

DOI: <http://dx.doi.org/10.18203/2320-1770.ijrcog20184496>

Original Research Article

Preterm premature rupture of membranes: maternal and perinatal outcome

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Received: 31 December 2017

Revised: 13 August 2018

Accepted: 01 September 2018

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ABSTRACT

Background: This is an observational analytical study carried out in department of obstetrics and Gynecology, in a tertiary care center to determine the factors influencing fetal and maternal outcome, prognosis and complications in preterm premature rupture of membrane cases.

Methods: The present study is a prospective observational study of perinatal and maternal outcome in 100 cases of preterm premature rupture of membranes in between 28-37 weeks gestation with singleton pregnancy, from 1st March 2013 to 28th February 2014. Patients with medical complications like anemia, preexisting hypertension, diabetes, vascular or renal disease, multiple gestations, uterine or fetal anomalies etc. are excluded from the study. Detailed history, physical examinations were carried out and appropriate management instituted as per individual patients need.

Results: In this study maternal morbidity was 16%. Perinatal morbidity was 33% and most common causes were hyperbilirubinemia (23%), RDS (21%). Perinatal mortality was seen in 15% and mainly due to RDS (53%). Twenty-five (25%) neonates were delivered by cesarean. The main indications for cesarean being malpresentation (36%) followed by fetal distress (24%).

Conclusions: PPRM is one of the important causes of preterm birth that can result in high perinatal morbidity and mortality along with maternal morbidity. Looking after a premature infant puts immense burden on the family, economy and health care resources of the country. An understanding of gestational age dependent neonatal morbidity and mortality is important in determining the potential benefits of conservative management of preterm PROM at any gestation.

Keywords: Mortality, Perinatal morbidity, Prom

INTRODUCTION

Premature rupture of membranes (PROM) is defined as the spontaneous rupture of amniotic membrane with a release of amniotic fluid at least one hour before the onset of labor. If the membranes rupture after 37 weeks of gestation it is called term PROM. If the rupture of membranes (ROM) occur after 28 weeks but before 37

weeks of gestation is termed as the preterm premature rupture of membrane (PPROM).¹

Latent period: It is the time interval between the rupture of membranes and the onset of uterine contractions.²

Prolonged Prom: It is the term used when more than 24 hours have elapsed before the labor ensues.²

High rupture of Membranes- It is due to the rupture of amniochorion at a site distant from internal OS and spontaneous cessation of leakage can occur.²

PROM is usually followed by labor. The onset of labor after PROM is directly related to the gestational age at the time of rupture. Labor started within 24 hours of PROM in 81% of patients carrying babies larger than 2500 grams but early in gestation.

Only 48% of the patients develop labor within three days of PROM.² It is an obstetric conundrum which is poorly defined, with an obscure etiology, difficult to diagnose and is associated with significant maternal and neonatal morbidity and mortality and has diverse and controversial management strategies.²

Incidence of Prom

PROM occurs in approximately 10 % of all pregnancies and in 70% of the cases at term. Although there is some morbidity when PROM occurs in term pregnancies, the fundamental clinical problem is preterm PROM, a condition that occurs in 3% of all pregnancies and is responsible for approximately 30 % of all preterm deliveries.¹

Preterm PROM complicates 3-8% of pregnancies and leads to one third of preterm deliveries.² It increases the risk of prematurity and leads to other perinatal and neonatal complications with 1-2% risk of fetal death. PROM is associated with increased risk of chorioamnionitis, dysfunctional labor, increased cesarean rates, postpartum hemorrhage and endometritis in the mother. In the fetus, there is increased occurrence of hyaline membrane disease, intraventricular hemorrhage, sepsis, cord prolapse, fetal distress and increased fetal wastage.

Thus, earlier the gestational age at the time of PROM, longer is the latency and more the complications. Management of PROM remains controversial and challenging.² Controversy surrounds the role of tocolytics, steroids and antibiotics.³

The aim of the study was to observe the maternal and perinatal outcome in patients with preterm premature rupture of membranes; to study the maternal complications in preterm premature rupture of membranes; to find out the perinatal morbidity and mortality in preterm premature rupture of membranes and to study mode of delivery in preterm premature rupture of membranes.

METHODS

Source of data: 100 patients of preterm premature rupture of membranes in between 28-37 weeks gestation admitted in labor room were studied after considering inclusion and exclusion criteria.

