Conclusions:** Morbidities were associated with increased duration of PROM to delivery interval. Prediction of these morbidities is an important step in the management of infection associated with PROM.

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## 1. Introduction

Premature rupture of membrane is associated with a high risk of maternal morbidity and mortality. It is characterized by spontaneous rupture of chorioamnion before the onset of uterine contractions which leads to progressive cervical dilatation. It occurs in approximately 8% of all pregnancies. In developing countries, the incidence of premature rupture of membrane is about 18-20%.<sup>1,2</sup> Maternal morbidities are found in terms of chorioamnionitis which leads to endometritis, puerperal pyrexia, wound infection and placental abruption. Further, consequences may increase due to obstetric interventions in terms of instrumental deliveries and caesarean sections. It may be a result of fetal distress, dry labor or incoordinate uterine actions.<sup>3</sup> Neonatal morbidities are mainly due to infection. Umbilical cord compression and cord prolapse may occur in PROM.

PROM is associated with 20% of neonatal deaths.<sup>4</sup> Neonatal complications include early onset neonatal infection, birth asphyxia, hyperbilirubinemia, late onset sepsis, congenital malformations and congenital pneumonia, bronchopulmonary dysplasia. Close monitoring with timely intervention and good neonatal set up can contribute significantly to reduce fetomaternal morbidities and mortalities.

In most cases of premature rupture of membrane it can be diagnosed on the basis of the patient's history and physical examination. Sterile speculum examination provides an opportunity to inspect for cord prolapse and assess cervical dilatation and effacement, and also helps to obtain cultures as appropriate.<sup>5</sup> The diagnosis of membrane rupture is confirmed by the visualization of amniotic fluid passing from the cervical canal and pooling into the vagina (a basic pH test of vaginal fluid or arborization of dried vaginal fluid which is identified under microscopic evaluation is helpful in diagnosis). The normal pH of vaginal secretions

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is generally 4.5–6.0, whereas amniotic fluid has a pH of about 7.1–7.3. False-positive test results may occur in the presence of semen, blood, alkaline antiseptics or bacterial vaginosis. False-negative test results may occur with prolonged membrane rupture.

Management of PROM is not clear, main uncertainty is related to induction of labor or expectant management. The key to the management of rupture of membrane is accurate assessment of gestational age, fetal position, presence or absence of chorioamnionitis, fetal heart rate monitoring. Group B streptococcal prophylaxis should be given based on prior culture results and intrapartum risk factors, if cultures have not been previously performed. The longer the time interval between rupture of membranes and onset of labor, the greater is the risk of ascending infection and chorioamnionitis. Number of vaginal examinations are more predictive of maternal infection than duration of membrane rupture.<sup>6</sup>

Labor usually starts spontaneously within 24 hours following term PROM, but up to 4% of cases they will not experience spontaneous onset of labour within seven days. With expectant management, approximately 60–80% of women with rupture of membrane go into labour within 24 hours, and 95% within 72 hours. If the interval from leaking to delivery exceeds 18 hours, then there is an increase in incidence of neonatal infections and admissions. Induction of labour is the only strategy besides expectant management of PROM that reduces the infectious morbidity for both mother and infants. Expectant management involves waiting for labor to occur and then making management decisions. If labour does not progress spontaneously after a specific period, intravenous oxytocin and different preparations of prostaglandins have been used for inducing labour but the effectiveness of all these agents vary.<sup>7</sup> Diagnosis and proper management are very important to limit various fetal and maternal complications generally due to infection.<sup>8</sup>

The present study aims to determine the maternal and fetal outcome in premature rupture of membrane, especially in the context of developing countries to help in formulating effective intervention strategies and minimize complications. Hence the present Descriptive observational study was done at our tertiary care centre to determine maternal and fetal outcomes in premature rupture of membrane.

## 2. Aim and Objectives

1. To study the maternal and fetal outcome in cases of premature rupture of membrane.
2. To find out risk factors of Premature rupture of membrane, if any.

## 3. Materials and Methods

A hospital based observational, prospective study was conducted with 100 patients with diagnosis of premature rupture of membrane at or more than 37 weeks of gestation, at SDMH, Jaipur to study maternal and fetal outcome in premature rupture of membrane (PROM).

