International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Sudha R et al. Int J Reprod Contracept Obstet Gynecol. 2023 Mar;12(3):706-710
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20230542

Original Research Article

Maternal and perinatal outcome in preterm premature rupture of membranes

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Received: 20 January 2023
Accepted: 11 February 2023

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ABSTRACT

Background: Preterm premature rupture of membranes (PPROM) and preterm birth results in one third of perinatal mortality and maternal morbidity such as chorioamnionitis and abruption placenta and preterm caesarean section, Preterm premature rupture of membranes occurs in 3% of pregnancies. PPROM is associated with intrauterine infection. Early detection of intrauterine infection may help in prevent neonatal sepsis. Objective of present study was to analyse the maternal and perinatal outcome of PPROM patients between 28 to 36 weeks +6 days and predict intrauterine infection by access the level of C reactive protein to prevent chorioamnionitis and neonatal infection.

Methods: A descriptive study was conducted on 126 antenatal patients between 24 to 36 weeks+6 days with PPROM admitted to Department of Obstetrics and Gynaecology, Cheluvamba Hospital Mysore medical college, Mysore, Karnataka, India from February 2022 to July 2022. After establishing the diagnosis of PPROM patients were monitored and maternal and perinatal outcomes were studied.

Results: 24% patients had late PPROM. 63% of early PPROM latency period >24 hours and were managed conservatively till 34 weeks. 18% had chorioamnionitis in that 12% CRP positive status and immediate termination of pregnancy. 73% of newborns in this group needed admission due to complications of prematurity like RDS (54.54%). Perinatal mortality (2.12%) was due to sepsis. 80% of late PPROM had latency period 24 hours and sepsis was 36% in >24 hours and 10% in <24 hours.

Conclusions: The most common cause of perinatal mortality in early PPROM is prematurity and its complications. Hence conservative management to prolong pregnancy is recommended under strict monitoring for evidence of chorioamnionitis. C-reactive protein helps to pick up chorioamnionitis early. At the earliest evidence of chorioamnionitis termination irrespective of gestational age is warranted. In late PPROM, perinatal outcome is good. So, termination is advised as conservative management shall add to the fetal and maternal morbidity due to sepsis.

Keywords: Chorioamnionitis, C-reactive protein, Latency period, Maternal outcome, Perinatal outcome, Sepsis

INTRODUCTION

Preterm premature rupture of membranes (PPROM) occurs in 3% of pregnancies and is responsible for approximately one third of all preterm births (Bartfield 1998; Goldenberg 1998).[1,2] The incidence of preterm premature rupture of membrane averages from 0.7 to 2.1% and accounts for about 20 to 40% cases of PROM before 37 weeks of gestation.[3]

Although preterm premature rupture of membrane complicates about 2-4% of singleton pregnancies and 7-20% of twin pregnancies, it is associated with 60% preterm deliveries and 10-15% of perinatal death.[4] PPROM is an important cause of perinatal morbidity and mortality, particularly because it is associated with brief latency from membrane rupture to delivery, chorioamnionitis, abruptio placenta, perinatal infection, and umbilical cord compression due to oligohydramnios.[2]

Preterm premature rupture of membranes is defined as spontaneous rupture of amniotic membranes before the onset of uterine contractions or prior to the onset of labour after the age of viability to 36 weeks +6 day.[4] Latency period is the time interval between the rupture of the membranes and the onset of uterine contractions. Kappy and Khupel defined PROM as rupture of the membranes with at least 2 hours of latent period before active labour. The membranes may either rupture at term (>37 weeks) when it is called term PROM or before 37 weeks of gestation when it is referred to as preterm PROM (PPROM).

PPROM is associated with increased risk of chorioamnionitis, unfavourable cervix, dysfunctional labour, increase in caesarean rates, postpartum haemorrhage and endometritis in mother. In fetus increased occurrence of hyaline membrane disease, intraventricular haemorrhage, sepsis, cord prolapse, fetal distress and increased fetal wastage.[4] The longer the time interval between the rupture of membranes and onset of labour, greater is the risk of ascending infections and chorioamnionitis. This risk may assume grave proportions in patient undergoing caesarean section. Thus, earlier the gestational age at the time of PPROM, longer the latency and more the complications.

