



**Maternal and Perinatal outcomes in Premature Rupture of Membranes at term - An observational study**

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**Abstract**

**Background:** Premature rupture of membranes (PROM) is the most challenging obstetric dilemma. PROM, which occurs before 37 weeks of gestation, is referred to as preterm premature membrane rupture (PPROM), while PROM, which occurs after 37 weeks of gestation, is referred to as the term premature membrane rupture. The aim of present study was to know maternal and perinatal outcomes in PROM at term and to identify the factors that aid in optimizing the management.

**Method:** A total of 70 women with at term pregnancy presenting with PROM were included in the study. A detailed history was taken, and gestational age confirmed, general, systemic, and obstetric examinations were done. Maternal and perinatal findings and outcomes were noted.

**Results:** PROM was observed more commonly among primigravida and mothers of younger age group (<29years). Majority of the cases deliver within 12 hours of PROM (45.71%). Majority of the cases of PROM delivery vaginally (54.3%). Non-progress of labour was the most common indication for LSCS (50%). Bacterial infection was observed in 27.1% cases with gram negative bacilli being the most common causative

organisms. Maternal morbidity rate observed was 24.3%, and fever was the most common maternal morbidity. Neonatal morbidity rate observed was 28.6%, and sepsis was the most commonly neonatal morbidity. There was 1 (1.4%) neonatal death.

**Conclusion:** Maternal and neonatal morbidity was associated with increased duration of PROM to delivery and infection of the female genital tract with pathogens. Hence an appropriate and accurate diagnosis of PROM is essential for favorable outcome in term pregnancy.

**Keywords:** Premature rupture of membranes, Term, Neonates, Morbidity, Mortality.

**Introduction**

Premature rupture of membranes (PROM) is defined as rupture of fetal membranes before the onset of labor. When it occurs before 37 weeks of gestation it is known as preterm premature rupture of membranes (PPROM) while PROM occurs after 37 weeks of gestation, is referred to as the term premature membrane rupture. The prevalence of PPRM varies between 2-4% of singleton pregnancy, whereas term PROM occurs in about 8-10% cases [1, 2]. However, PROM is generally observed in younger age group of women majorities of whom are primigravida [3]. Majority of the patients with PROM

enter spontaneous labor within 24 hours when they experience ROM at term [4]. Longer the length of rupture of membranes the chances of maternal and neonatal morbidity are increased. Also, the rate of CS also increases as the length of rupture of membranes increases [5].

The aetiology of PROM is largely unknown. Known risk factors for term PROM includes- cervical incompetence/short cervical length; multifetal pregnancy; polyhydramnios; previous history of PROM (recurrence); history of previous bleeding pv; smoking; infections like group -B- Streptococci, chlamydia trachomatis, neisseria gonorrhoea, bacterial vaginosis all increases the risk of PROM. Also, the invasive uterine procedures like amniocentesis, chorionic villus sampling, cervical encirclage etc [6], previous history of termination of pregnancy and antecedent coitus increases the risk of PROM [7,8].

The management of PROM presents with a dilemma as to either wait and watch or induce labor. Though normal delivery occurs in majority of the patients [9], the rates of CS are observed to be high in patients who had PROM. But the outcome in terms of maternal and neonatal morbidity and mortality have not been conclusive [10]. Considering all the aforementioned factors the present study was undertaken to understand the maternal and neonatal outcomes in cases of PROM at term and to identify the possible risk factors.

### **Materials and Method**

After obtaining Institutional Ethical Committee approval and written informed consent from all the patients, this prospective observational study was conducted in the Department of Obstetrics and Gynecology at a tertiary care hospital during a period of 18 months. A total of 70 women with at term pregnancy (37 completed weeks i.e., 37.1 and above) by last menstrual period/first trimester

scan of less than 8 weeks, presenting with PROM, also with absence of uterine contractions for at least one-hour post PROM, singleton pregnancy, vertex presentation, clear amniotic fluid on clinical evaluation, reactive Cardiac-topography on admission and those willing to participate in the study were included. While women with <37 weeks of gestation, malposition, non-reactive cardiac topography on admission, previous LSCS/previous uterine scar, with bleeding per vaginum/ante partum haemorrhage, meconium-stained amniotic fluid at admission, cephalo-pelvic disproportion and contraindications to vaginal delivery and patients with medical complications like hypertension and diabetes were excluded from the study.