### 3.1. Inclusion criteria

1. Cases admitted with PROM at >37 weeks of gestation.
2. Cervical dilatation of < 3cm
3. Lack of uterine contraction for at least 1 hour of PROM
4. Singleton pregnancy
5. Vertex presentation
6. Reactive NST
7. Clear liquor

### 3.2. Exclusion criteria

1. Cases admitted with Preterm premature rupture of membranes < 37 weeks of gestation
2. Cervical dilatation >3cm
3. Uterine contraction within 1 hour of PROM
4. Multiple pregnancy
5. Malpresentation
6. Non-reactive NST
7. Meconium stained liquor
8. History of previous LSCS
9. Any other medical complications/consent withdrawn

### 3.3. Procedure of study

#### 3.4. Detailed history was obtained Obstetrical examination was done

A detailed pelvic examination was done under aseptic precaution. As per speculum examination, discharge, leaking p/v and colour of liquor were recorded. Routine investigations including complete blood count and C-reactive protein were noted. Then swab was taken from amniotic fluid for gram stain culture and sensitivity. A detailed “per vaginal examination” was done to determine the consistency, effacement, dilatation of cervix, position of cervix, presence or absence of membrane, the station of the vertex with its position, the presence of caput, molding and pelvic assessment were noted. Maternal and fetal outcome was observed.

## 4. Observations and Results

A hospital based observational, prospective study was conducted with 100 patients to study maternal and fetal outcome in premature rupture of membrane (PROM).

#### 4.1. Distribution of patients according to risk factors of PROM

The most common risk factors of PROM were UTI (22%) Previous history of PROM (16%).

#### 4.2. Distribution of patients according to gestational age

66% of patients were of  $\leq 38$  weeks and 34% were of  $>38$  weeks.

#### 4.3. Distribution of patients according to rupture of membrane to delivery interval:

66% of patients delivered in between 16-24 hrs. while 24% and 10% of patients delivered after 20 hrs and  $<16$  hrs respectively.

#### 4.4. Distribution of patients according to rupture of membrane to delivery interval

66% of patients delivered in between 16-20 hrs. While 24% and 10% of patients delivered after 20 hrs and  $<16$  hrs respectively as shown in Table 1.

**Table 1:** Distribution of patients according to rupture of membrane to delivery interval

| Rupture of Membrane (Hrs) | No. | %      |
|---------------------------|-----|--------|
| $<16$                     | 10  | 10.00  |
| 16-20                     | 66  | 66.00  |
| $>20$                     | 24  | 24.00  |
| <b>Total</b>              | 100 | 100.00 |

Chi-square = 23.963 with 2 degrees of freedom;  $P < 0.001$

#### 4.5. Distribution of patients according to mode of delivery

68% of patients delivered vaginally. Among 100 patients 8% delivered by forceps application and 24% underwent LSCS.

#### 4.6. Distribution of patients according to Indication of LSCS

Most common indication was failure to progress in 8 patients (33.33%). Fetal distress was there in 3 patients (12.50%), Malpresentation and failed induction in 2 patients (8.33%) respectively, Maternal request for 1 patient (4.17%) as shown in Table 2.

#### 4.7. Distribution of patients according to maternal morbidity

The most common maternal morbidity was Puerperal pyrexia (12%) followed by Chorioamnionitis (8%), puerperal

**Table 2:** Distribution of patients according to indication of LSCS

| Indication for LSCS (N=24) | No. | %     |
|----------------------------|-----|-------|
| Failure to progress        | 8   | 33.33 |
| Fetal distress             | 3   | 12.50 |
| Mal-presentation           | 2   | 8.33  |
| Failed induction           | 2   | 8.33  |
| Maternal request           | 1   | 4.17  |

sepsis (3%) Urinary tract infection (1%), adherent placenta (1%), wound infection, and PPH (2%) as shown in Table 3.

**Table 3:** Shows distribution of patient according to maternal morbidity

| Maternal Outcome (N=100)  | No. | %     |
|---------------------------|-----|-------|
| Presence of Fever         | 12  | 12.00 |
| Clinical Chorioamnionitis | 8   | 8.00  |
| UTI                       | 1   | 1.00  |
| Puerperal Sepsis          | 3   | 3.00  |
| Adherent Placenta         | 1   | 1.00  |
| Wound Infection           | 1   | 1.00  |
| PPH                       | 2   | 2.00  |
| Maternal Mortality        | 0   | 0.00  |

#### 4.8. Distribution of neonates according to birth weight

LBW infant were of 8%, 67% were between 2.5-2.99 Kg, and 25% were of more than 3 Kg as shown in Table 4.