In planning the management of PPROM, several issues need to be considered. Prematurity is the principal risk to the fetus while infectious morbidity is the primary maternal risk. Chorioamnionitis with PPROM is responsible for significant maternal and neonatal morbidity including early onset neonatal sepsis, bronchopulmonary dysplasia, intraventricular haemorrhage and periventricular white matter injury. PPROM is an obstetric conundrum with significant maternal morbidity and neonatal morbidity and mortality, a careful consideration of various factors and individualization of cases is necessary for appropriate management

Chorioamnionitis, an intrauterine infection, affects many pregnancies already complicated by preterm premature rupture of membranes. The authors assess how C-reactive protein levels might play a role in predicting chorioamnionitis. Clinical chorioamnionitis (CAM), which is diagnosed before delivery using only clinical findings, complicates 0.5% to 10% of pregnancies and is considered a risk factor for increasing rates of perinatal death, neonatal respiratory distress syndrome, and neonatal infection. Histologic CAM refers to CAM that is confirmed after delivery by means of histologic evaluation, which detects pathogens in usually sterile tissues.

Traditionally, clinical CAM diagnosis is dependent on findings such as leucocytosis [white blood cell (WBC) count, >15,000/µl], fetal tachycardia, maternal fever (temperature, >100.4°F), fundal or uterine tenderness, or foul-smelling amniotic fluid.[4] Amniocentesis may be used to detect subclinical infections in patients. In addition to culturing the amniotic fluid to identify microbial colonization, the fluid can also be evaluated by Gram stain to measure WBC counts and glucose levels. Other laboratory values may act as markers of intrauterine infection before clinical symptoms emerge. These markers would help to stem systematic, unidentified infection in preterm neonates and allow for prompt identification of early or subclinical intrauterine infection leading to more timely delivery. Patients with preterm premature rupture of membrane (PPROM) would then be treated with antibiotic and steroid administration.[6]

C-reactive protein (CRP) levels may be a marker of CAM prior to its clinical expression. C-reactive protein is an acute-phase protein that tends to be elevated in patients with systemic cases of inflammation. It is produced by the liver and binds to phosphocholine on microbes to assist in complement binding to damaged or foreign cells, serving as an early defence against infection. This process in turn promotes enhancement of phagocytosis of macrophages.

METHODS

It was a descriptive study conducted at Mysore medical college Mysore, Karnataka. Samples were those who got admitted with PPROM in labour room between 24 weeks and 36 weeks +6 days from February 2022 to July 2022. The diagnosis of PPROM was established by history, sterile pelvic speculum examination showing amniotic fluid trickling from cervix, pad test. Ultrasonography was done in each case to asses gestational age, growth parameters, presentation, exclusion of congenital anomalies and liquor columns for amniotic fluid index. USG was done mainly in those patients who were treated conservatively.

Conservative management was done in all early PPROM (24 weeks to 33 weeks +6 days) patients till the onset of spontaneous labour or till the maternal or fetal indication for delivery ensues such as chorioamnionitis, meconium-stained amniotic fluid, abruption, cord prolapse, fetal distress and/or advanced labour on admission. All late PPROM (>34 weeks) patients were induced if not getting into spontaneous labour. Patients were hospitalized until delivery and were advised bed rest. four doses of dexamethasone 6 mg i.m. 6 hours apart were given to the mothers <34 weeks to enhance fetal lung maturity. PPROM less than 32 weeks $MgSO_4$ used for neuro protection and also acts as tocolysis which is given 4 gram i.v. stat followed by 1 gm/hour infusion for 24 hours. Prophylactic antibiotics were used in all cases for ten days or up to delivery (whichever is later) to reduce the risk of infection. Maternal monitoring to detect chorioamnionitis was done by monitoring pulse rate, temperature, abdominal tenderness, colour and smell of liquor, C-reactive protein levels and cardiotocography CTG.

Mothers were monitored intrapartum for complications such as abruption, PPH, retained placenta. Neonates with

poor APGAR score or infection were admitted in IBN (in born nursery) for further management and their outcome were studied. Mother and babies were followed up till discharge. 128 cases were studied, data analysed and expressed in its frequency and percentage.

RESULTS

Of 128 patients studied ,76% had late PPROM and 24% had early PPROM (Table 1). 95.32% were singleton pregnancies, 4.68% twins (Table 2).

Table 1: Distribution among early PPROM and late PPROM.

	Percentage
Early PPROM	24
Late PPROM	76

Table 2: Distribution of number of singleton pregnancy and twin pregnancy.

	Percentage
Singleton	95.32
Twins	4.68

Table 3: Age distribution of study population.

Age (years)	Percentage
18-20	12
21-25	42
26-30	32
31-35	14

The early PPROM was common in 26 to 30 years, whereas late PPROM in 21 to 25 years (Table 3). Most of them fall under lower socioeconomic status. Almost all were booked cases. Most of the PPROM patients in the present study were primigravida 63.12% (Table 4). Both early and late PPROM were common among primigravida.