A detailed history was taken on admission. Confirmation of expected date of delivery was done by first scan. General and systemic examination was conducted. Per speculum examination and per vaginum examination along with pH testing with litmus paper was performed to confirm PROM and Bishops scoring to correlate with duration of PROM and decision on management taken. Tests performed on mother to included high vaginal swab, differential white blood cell count, C reactive protein levels, urea and creatinine, intrapartum maternal and fetal monitoring.

Maternal and perinatal findings and outcomes were noted under the headings: 1) Registered and unregistered cases; 2) Age group; 3) Mode of delivery (vaginal/forceps/ventouse/Caesarean section); 4) AFI on recent antepartum scan; 5) Baby weights; 6) Maternal complication (fever/wound sepsis/sepsis/abruption etc); 7) Neonatal complications (sepsis/ RDS/asphyxia/death etc) and NICU admissions; 8) Take home baby rates; 9) Culture organism isolated on high vaginal swab taken under all aseptic precautions (staphylococcus/streptococcus/klebsiella/pseudomonas/candida/sterile)

**Statistical analysis**

Data was analyzed using SPSS software Version 21.0 and statistical tools like mean, median, range, proportions and appropriate Tests of significance were used as required. Qualitative data was analyzed in terms of percentage (%age) and proportions. Chi-square test was used as the test of significance. Quantitative data was analyzed in terms of mean, standard deviation (SD) & standard error (SE). T-test was used as the test of significance. P value less than 0.05 was considered statistically significant.

**Observations and Results**

A total of 70 women with at term pregnancy presenting with PROM were enrolled in the study. Most of the patients were from the age group of 25 to 29 years (42.9%), registered (81.4%), Graduate (44.3%), socio-economic class-2 (51.4%) and primigravida (67.15) as shown in table 1. Mean week of gestation, mean hours of rupture of membranes, mean bishops score, WBC count, mean time from induction to delivery, mean time from rupture of membranes to delivery, mean AFI observed on USG was 40.95±1.78, 4.59±5.00, 3.60±1.43, 13336.43±3943.13, 6.91±5.26, 14.68±6.13 and 12.94±3.17 respectively.

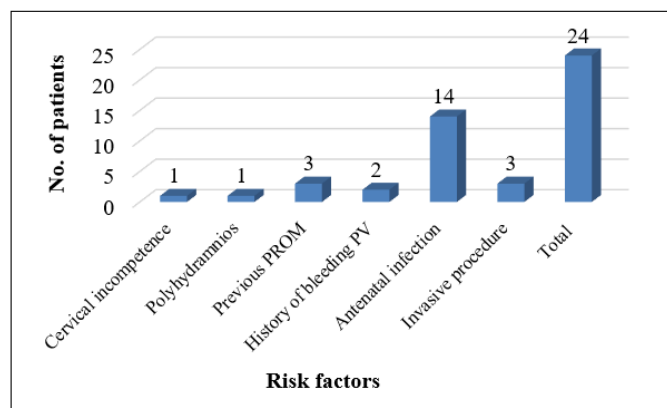
Table 1: Socio-demographic profile of the patients and obstetric characteristics

Parameters		Frequency	Percentage
Age-groups [years]	20 to 24	17	24.3
	25 to 29	30	42.9
	30 to 34	20	28.6
	>35	03	4.3
	Mean	27.64±4.23	
Registration	Registered	57	81.4
	Unregistered	13	18.6
Education	10 <sup>th</sup>	18	25.7
	12 <sup>th</sup>	21	30.0
	Graduate	31	44.3
SEC	1	12	17.1
	2	36	51.4

	3	16	22.9
	4	06	8.6
Gravida status	Primi	47	67.1
	Multigravida	23	32.9

The risk factors were observed in 24 (34.3%) of the participants. The most common risk factor observed was antenatal infection (58.3%) followed by history of previous PROM and invasive procedure (12.5% each) as depicted in figure 1.

Figure 1: Risk factors of PROM



There was no relationship found between gravida status of study participants and Bishop’s score, induction to time to delivery, PROM to delivery interval and mode of delivery as shown in table 2.