**Table 4:** Distribution of neonates according to birth weight

| Baby Weight (Kg) | No. | %      |
|------------------|-----|--------|
| LBW              | 8   | 8.00   |
| 2.5-2.99         | 67  | 67.00  |
| $\geq 3.0$       | 25  | 25.00  |
| <b>Total</b>     | 100 | 100.00 |

#### 4.9. Distribution of patients according to neonatal outcome

69 (69%) neonates were healthy while the rate of neonatal morbidity was 31% in our study. The most common neonatal morbidity was Early onset sepsis (15%) followed by Neonatal Jaundice (5%), neonatal infection (4%), and Hypoglycaemia (3%), respiratory distress in 2%, late onset sepsis 1%, congenital abnormality seen in 1% of patients as shown in Table 5.

## 5. Discussion

Nowadays, Pre-labor rupture of the membrane (PROM) is one of the common and challenging problems in obstetric and perinatal medicine. ACOG (2007) have suggested that PROM complicates 2 to 4% of all singleton and 7 to 20% of twin pregnancies. A hospital based observational,

**Table 5:** Distribution of patients according to neonatal morbidity (n=31)

| Neonatal Outcome (N=100) | No. | %     |
|--------------------------|-----|-------|
| Neonatal Infection       | 4   | 4.00  |
| Early Onset Sepsis       | 15  | 15.00 |
| Neonatal Jaundice        | 5   | 5.00  |
| Respiratory Distress     | 2   | 2.00  |
| Hypoglycemia             | 3   | 3.00  |
| Late Onset Sepsis        | 1   | 1.00  |
| Congenital Abnormalities | 1   | 1.00  |
| Neonatal Mortality       | 0   | 0.00  |

prospective study was conducted with 100 patients to study maternal and fetal outcome in premature rupture of membrane (PROM).

### 5.1. Cause of PROM

History of UTI was given by 22% of patients. History of PROM was given by 16% of patients. Study done by Amulya et al.<sup>9</sup> observed that the history of infection was given by 19% of patients, and unknown etiological analysis in 59.16% of cases.

### 5.2. Mean duration between PROM to delivery

The mean duration between PROM to delivery was 18.74 hrs with a standard duration of 2.92 hrs. It was observed in our study that as the duration of PROM to delivery interval increases, there is increased risk of neonatal morbidity. Mean duration between PROM to delivery was 20.2 hrs in study of Suryapalem S et al.<sup>10</sup> 64% of the study population delivered within 24 hrs in a study conducted by Patil S et al.<sup>11</sup> In our study, the PROM to delivery interval was within 24 hrs as per the ACOG guidelines. In our institution, management protocol is to deliver the patient within 24 hrs by doing active management. Prostaglandin gel or oxytocin drip or both can be used for induction and augmentation of labor.

### 5.3. Mode of delivery

It was observed in our study that normal delivery is the most common mode of delivery which is 76%, among which forceps delivery was 8%. The LSCS rate in our study group was 24%. In comparison to Chhangte et al.<sup>3</sup> and Shrestha et al.<sup>12</sup> the rate of vaginal delivery was more in our study group as shown in Table 6. This could be due to active management of labor, timely induction and augmentation of labor, strict fetal heart rate monitoring, judicious use of instruments and oxytocics during delivery.

### 5.4. Cause of LSCS

In a study, the most common reason for LSCS was failure to progress in 10 patients (41.6%). Study done

by Suryapalem S et al.<sup>10</sup> also showed the same results, failure to progress was the most common indication for LSCS 45.45% followed by foetal distress 32.73% and least common was intrapartum sepsis 1.82%. Chhangte et al.<sup>3</sup> observed that the most common indication for LSCS in PROM was malpresentation (33.3%) followed by failed induction without fetal distress(30.5%).

### 5.5. Maternal outcome

In our study, 72 (72%) patients were healthy while the rate of maternal morbidity was 28% in our study. The most common maternal morbidity was febrile morbidity in 12 patients (12%) followed by Clinical Chorioamnionitis (8%), puerperal sepsis (3%), PPH(2%) and Urinary tract infection (1%), adherent placenta(1%), wound infection(1%) as shown in Table 7.

In our study, febrile morbidity is the most common, compared to clinical chorioamnionitis as we had a protocol of starting antibiotics in case of PROM. No case of maternal mortality was seen.

