

Perinatal outcome of preterm labour with and without prelabour rupture of membranes - an observational study

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Abstract:

Objective - This study was done with the mindset to identify preventable risk factor for preterm labor and develop optimum management protocol to achieve, lesser maternal and perinatal morbidity and mortality by observing mother with preterm labour. **Method** - In this study 100 antenatal women admitted with preterm labour with gestational age more than 28 completed weeks to less than 37 completed weeks were observed till delivery. Maternal and fetal outcome were analyzed and measures that could reduce perinatal morbidity and mortality were identified. **Results** - All the women with preterm labour had presented with PROM too. Maternal outcome, perinatal morbidity and mortality all showed close relation with the duration of rupture of membranes, with 39.28% of mother with more than 36 hours since rupture of membranes had greater perinatal morbidity. Those babies with gestational age between 28-32 weeks had perinatal morbidity in 51.43% cases and mortality was 34.29%. Subclinical urogenital infection was present in most of the mothers with 12% of them having febrile morbidity. Cervical swab was positive in 23% of the cases with 10 cases of normal vaginal flora and 4 cases of E. coli. Hyperbilirubinemia and RDS both having incidence of 29.60% followed by sepsis with incidence of 14% were responsible for most of the perinatal morbidity and mortality. **Conclusion** - A gestational age approach to therapy is found important. Perinatal mortality and morbidity was not influenced by the mode of delivery. As the duration of PPROM increased, perinatal morbidity and mortality also increased.

Keywords: Preterm labor, premature rupture of membranes.

The normal development, structural integrity and function of the foetal membranes are essential for the normal progress and outcome of pregnancy. One of the most important function of the membranes is to remain intact until the onset of labour at term in order to maintain the protective intrauterine fluid environment; the amniotic fluid upon which foetus depends for its survival in utero. Preterm birth is defined as birth prior to 37 weeks of gestation, and preterm premature rupture of membrane (PPROM) is defined as the spontaneous rupture of amniotic membrane with release of amniotic fluid after 28 wks but before 37 wks of gestation.

Preterm labour is the presence of regular uterine contractions that leads to progressive changes in the cervix prior to 37 completed weeks of gestation, threatening premature delivery of fetus. In most pregnancies labour begins at term in the presence of intact foetal membranes. Without intervention their spontaneous rupture usually occurs near the end of the first stage of labour. The onset of labour following premature rupture of membrane (PPROM) is directly related to gestational age at the time of rupture, and after 36 weeks more than 80% of patients will be in labour within 24 hours; before 28 weeks only 48% will be in labour within 3 days of rupture. Preterm birth, affects 18% of

pregnancies. It is the leading cause of neonatal death and the second cause of childhood death below the age of 5 years¹. The single greatest risk factor for preterm delivery is a history of preterm labour, so delivery cannot be reliably predicted in first pregnancy. The risk of preterm delivery after one and two previous preterm deliveries has been given as 15% and 41% respectively². Neonates born preterm are at an increased risk of short term complications attributed to immaturity of multiple organ systems, as well as neurodevelopmental disorders, such as cerebral palsy, intellectual disabilities, and vision/hearing impairments³. A positive swab for fetal fibronectin taken in the late second or early third trimester increases the likelihood of preterm delivery by a factor of 4.2 and a negative swab reduces the likelihood of delivery to 0.78 as seen from a meta-analysis including women both at high and low risk⁴. A study where testing was restricted to women with high risk at 24 weeks has shown a likelihood ratio of 11.8 and 0.48 for a positive test and negative test respectively⁵. Hence fetal fibronectin can be a helpful indicator for subsequent preterm delivery.

Several biochemical and biophysical markers have been proposed for the identification of patients at risk for spontaneous preterm delivery, in both patients with threatened preterm labor and asymptomatic ones, with the hope that interventions could prevent preterm delivery⁶⁻⁸. There is now evidence that examination of the cervix with ultrasound is superior to vaginal digital examination⁹ and in patients presenting with preterm labor can assist in determining the risk for preterm delivery before 34 weeks. In general, the shorter the cervix, the higher the risk for preterm delivery and vice versa^{10,11}. Transvaginal cervical sonography is a good method to assess the risk of preterm delivery in patients presenting with preterm labor, low risk asymptomatic patients and patients at high risk for preterm delivery. In patients with a long cervical length (4.3 cm), the likelihood of preterm delivery is low and, therefore, avoiding aggressive intervention in the setting of premature labor may be justified¹². Patients who have a short cervix would have a higher rate of preterm delivery and may benefit from targeted interventions (i.e. steroid administration and transfer to a centre with a newborn special intensive care unit¹³). A cervical length of 25 mm or less had a sensitivity, specificity, positive predictive value, and negative predictive value of 76%, 68%, 20%, and 96%, respectively¹⁴.