Study design: Hospital based prospective observational study.

Study period: Over a period of one year from March 2013 to February 2014.

Study place: Tertiary care hospital.

Sample size: 100.

As per statistical formula sample size was 100.

In last year (2012) population of PPROM is 135 (calculated by considering all inclusion and exclusion criteria).

Confidence level: 95%.

Confidence interval: 5.

Inclusion criteria

- All pregnant women with a singleton pregnancy between 28-37 weeks of gestational age with preterm premature rupture of membranes.

Exclusion criteria

- Multiple pregnancies
- Intrauterine growth restriction
- Uterine anomalies
- Fetal anomalies
- Myoma uteri
- Hypertensive disorders and pregnancy induced hypertension
- Gestational diabetes mellitus
- Antepartum hemorrhage
- Chronic renal failure
- Class II to IV cardiac diseases.

Method of collection of data

A detailed history was taken including age, booking, socio-economic status, time of onset of leaking, amount of fluid lost, its colour, odour, association with pain or bleeding per vagina and perception of fetal movements.

General examination, height and weight were recorded. Systemic examination included cardiovascular, respiratory systems and CNS systems.

In the obstetric examination, following were noted. Height of uterine fundus, lie, presentation and position of fetus, engagement of presenting part, condition of uterus whether contracted or relaxed.

Uterine tenderness was looked for as a sign of chorioamnionitis. Fetal heart sound was auscultated and its rate, rhythm and tone were noted. A sterile speculum

examination was done and amniotic fluid pooling in posterior fornix was observed. The colour and smell of fluid was noted. If no fluid was seen, the patient was asked to cough, and drainage of fluid was looked for. In doubt, vaginal fluid specimen was collected and subjected to litmus paper test. Cervical swab was taken and sent for Gram stain and culture sensitivity.

A single pelvic examination was done to note the Bishop's score, adequacy of pelvis, assessment of CPD and to rule out cord prolapse. Investigations like total count, differential count and C-reactive protein were done. Prophylactic antibiotic in the form of injection ampicillin 1 gm IV every 6 hourly was given.

Depending upon the gestation age and Bishop's score labour was induced with prostaglandins or augmented with oxytocin. Time of induction was noted. Progress of labor was monitored, Induction to delivery interval and PROM to delivery interval were noted. Maternal pulse, blood pressure, fetal heart rate and its variations were checked frequently.

The onset of any complications like fetal distress, fetal heart rate variations, chorioamnionitis (clinical) were looked for. Progress of labour was monitored. If there was any evidence of fetal jeopardy or any other obstetrical complications, labour was cut short by instrumental delivery or cesarean section as required.

Following facts were noted:

- Soon after delivery, APGAR score at 1- and 5- minutes birth weight, sex, congenital anomalies, immediate complications and birth injuries, signs of asphyxia, meconium aspiration, sepsis and other associated complications were recorded.
- The babies were followed up in the postnatal period. Neonatal morbidity and mortality were noted.
- Mothers were watched for third stage complications like PPH and retained placenta.
- They were followed up in puerperal period. Vital parameters like temperature, pulse, blood pressure were frequently monitored. Women were specifically asked for foul smelling lochia and the presence of febrile morbidity. Episiotomy wound, and cesarean section wound was observed, and regular Follow-up was done. Maternal morbidity like puerperal sepsis,

urinary and respiratory tract infection and wound infection were looked for.

Both mother and the baby were followed up till their stay in the hospital.

Statistical analysis

All relevant data will be compiled and entered into computer using computer-based software SPSS for appropriate analysis. Quantitative data will be analyzed by proportion and Chi square test at p<0.05 level of significance.

RESULTS

It is observed that as the duration of PPRM increases the maternal morbidity also increases. In this study 81.25% patients had maternal morbidity when duration of PROM exceeded 24 hours.

Table 1: Duration of PPRM and maternal morbidity.

Duration of PPRM in hours	No. of cases	Percentage
<12	1	6.25
13-24	2	12.50
>24	13	81.25

But no maternal mortality was seen in this study. In this study maternal morbidity was 84%. There are various causes of maternal morbidity including fever, wound infection, lower respiratory tract infection (LRTI), retained placenta which required manual removal of placenta (MROP) and post-partum hemorrhage (PPH).