Table 4: Distribution of obstetrics score.

Obstetrics score	Percentage
Primi	64.12
Gravida 2	30.62
Gravida 3	5.25

Majority of PPROM in multigravida were associated with no significant past obstetric history, those with past history 26% had abortion, 16% had PPROM, 10% had preterm delivery.

63% of early PPROM (28 weeks-33 weeks 6 days) and 24% of late PPROM (34 weeks-36 weeks 6 days) had prolonged latency period (>24 hours) (Table 5). The induction rate was more common in patients with prolonged latency period. Most of the early and late PPROM patients delivered vaginally, only 24% had LSCS. The most common indication for primary LSCS in PPROM was malpresentations, followed by fetal distress and failed induction.

Table 5: distribution of latency period of study population.

Latency period	<24 hour	>24 hour
Early PPROM	37%	63%
Late PPROM	76%	24%

Table 6: Distribution of maternal morbidity.

	Early preterm	Late preterm
Chorioamnionitis	18%	2%
Abruptio placenta	8%	00
Preterm c section	21%	3%
No complication	71%	95%

Most of patients in early and late PPROM had no complications. Complications like chorioamnionitis and abruption were observed in patients with prolonged latency period. Of 63% of early PPROM with prolonged latency 18% had chorioamnionitis and 8% had abruption, 24% of late PPROM with prolonged latency 2% had chorioamionitis (Table 6) of the babies born out of PPROM 59% were males, 41% were females.

Table 7: Distribution of perinatal morbidity.

Perinatal morbidity	Early PPROM	Late PPROM
SEPSIS	12.12%	3.70%
RDS	54.54%	9.25%
NEC	6%	0%
Hyperbilirubinemia	24.24%	18.51%

About 73% of newborns in early PPROM 27% late PPROM needed NICU admission because of prematurity and associated complications. The mean birth weight of babies in early PPROM was 1.4 kg and in late PPROM was 2.65 kg. In early PPROM common complication were RDS and sepsis accounting for 54.54% and 12.12% respectively (Table 7).

The cause of mortality in the present study was sepsis. All of them were between 28 weeks-32 weeks and latency period of >24 hours. Most common cause of perinatal mortality is sepsis and septic shock (Table 8).

CRP positive status among the maternal chorioamnionitis and sepsis among the neonates born by PPROM is shown in Table 9.

Table 8: Distribution of cause of perinatal mortality.

Gestational age	Number	Birth weight	Cause of death
24 weeks	6	600 grams to 800 grams	Extremely LBW, severe RDS
25 weeks	4	750 to 800 grams	Early sepsis, shock
26 weeks	3	750 grams to 900 grams	Septic shock, DIC
27 weeks	4	850 to 1 kg	Severe RDS
28 weeks	00	00	
29 weeks	3	1.1 kg, 1.2 kg, 1 kg	Severe RDS sepsis DIC MODS
30 weeks	4	1.2 kg, 1.6 kg, 1 kg, 1.2 kg	RDS sepsis DIC
31 weeks	2	1.4 kg, 1.6 kg	Severe RDS sepsis DIC MODS
32 weeks	1	1.4 kg	RDS sepsis

Table 9: Destitution of CRP status in chorioamnionitis and sepsis in neonates.

CRP status	Chorioamnionitis		Neonatal sepsis	
	Early PPROM	**Late PPROM**	**Early PPROM**	**Late PPROM**
Positive	12%	2%	9.5%	3%
Negative	6%	0%	3.7%	0.7%

DISCUSSION

In present study 42% were between 21-25 years of age. In a study by Noor et al in Ayub Medical College in 2006, 58.8% were in the age group of 21-25 years.[6] Among 141 patients, 67% of them belong to lower socioeconomic status. In a study done by Sheela et al 68.2% were under lower socioeconomic group.[5] Among the total study population 63.12% were primigravida.

In a study conducted by Ghandhi et al 60.7% were primigravida.[7] Another study by Okeke et al majority were primigravida 29.1%.[8] In present study 48% of multigravida had no significant past history. 29% had abortions, 13% had PPROM.