### 5.6. Birth weight

Average birth weight of babies in our study was 2.82 Kg with standard deviation of 0.24Kg. 8% of babies were low birth weight. Study done by Chhangte et al.<sup>3</sup> observed mean birth weight to be 2.9±0.3 Kg. Most of the babies were of normal weight and 4% belonged to low birth weight. In various studies birth weight is normal as term patients were taken for study.

### 5.7. Neonatal outcome

The relationship of PROM to the consequential fetal hazard is matter of concern. In the present study, perinatal morbidity was seen in 32% cases. Clinical early onset infection was seen in 15% cases. This was the most common cause of perinatal morbidity. Foetal morbidity always increases with PROM to delivery interval. It is evidenced in our study that when the duration of rupture was more than 20 hrs, adverse neonatal outcome was seen in 58.33% cases. There was no perinatal mortality in our study. There was no perinatal mortality seen in our study since we had only included the women with >37 weeks gestation and excluded the women with obstetric complications which could have given rise to compromised fetus.

This coincides with the findings of study done by Jaiswal et al,<sup>14</sup> Suryapalem et al,<sup>10</sup> Shrestha et al.<sup>12</sup> Jaiswal et al<sup>14</sup> found perinatal morbidity in 30% cases, early onset infection in 23% cases, birth asphyxia in 6.19% cases, hyperbilirubinemia in 2.86% cases, late onset sepsis in 0.95% cases, congenital malformations in 0.48% cases, congenital pneumonia in 0.48% cases, and perinatal mortality in 1.43% cases. Perinatal mortality was due to birth asphyxia and multiple congenital abnormalities. Study

**Table 6:** Comparison among different studies based on mode of delivery

| Studies                           | Normal vaginal Delivery | Instrumental Delivery | LSCS  |
|-----------------------------------|-------------------------|-----------------------|-------|
| Amulya et al <sup>9</sup> 2019    | 80%                     |                       | 20%   |
| Chhangte et al <sup>3</sup> 2018  | 55%                     | 9%                    | 36%   |
| Shrestha et al <sup>12</sup> 2006 | 70%                     | 3%                    | 27%   |
| Gandhi et al <sup>13</sup>        | 88%                     | 0.5%                  | 11.5% |
| Study group                       | 76%                     | 8%                    | 24%   |

**Table 7:** Comparison between different studies based on maternal outcome

| Study                             | Fever | Wound infection | Others   | Maternal Morbidity |
|-----------------------------------|-------|-----------------|--|--------------------|
| Amulya et al <sup>9</sup> 2019    | 9.16% | 3.33%           | PPH (1.66%) Puerperal sepsis (1.66%)                       | 16.6               |
| Jaiswal AA et al <sup>14</sup>    | 10.5% | 1.4%            | Puerperal sepsis (1.4%) LRTI : 0.5% chorioamnionitis : 11% | 26%                |
| Surayapalem S et al <sup>10</sup> | 8%    | 2.5%            | Puerperal sepsis (1%) LRTI : 2%                            | 17.5%)             |
| Study group                       | 12%   | 1               | Puerperal sepsis (3) PPH (2)                               | 28                 |

done by Chhangte et al.<sup>3</sup> 6 neonates were admitted to NICU. Early onset of sepsis in 2% cases, birth asphyxia in 2% cases, transient tachypnoea of newborn and neonatal jaundice in 1% cases. Study done by Surayapalem et al.<sup>10</sup> recorded 26% perinatal morbidity with birth asphyxia causing the maximum 14% cases; other less common were septicemia 4%, umbilical cord sepsis 2%, convulsions 3%, LRTI and malformations 1% each, meconium aspiration syndrome 0.5%. Perinatal mortality was 3%.

## 6. Recommendation

1. To ensure better neonatal outcome active management of labor should be done and delivery should occur within 24 hrs of PROM.
2. Babies born with infection should be followed for a longer period for morbidity and mortality of PROM.

## 7. Conclusion

In the present study we concluded that maternal morbidity and neonatal morbidity was associated with increased duration of PROM to delivery interval in our study. Prediction of these morbidities is an important step in the management of infection associated with PROM. Hence an appropriate and accurate diagnosis of PROM is essential for favorable outcome in pregnancy. ANC cases should be educated regarding regular and timely antenatal checkup. The obstetrician and neonatologist should work as a team to ensure optimal care for mother and neonate.

## 8. Source of Funding

None.

## 9. Conflict of Interest

The authors declare that there is no conflict of interest.

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