Rupture of membrane is usually followed by labour. The onset of labour is directly related to the gestational age at the time of rupture. PPRM is an obstetric conundrum which is poorly defined, with an obscure aetiology and is associated with significant maternal and neonatal morbidity and mortality and has diverse and controversial management strategies.

Materials and methods

The present cross sectional analytical study was done in department of obstetrics and gynaecology, R G Kar Medical College and Hospital from July 2018 to June 2019. The study population included antenatal women admitted with preterm labour with gestational age more than 28 completed weeks to less than 37 completed weeks. Mothers who met the inclusion and exclusion criteria of the study, in the study period were considered as the study participants. There were total 100 mothers.

Inclusion criterias: 1) Antenatal women admitted with preterm labour with gestational age more than 28 completed weeks to less than 37 completed weeks with live fetus, 2) Regular uterine contractions of one or > one/10 minute, 3) Progressive changes in cervix in the form of effacement or dilatation, 4) With or without rupture of membranes, 5) Singleton pregnancy, 6) Clear liquor.

Exclusion criterias: 1) Gestational age less than 28 completed weeks or more than 37 completed weeks, 2) Induction of labour before 37 completed weeks for maternal or foetal indications, 3) Intrauterine foetal demise, 4) Congenital anomalies of the foetus, 5) Multiple pregnancy, 6) Meconium stained liquor.

A detailed history including age, booking, socioeconomic status, time of onset of draining, amount of fluid lost, its colour, association with pain or bleeding per vagina and perception of foetal movements was taken for women admitted with preterm labour and satisfying the study criteria. After general and systemic examination, following were noted - height of uterine fundus, lie, presentation and position of foetus, engagement of presenting part, condition of uterus whether contracted or relaxed. Foetal heart sound was auscultated and its rate and rhythm were noted. A sterile speculum examination was done to identify any amniotic fluid pooling in the vaginal fornix. The colour and smell of fluid was noted if dribbling seen. 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 diagnose preterm labor. Investigations like total count, differential count and C-reactive protein (CRP) were done. Prophylactic antibiotic in the form of injection ampicillin 1gm IV every 6 hourly was given.

Depending upon the gestational age and Bishop's score labour was augmented with oxytocin or prostaglandin, if needed. Progress of labour was monitored, PPRM to delivery interval were noted. Maternal pulse, blood pressure, foetal heart rate and its variations were checked frequently. The onset of any complications like foetal distress, foetal heart rate variations, chorioamnionitis (clinical) were looked for. Progress of labour was monitored. If there was any evidence of foetal jeopardy or any other obstetrical complications, labour was cut short by instrumental delivery or caesarean section as required. Following facts were noted soon after delivery - Apgar score at 1 and 5 minutes, birth weight, congenital anomalies, immediate complications and birth injuries, signs of asphyxia, meconium aspiration, sepsis. The babies were followed up in the postnatal period. Neonatal morbidity and mortality were noted. Mothers were watched for third stage complications like postpartum haemorrhage and retained placenta and were followed up in puerperal period. Women were specifically asked for foul smelling lochia and the presence of febrile morbidity. Episiotomy wound and caesarean section wound were 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.

Variables like age, parity, duration of pregnancy, and mode of delivery, maternal and foetal condition are recorded. All relevant data are compiled and entered into computer using computer based software SPSS for appropriate analysis. Quantitative variable like maternal age, gestational age, and Bishop score are presented by mean \pm standard deviation. Frequency and percentage are computed for presentation of parity, cervical ripening, mode of delivery, induction to delivery interval and maternal complications. Quantitative data analyzed by proportion and Chi square test at $p < 0.05$ level of significance.

Results

Study shows highest number of PPRM cases were in the age group of 20-29 years. PPRM was present in 61% of mother in the age group of 20-29 years. No specific weeks of gestation seen as separately vulnerable for preterm labour (table-1).

Table 1: Analysis of PPRM and preterm delivery cases according to maternal age and gestational age.

Gestational age	Less than 20 yrs No (%)	20-29yrs No (%)	30 or more No (%)
28-32 wks	6(17.14%)	23(65-71%)	6(17.14%)
33-35 wks	8(25%)	18(56.25%)	6(18.75%)
36 or more	10(33.33%)	20(66.66%)	3(9.09%)

PPROM – Preterm premature rupture of membrane

Patients from low socioeconomic status were 58% and middle socioeconomic status was 30%. This is true for both PPRM and PTL. Patients who had 3 antenatal checkups of which at least one in third trimester were considered booked. Study had 16% booked cases and unbooked cases 84%. Numbers of primigravida in the study were 48% and multigravida was 52%.