In a study by Revathi et al 17% had previous abortion, 10% had previous PPROM.[9] Another study by Sheela et al 29% had previous preterm deliveries, in the present study 10% had previous preterm deliveries.[5]

In our study 63% of early PPROM and 24% of late PPROM had prolonged latency period. Singhal et al study showed 56% of early PPROM and 20% of late PPROM had prolonged latency.[10] Diraviyam JMV et al showed early PPROM 70% had vaginal delivery, 30% underwent LSCS, in late PPROM 81% vaginal delivery and 19% LSCS. In early PPROM 70% had vaginal delivery, 30% underwent LSCS, in late PPROM 81% vaginal delivery and 19% LSCS. Diraviyam JMV et al showed in early PPROM 70% had vaginal delivery, 30% underwent LSCS, in late PPROM 81% vaginal delivery and 19% LSCS. LSCS rate were high in the present study because according to our institution protocol breech presentations were not kept for vaginal delivery.

Chorioamnionitis was more common in indicated deliveries as they had prolonged latency period and they were prone to infection during this period. Diraviyam et al showed 18% of cases in early PPROM had chorioaminonitis and 4% of Late PPROM had chorioaminonitis.[15] In the present study (8%) had abruption in early PPROM, no abruption in late PPROM.

Major neonatal morbidity noted in our study was RDS contributing to 54.5% followed by 24.2% by hyperbilirubinemia, 12.1% by sepsis, and 6% by necrotizing enterocolitis. RDS is more common in early PPROM and hyperbilirubinemia was more common in late PPROM. A study by Emechebe et al showed 61% RDS, Singhal et al obtained 92% RDS in early PPROM.[10] A study by Emechebe et al showed 22% RDS, 17.8 hyperbilirubinemia, and 16% sepsis.[13] Similar study by Singhal et al, in late PPROM showed 6.6% RDS, 16% sepsis and 25% NEC.[13] In present study, 9.2% had RDS, 18.5% had hyperbilirubinemia, 3.7% had sepsis.

In present study, RDS was more common in patients who delivered within 24 hours, and sepsis was common in patients who had prolonged latency period. 33% had RDS, 2.5% had NEC and 10% had sepsis in patients whose who delivered within 24 hours. In a Similar study by Singhal et al, 46.6% had RDS, and 25% had NEC.[10] Among patients who had prolonged latency period of more than 24 hours, 18% had RDS 36% had sepsis, and 0% NEC. In a similar study by Diraviyam 33.3% had RDS and 2.5% had NEC.[15] Perinatal mortality was 2.12% in this study, whereas 7.6% mortality in a study by Diraviyam.[15] Early PPROM mainly contributes to perinatal mortality. Sepsis was the main cause of perinatal mortality

In present study C-reactive protein is positive in 12% in patient with chorioamnionitis in early PPROM, negative in 6% of early PPROM. Late PPROM 2% positive in patient with chorioamnionitis.

Early onset sepsis in neonates with early PPROM CRP values was positive in 9.5% negative in 3.7% in late PPROM CRP positive status in 3% and negative in 0.7%.

Limitations of studies were due to late referral from peripheral hospital, non-availability for all investigations 24 hours, nonavailability of adequate number of ventilators for babies.

CONCLUSION

Present study concluded that most common maternal morbidity associated with PPROM was chorioamnionitis, that of neonatal morbidity was prematurity and its complications. In current study, of the patients with PPROM most of them were between 21-25 years. Incidence of PPROM was more common in primigravidas.

Most multigravida had no significant past obstetric history, of those with past history most of them had abortions. More women had spontaneous delivery; inductions were common in late PPROM. Most of the patients delivered vaginally, LSCS were done commonly for malpresentations like breech, followed by fetal distress and failed inductions.

Common maternal morbidity observed in present study was chorioamnionitis. It was more common among the patients with prolonged latency and induced deliveries. Perinatal morbidity observed in our study were due to prematurity and not the PPROM per se. commonest complication encountered was RDS which was more common in early PPROM.

Other complications like neonatal jaundice, sepsis was more or less equally common among early and late PPROM. Sepsis was more common in patients with prolonged latency period, also contributes to perinatal mortality, whereas RDS was more common in patient with short latency period. In early PPROM conservative management to prolong pregnancy is recommended under strict monitoring for evidence of chorioamnionitis with CRP values. At the earliest evidence of chorioamnionitis termination irrespective of gestational age is warranted. In late PPROM termination is advised as conservative management shall add to the fetal and maternal morbidity due to sepsis.

ACKNOWLEDGMENTS

Authors would like to thank Dr. Dhakshayini K. R. Dean of Mysore medical college and Research Institute, Mysore, Karnataka, India for utilizing the institutional facilities.

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: Sudha R, Biradar P. Maternal and perinatal outcome in preterm premature rupture of membranes. Int J Reprod Contracept Obstet Gynecol 2023;12:706-10.