Table 2: Maternal morbidity causes.

Morbidity	No.	%
Febrile morbidity	12	12
Wound infection	1	1
LRTI	1	1
MROP	1	1
PPH	1	1

Out of this, in this study fever is the most common cause of febrile morbidity accounts for 12 % of cases.

Table 3: Mode of delivery and parity.

Mode delivery	No. of cases	Primi	Percentage	Multi- gravid	Percentage	P value
ND	65	35	54	30	46	0.176
Forceps	10	5	50	5	50	
LSCS	25	8	32	17	68	

In above table mode of delivery is categorized according to parity. The total number of cases of LSCS in this study was 25%, which is seen more in multigravida 68%.

In this study normal vaginal delivery in primigravida was 54% and multigravida 46%, outlet forceps were 50% in both the groups but LSCS were 68% in multigravida and 32% in primigravida.

Table 4: Indications for LSCS in PPROM.

Indications	No. of cases	Percentage
Breech	7	28
Fetal distress	6	24
Failure of induction	3	12
Oligohydramnios	3	12
Previous LSCS	3	12
Transverse lie	2	8
Persistent occipito-posterior position	1	4
Total	25	

The mode of delivery according to parity did not show any significant difference in the ND and outlet forceps groups but LSCS were more in the multipara than in the primipara. There was no statistical significance noted in primigravida and multigravida groups.

In this study LSCS was done in 25% of the cases, the main indications being malpresentation (breech and transverse lie) 36% followed by fetal distress 24%, failure of induction 12%. other indication being oligohydramnios and previous LSCS accounts for 12% each.

Table 5: Perinatal morbidity.

Causes	No. of cases	Percentage
Hyperbilirubinemia	23	69.69
Sepsis	10	30.30
RDS	21	63.63
NEC	4	12.12
ROP	2	6.06
HIE	2	6.06
IVH	2	6.06
Birth asphyxia	3	9.09

Table 7: Perinatal morbidity and mortality in relation to duration of PPROM.

Duration of Prom	No of cases	Perinatal morbidity	Percentage	Perinatal mortality	Percentage
<12 hours	29	3	10.34	1	3.44
12-24 hours	19	7	36.84	1	5.26
24-36 hours	24	6	25	5	20.83
>36 hours	28	17	60.71	8	28.57

In this study perinatal morbidity was 33%. There are various causes including hyperbilirubinemia (69.6%), respiratory distress syndrome RDS (63%), sepsis (30%).

Other causes being necrotizing enterocolitis (NEC), prematurity of retina (ROP), Hypoxic Ischemic encephalopathy (HIE), intraventricular hemorrhage (IVH), birth asphyxia.

Table 6: Perinatal mortality.

Causes	No. of cases	Percentage
RDS	8	53.3
Sepsis	4	26.7
Birth asphyxia	3	20

In this study, perinatal mortality was 15%. The most common cause is respiratory distress syndrome (53%) followed by sepsis (26.7%) and birth asphyxia (20%). In this study it is observed that as the duration of PPROM increases, perinatal morbidity and mortality also increases. Perinatal morbidity was 60.71% and perinatal mortality was 28.57% with PPROM to delivery interval more than 36 hours. The studies by Russel 19 showed that the danger of infection to both mother and fetus increases with duration of PPROM. But prolongation of latent period decreases the incidence of RDS.

In this study RDS occur in 53.3% of the case. RDS was present in 64% of the cases, when the gestational age was less than 32 weeks and duration of PPROM was < 24 hours and 32% when gestational age was 30 weeks and duration of PPROM was > 24 hours.

According to Yoon RDS occurred in 24.6% when PPROM was < 24 hours and 12.5% when PPROM was > 24 hours.¹² In this study it is observed that as birthweight increases perinatal morbidity and perinatal mortality decreases.

In this study perinatal mortality was highest (66.6 %) when the birthweight was up to 1000 g and no mortality seen when birthweight was more than 2000 g. In this study 6% of the cases were < 1000 gm in weight, 21% were between 1001-1500 g, 23% of cases were between 1501-2000 g and 26% were between 2001-2500 g and 24% were above 2500 g.

Table 8: Perinatal morbidity and mortality according to birth weight.