Spontaneous vaginal deliveries were in 45% of the cases and augmentation was done in 55% of the cases. PPRM is often followed by labour and the onset of labour after PPRM is directly related to the gestational age at the time of rupture. In this study 45% developed spontaneous labour and 55% needed augmentation (table - 2).

Table 2: Analysis of PTL with PPROM according to mode of delivery.

Mode of delivery	No of cases	Percentage
Spontaneous labor	45	45
Induction of labor	13	13
Augmentation of labor	28	28
Induction and augmentation	14	14

Maximum number of LSCS (38%) were seen in the group with bishop score 0-5, comparable with the mode of delivery in general population delivered in our hospital (Normal delivery - 62.7%, LSCS - 26.2% and outlet forceps - 11.1%). LSCS were more when augmentation of labour was done, compared to cases with Bishop score > 5. Malpresentation and foetal distress due to oligohydramnios also resulted in LSCS. Cases with unfavourable cervix were better off with a wait and watch policy for 24 - 48 hours period. Prostaglandins offered a considerable benefit in these cases with local PGE2 gel used to ripen the cervix followed by oxytocin supplementation, if required (table - 3).

Table 3: Analysis of PPROM according to Bishop score at the time of admission and mode of delivery

Bishop score	Number of cases	Vaginal delivery without forceps. No (%)	Outlet forceps No (%)	LSCS No (%)	P value
0-5	52	24(46%)	8(15%)	20(39%)	
6-10	42	35(83%)	2(5%)	5(12%)	0.0015
11-13	6	6(100%)			

No statistical significance is found between primigravida and multigravida when comparing mode of delivery. 25% cases had caesarean delivery of which 68% percentage were in the multigravida, with p -value 0.176 which is statistically insignificant.

Augmentation was done in 55 cases of which 78% delivered within 12 hours, 16% delivered in 24 hours and 5% after 24 hours, with the advantage of shorter maternal hospital stay and less chorioamnionitis, shorter neonatal hospital stay and less neonatal sepsis (28% vs 60%) (table - 4). There was no difference in the rates of LSCS, postpartum infection and neonatal survival.

Table 4: Analysis of PTL with PPROM according to induction to delivery interval (N=55)

Induction to delivery interval	No of cases	%
Less than 12 hrs	43	78.18%
13-24 hrs	9	16.36%
25-48 hrs	2	3.36%
More than 48 hrs	1	1.83%

Most common maternal complication was subclinical urogenital infection (53%) followed by oligohydramnios (25%) and 13.5% women presented with chorioamnionitis. The main indication for LSCS was malpresentation (28%) followed by foetal distress (24%), failure of progress of labour (12%) and transverse lie (8%).

Cervical swab was positive in 23% of the cases with 10 cases of normal vaginal flora, 4 cases of E. Coli, 2 cases of Klebsiella, 2 cases of group B Streptococcus, 1 case of Staphylococcus aureus, 1 case of coagulase negative Staphylococcus, 1 case of coagulase positive Staphylococcus and 2 cases of Candida species. 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 (table - 5). As leucocytosis can be affected by pregnancy and labour, CRP estimates seemed to be reliable monitoring tool. In this study the organisms isolated were E. Coli, coagulase positive staphylococcus, providential organisms, Candida and normal vaginal flora. Due to the limited culture and sensitivity facilities in our

institute we did not find any anaerobic organisms in our study. As the duration of PPROM increased the maternal morbidity also increased.

Table 5: Analysis of PPROM according to investigations for evidence of infection

Investigations	No of cases	%
Cervical swab positive	23	23
CRP Positive	19	19
WBC more than 12000	38	38

The most common complication of prematurity was hyperbilirubinemia followed by respiratory distress syndrome (RDS) and sepsis (table - 6). In the study only 24 babies had birth weight more than 2500 gm. Poor Apgar score seen mostly in 28-32 wks and below 1kg weight, but the score increased with increase in the gestational age and birth weight of baby. Highest percentage of perinatal morbidity (55.56%), and perinatal mortality (86.67%) was seen between Apgar score 1 to 5. In our study, perinatal mortality was 15% of which 26.6% were due to sepsis, 53.3% were due to RDS and 20% were due to birth asphyxia.

Table 6: Complications of newborn

Complications	No of cases according to PPROM	%
Hyperbilirubinemia	8	29.60%
Sepsis	4	14.90%
RDS	8	29.60%
NEC	2	7.40%
ROP	1	3.70%
HIE	1	3.70%
IVH	1	3.70%
Birth asphyxia	2	7.40%

RDS – Respiratory distress syndrome, NEC – Necrotizing enterocolitis, ROP – Retinopathy of prematurity, HIE – Hypoxic ischemic encephalopathy, IVH – Intraventricular haemorrhage.