Table 2: Relationship between gravida status of study participants with Bishop’s score, induction to time to delivery, PROM to delivery interval and mode of delivery

Parameters		Total	Primi	Multi	P value
Bishop’s score	0-2	16 (22.85%)	13 (27.7%)	03 (13.0%)	0.390
	3-4	37 (52.85%)	25 (53.2%)	12 (52.2%)	
	5-6	15 (21.42%)	08 (17.0%)	07 (30.4%)	
	7-8	02 (2.85%)	01 (2.1%)	01 (4.3%)	
Induction to time to delivery	0-6hrs	11 (15.71%)	04 (11.1%)	07 (38.9%)	0.262
	6-12hrs	35 (50.0%)	26 (72.2%)	09 (50.0%)	

	12-24hrs	08 (11.4%)	06 (16.7%)	02 (11.1%)	
PROM to delivery interval	Up to 12 hrs	32 (45.71%)	18 (38.3%)	14 (63.6%)	0.251
	12-17 hrs	17 (24.3%)	14 (29.8%)	03 (13.6%)	
	18-23 hrs	16 (22.9%)	12 (25.5%)	04 (18.2%)	
	≥24hrs	04 (5.7%)	03 (6.4%)	01 (4.5%)	
Mode of delivery	LSCS	20 (28.6%)	16 (34%)	04 (17.4%)	0.148
	Forceps	06 (8.6%)	05 (10.6%)	01 (4.3%)	
	Vaginal	38 (54.3%)	21 (44.7%)	17 (73.9%)	
	Ventouse	06 (8.6%)	05 (10.6%)	01 (4.3%)	

Most of the participants who were induced the mode of induction was misoprostol Pitocin [28/40%], followed by those receiving misoprostol alone [15/21.4%] while 15.7%/11 received oxytocin augmentation and 15/21.4% had spontaneous labor. The majority of participants delivered within 6-12 hrs of induction, and most were delivered within 12hrs of PROM. Among those who required intervention for delivery the major indication was nonprogress of labor (10/14.3%) followed by fetal distress (8/11.4%) and also, the non-progress of labor (50%) was the major reason for LSCS followed by fetal distress (25.0%), (Table 3).

Table 3: Indications for interventional delivery

Parameters		Frequency	Percentage
Indication for interventional Delivery (n=70)	Fetal distress	08	11.4
	Deep transverse arrest	02	2.9
	Maternal exhaustion	07	10.0
	Maternal request	01	1.4
	Nonprogress of labor	10	14.3
	Prolonged leaking	02	2.9
	Prolonged second stage of labor	01	1.4
	Not applicable	39	55.7
Indication for LSCS (n=20)	Fetal distress	05	25.0
	Deep transverse arrest	02	10.0

	Maternal request	01	5.0
	Nonprogress of labor	10	50.0
	Prolonged leaking	02	10.0

The growth of microorganisms was seen in 19/27.1% participants. The most common organism grown was gram -ve bacilli (7/35%), followed by gram +ve bacilli (5/25%), gram +ve cocci (3/15%), candida and yeast 2/10% each and enterococcus 1/5%.

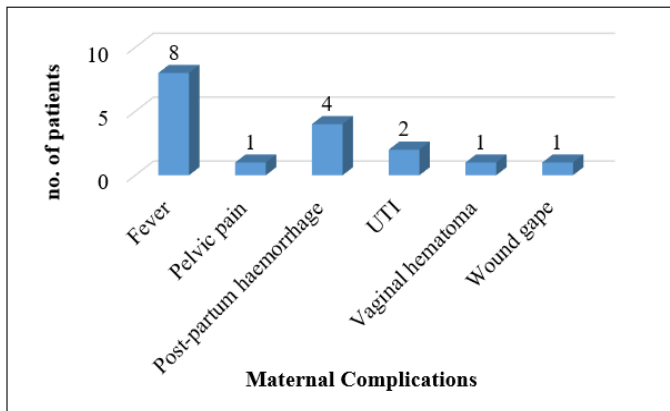
Out of 70 neonates, 5/7.1% babies were low birth weight, CRP was found to be positive in 20/28.6%, NICU admission was required in 20/28.6% newborn, neonatal complications were seen in 20/28.6%, most common morbidity observed among the neonates was sepsis (7/30.4%), followed by HIE (4/17.4%) and there was 1/1.4% neonatal death among the neonates as shown in table 4.

Table 4: Neonatal characteristics, complications and neonatal morbidity

Parameters		Frequency	Percentage
Birth weight	Low birth weight	05	7.1
	Normal birth weight	65	92.9
CRP status among new-borns	Positive	20	28.6
	Negative	50	71.4
NICU admission	Yes	20	28.6
	No	50	71.4
Neonatal complications	Present	20	28.6
	Absent	50	71.4
Neonatal Morbidity	HIE	04	17.4
	MAS	01	4.3
	Hydronephrosis	01	4.3
	UTI	01	4.3
	Hypoglycaemia	02	8.7
	Sepsis	07	30.4
	Tachypnoea	03	13.0
	NEC	01	4.3
	Hyperbilirubinemia	02	8.7
Neonatal death	Convulsions	01	4.3
	Yes	01	1.4
No	69	98.6	

The major morbidity seen post-delivery among the study participants was fever (8/11.4%) followed by post-partum hemorrhage (4/5.7%) as depicted in figure 2.