Birth weight	No. of cases	Perinatal morbidity	Percentage	Perinatal mortality	Percentage
Upto 1000 g	6	5	83.33	4	66.6
1001-1500 g	21	16	76.19	8	38.81
1501-2000 g	23	7	30.43	3	13.04
2001-2500 g	26	3	11.53	-	-
> 2500 g	24	2	8.33	-	-

DISCUSSION

Preterm PROM complicates 3-8% of pregnancies and leads to one third of preterm deliveries.² It increases the risk of prematurity and leads to other perinatal and neonatal complications with 1-2% risk of fetal death. It is an observational study done in tertiary care hospital including 100 patients of preterm premature rupture of membranes in between 28-37 weeks gestation admitted in labor room for a period of one year were studied.

Maternal age

In this study PPROM was present in 79% of cases in the age group of 20-29 years.

Socio-economic status

In this study the patients of low socioeconomic status were 58% and middle socioeconomic status were 30% which is comparable with the study by Shehla which is 68.23% and 31.77% respectively.⁴ Studies have shown

that defects in the amniotic membranes occur due to low socio-economic status associated with factors like malnutrition, over exertion, poor hygiene, stress, high parity, recurrent genitourinary infection and anemia. The risk of PPROM increases with decrease antibacterial activity in the amniotic fluid of patients with low socio-economic status.

Booked and unbooked cases

In this study the booked cases were 16% and unbooked cases 84%. In unbooked cases there is lack of antenatal care leading to lack of identification of recurrent risk factors like PPROM, preterm delivery, induced abortions and their managements. Also, urogenital infections are not detected and treated due to lack of antenatal care leading to PPROM.

Parity

Multiparity is a risk factor for PPROM due to long standing infection, previous trauma to cervix and patulous os.

Table 9: Comparison of parity with other studies.

Comparison with other studies	Swathi ³	Shehla ⁴	Okeye ⁵	Trinity ⁶	Present study
Primigravida	48 %	44.7 %	29.1 %	55.9 %	48 %
multigravida	52 %	55.3 %	69.9 %	44.1 %	52 %

Mode of delivery

In our study normal delivery were 65% which is comparable to the above studies. LSCS were more when

cervix was unripe, and induction was done compared to cases with Bishop score >5. Also, malpresentations, failure of induction and fetal distress due to oligohydramnios resulted in LSCS.

Table 10: Comparison of mode of deliveries with other studies.

Mode of delivery	Shehla ⁴	Trinity ⁶	Kadikar ⁷	Present study
Normal delivery	65.88 %	71.4 %	77%	65 %
Cesarean section	14.11 %	26.7 %	10%	25 %
Instrumental delivery	20 %	1.9 %	4%	10 %

PPROM to delivery interval

Duration of PPRM is inversely related to gestational age when the membranes ruptured.⁸ Many studies have shown that earlier in gestation (23-28 weeks), 30-40% of pregnancy will advance more than one week after

PPROM. 20% will advance for more than 4 weeks. On the other hand, later in gestation (32-34 weeks) fewer women will deliver after one week and 40% will deliver within 3 days. In this study 48% delivered within 24 hours, 24% delivered within 36 hours and 28% after 36 hours.

Table 11: Comparison of maternal morbidity with other studies.

Studies	Swathi ³	Okeye ⁵	Kadikar ⁷	Anjana ¹²	Present
Maternal morbidity	9%	20%	8%	21%	16%

Indications for LSCS

In this study LSCS was done in 25% of the cases, the main indications being malpresentation 28% followed by fetal distress 24%, failure of induction 12% and transverse lie 8% which is comparable to the study by Kamala Jayaram, the indications being failed induction, fetal distress and malpresentation.⁹

Investigations for evidence of infection

The investigations like total count, C-reactive protein and high vaginal swab for culture and sensitivity were done to evaluate for the evidence of infection. Leukocytosis can be affected by pregnancy and labor. CRP estimates seem to be reliable monitoring tool (Carroll).⁸ But in more detailed studies WBC and CRP were poor predictors of the presence of a positive amniotic fluid or fetal blood culture.¹⁰ In this study 10 cases of normal vaginal flora, 4 cases of E. coli, 2 cases of Klebsiella, 2 cases of Group B streptococcus, one case of staphylococcus Aureus, one case of coagulase negative Staphylococcus, one case of coagulase positive staphylococcus and 2 cases of candida species were isolated.