As the duration of PPROM increased, perinatal morbidity and mortality also increased. Perinatal morbidity was 39.28% and perinatal mortality was 28.57% with PPROM to delivery interval more than 36 hours. As the gestational age increased, perinatal morbidity and mortality decreased. Perinatal morbidity was 51.43% and perinatal mortality was 34.29% with gestational age between 28 to 32 weeks (table – 7).

Table 7: Analysis of perinatal morbidity and mortality in relation to duration of PPROM and gestational age

Duration of PPROM	No of cases	Perinatal morbidity No(%)	Perinatal mortality N(%)
Less than 12 hrs	29	3(10.34%)	1(3.44%)
12-24 hrs	19	7(36.84%)	1(5.26%)
24-36 hrs	24	6(25%)	5(20.83%)
More than 36 hrs	28	11(39.28%)	8(28.58%)
Gestational age	No of cases	Perinatal morbidity	Perinatal mortality
28-32wks	35	18(51.43%)	12(34.29%)
33-35wks	32	7(21.87%)	2(6.25%)
36-37wks	33	2(6.06%)	

Discussion

In the present study all the women with preterm labour had presented with PROM too. So perinatal outcome was not complicated with preterm labour (PTL) only, but PROM was also implicated with adverse outcome. Prevalence of PPRM is 7.72% in our centre. In our study highest number (61%) of PPRM cases were observed in the age group of 20-29 years and comparatively less in both the extremes of age as observed by Okeye et al¹⁵ in his study. Also most of them belonged to lower socioeconomic status as found with other studies eg. Swathi Pandey et al suggesting that lower socioeconomic factor has a contributory role in the occurrence of preterm labour. Study found a higher percentage (84%) of unbooked cases as compared to previous other studies eg. Anjana Devi et al¹⁶ had 52% unbooked cases. Lack of antenatal care led to failure of identification of recurrent risk factors like PPRM or preterm delivery in previous pregnancy, induced abortions and any previous cervical surgery. Study did not find any difference in the parity of mother, as both primi and multipara were equally found vulnerable to preterm labour, also seen in other studies eg. Swathi Pandey (multipara 48% and primipara 52%) and Fatemeh Tavassoli¹⁷ (primipara 55.9% and multipara 44.1%). Spontaneous vaginal deliveries were in 45% of the cases and augmentation was done in 55% of the cases, comparable to that of Kadikar et al¹⁸ where 79.19% of the patients required induction.

We had 25% of mother who needed cesarean delivery and these were mostly in mothers whose labour were augmented and had bishop score between 0-5. This number is comparable with other studies also eg. Kadikar et al, Trinity et al¹⁹ and Shelha Noor et al²⁰. It was seen that mother whose labour was augmented had less duration of hospital stay and so less morbidity both in respect to herself and her neonate. And this finding was also supported by a study by Mercer²¹ that intentional delivery reduces the length of maternal hospitalization along with reduction of infection in both mother and the new born.

Most common maternal complication was subclinical urogenital infection. Indication for cesarean delivery were malpresentation, foetal distress, failure of progress of labour and transverse lie in descending order, comparable to study by Kamala Jayaram, though percentage of cesarean delivery was higher in a study by Singhal at 49% with fetal distress being the main indication. The study of cervical swab found E. Coli to be the main pathogen comparable to the studies by Swathi Pandey and Kamala Jayaram. Our study also confirmed that as the duration of rupture of membranes increased the morbidities also increased as also shown by other studies.

Study by Arul Kumaran²² showed that after 32 weeks of gestation the common causes of perinatal morbidity were RDS, perinatal asphyxia and infection. We had hyperbilirubinemia as the most common neonatal morbidity followed by RDS and sepsis. As with all other studies our study also revealed that more the gestational age better is the neonatal prognosis. The study by Russel²³ showed that the danger of infection to both mother and foetus increases with duration of PPRM. But prolongation of latent period decreases the incidence of RDS.

Limitations: 1) This is an observational study, which may encompass some missing data, 2) The data were collected just from one hospital which too may not be representative of all maternity hospitals in India, 3) The sample size was small and should be increased in further studies.

Conclusion

Management of preterm labour is not a generalised regime. Multi factorial study of individual cases and hence management has to be planned accordingly, varying from expectant to aggressive therapy. Prevention of preterm birth by identifying the high risk group among mothers by sonographic measurement of cervical length at 18 weeks gestational age during anomaly scan can be achieved by taking appropriate preventive measures. Though successful prevention of preterm labour requires a multifaceted approach. Combining educational programmes, lifestyle modification, nutritional supplementation and optimization of obstetric healthcare is important in reducing perinatal morbidity and mortality. From this study, PPRM seems to be an important risk factor for preterm labour, and as it is a modifiable factor in many cases, hence taking care of those aspects will help to prevent preterm labour to large extent.

Conflict of interest: None. **Disclaimer:** Nil.

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