AFI < 5 and LSCS

The findings of this study correlate with the studies by Tavassoli et al that PPRM with oligohydramnios is

associated with shorter latency, higher rate of C/S, higher rate of early neonatal death and lower neonatal Apgar.¹¹ Therefore, it is recommended to consider the AFI as a prognosis index in patients with PROM. These patients with reduced AFI on NST had variable deceleration. These studies suggest that NST could be used to monitor for low AFI and cord compression in patients with PPRM. As the duration of PPRM increases the maternal morbidity also increases. The maternal morbidity in this study was 16%. In this study 84% of patients were healthy. Febrile morbidity was seen in 12 % of cases, 2% of cases had Postpartum hemorrhage.

The study conducted by Arul Kumar showed that after 32 weeks of gestation the common causes of perinatal morbidity were RDS, perinatal asphyxia and infection, but with good supportive neonatal care most of the infants can survive.¹³ In this study perinatal morbidity was 33% of which 23% were hyperbilirubinemia 10% sepsis and 21% RDS. In this study, perinatal mortality was 15%. The most common cause is respiratory distress syndrome (53%) followed by sepsis (26.7%) and birth asphyxia (20%). The high incidence of maternal and neonatal infection may be consequence of decreased antibacterial activity in the amniotic fluid which is low in early pregnancy and increases with gestational age. Another factor is the limited ability of a preterm infant to fight infection.

Table 12: Comparison of perinatal mortality with other studies.

Study	Swathi ³	Shehla ⁴	Okeye ⁵	Anjana ¹²	Present study
Perinatal mortality	12%	12.94%	8.9%	5%	15%

Perinatal morbidity and mortality in relation to duration of PPRM

In this study, as the duration of PPRM increases, perinatal morbidity and mortality also increases. When PPRM to delivery interval more than 36 hours Perinatal

morbidity was 60.71% and perinatal mortality was 28.57%. The studies by Russel showed that the danger of infection to both mother and fetus increases with duration of PPRM. But prolongation of latent period decreases the incidence of RDS.¹⁴ Perinatal morbidity and mortality according to birth weight. Perinatal morbidity and

mortality decrease as the birthweight increases. When the weight was < 1000 g, perinatal morbidity was 83.3% and mortality was 66.6%. It reduced to 8.33% morbidity and no mortality when birth weight increased to >2500 g.

CONCLUSION

PPROM is one of the important causes of preterm birth that can result in high perinatal morbidity and mortality along with maternal morbidity. Looking after a premature infant puts immense burden on the economy and health care resources of the country. Therefore, management of PPRM requires accurate diagnosis and evaluation of the risks and benefits of continued pregnancy or expeditious delivery. An understanding of gestational age dependent neonatal morbidity and mortality is important in determining the potential benefits of conservative management of preterm PROM at any gestation. It is important that the patient should be well informed regarding the potential for subsequent maternal, fetal and neonatal complications regardless of the management approach. Risk scoring strategies involving the demographic variable along with previous history of preterm deliveries should be developed to identify high risk cases and treating them prior to rupture of membrane. Tocolysis in women with PPRM is not recommended because this treatment does not significantly improve perinatal outcome. Antenatal corticosteroids should be administered in women with PPRM. Routine antibiotic administration reduces maternal and neonatal morbidity. Antibiotic therapy also delays delivery, thereby allowing sufficient time for prophylactic prenatal corticosteroids to take effect. PPRM with oligohydramnios is associated with shorter latency, higher rate of cesarean sections, early neonatal death.

Recommendations

- Regular antenatal care, good hygiene, nutritious diet, early diagnosis of vaginal infection, literacy, and health education can decrease the incidence of PROM.
- Timely referral of PROM cases to tertiary care hospitals and timely intervention can further improve perinatal outcome.
- Strict aseptic precautions, appropriate therapy, regular antenatal follow-up are important factors in the prevention and management of PPRM.
- The management protocol should be improved and strictly followed in order to improve neonatal outcomes.
- Thus, PPRM patient should be considered high risk and monitored closely with strict supervision and managed according to protocol.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Khade SA, Bava AK. Preterm premature rupture of membranes: maternal and perinatal outcome. *Int J Reprod Contracept Obstet Gynecol* 2018;7:4499-505.