Figure 2: Maternal complications observed among study participants.



There was statistically significant relationship between PROM to time to delivery and maternal morbidity as well as neonatal morbidity occurrence with p value of <0.05 as shown in table 5. The relationship was statistically significant with p-value of 0.046 suggesting that maternal morbidity increases with interventional delivery than with normal vaginal delivery.

Table 5: Relationship between PROM to time to delivery and maternal and neonatal morbidity occurrence

PROM to delivery interval	Maternal morbidity			Neonatal Morbidity		
	Yes	No	P value	Yes	No	P value
Up to 12 hrs	03 (18.8%)	29 (54.7%)	0.031	05 (25.0%)	27 (55.10%)	0.021
12-17 hrs	04 (25.0%)	13 (24.5%)		08 (40.0%)	09 (18.4%)	
18-23 hrs	07 (43.8%)	09 (17.0%)		04 (20.0%)	12 (24.5%)	
≥24hrs	02 (12.5%)	02 (3.8%)		03 (15.0%)	01 (2.0%)	

**Discussion**

In the present study, most of the patients were from the age group of 25 to 29 years (42.9%), registered (81.4%), Graduate (44.3%), socio-economic class-2 (51.4%) and

primigravida (67.1%) which is comparable with the previous studies [4, 11-14].

The risk factors were observed in 24 (34.3%) of the participants while they were unknown in the remaining. The most common risk factor observed was antenatal infection (58.3%) followed by history of previous PROM and invasive procedure (12.5% each). These findings are in accordance with the study done by Patil DS et al [11] and Kurude V et al [13].

Among the primigravid participants majority had a Bishop score in the range of 3-4 (53.2%), followed by those having 0-2 (27.7%) and least participants having score of 7-8 (2.1%). Among the multigravida participants majority had a Bishop score of 3-4 (52.2%) followed by those with 5-6 (30.4%) and least with 7-8 (4.3%). The difference observed was not statistically significant. These findings are correlated with the study conducted by Surayapalem et al [12] and Amala et al [15]. The majority of the participants had a latency period of less than 6 hours which is comparable with the other studies [14, 15]. Most of the participants delivered within 6-12hrs of induction and majority of the participants delivered within 12hrs of PROM. Similar findings are reported in Surayapalem et al [12] and Sansare et al [16]. However, the maximum study participants (38/54.3%) had a vaginal delivery whereas 28.6%/20 underwent LSCS, those requiring forceps and ventouse delivery were 8.6%/6 each which is comparable with the earlier studies [4, 11-15]. The non-progress of labor was the major reason for LSCS followed by fetal distress as reported in other studies [11, 12, 15, 16].

The growth of microorganisms was seen in 19/27.1% participants while the remaining didn't show any growth on culture. The most common organism grown was gram -ve bacilli (7/35%), followed by gram +ve bacilli (5/25%), gram +ve cocci (3/15%), candida and yeast

2/10% each and enterococcus 1/5%. These findings are correlated with the Surayapalem et al [12] and Aboyeji et al study [17].

In the current study, it was observed that 5/7.1% babies were low birth weight while the remaining had normal birth weight as reported in Nagaria et al [4] and Amala S et al study [15]. CRP was found to be positive in 20/28.6% of the newborn which is comparable with the study done by Ahirwar G et al [16]. There was 1/1.4% neonatal death among the neonates as similar to Patil et al study [11].

The major morbidity seen post-delivery among the study participants was fever (8/11.4%) followed by post-partum hemorrhage (4/5.7%), urinary tract infection (2/2%) a pelvic pain, vaginal hematoma and wound gaping in 1/1.4% each. These findings are correlated with the previous studies [4, 11, 13, 14, 19].

The neonatal complications were seen in 20/28.6% newborns while they were absent in the remaining 50/71.4%. The most common morbidity observed among the neonates was sepsis (7/30.4%), followed by HIE (4/17.4%), tachypnoea (3/13%), hypoglycemia and hyperbilirubinemia 2/8.7% each and MAS, hydronephrosis, UTI, NEC, and convulsion 1/ 4.3% each. Similar results are reported in earlier studies [12-14]. NICU admission was required in 20/28.6% newborn which is comparable with the study done by Amala S. et al [15].

In the current study, it was observed that as the interval between PROM and delivery increased the maternal morbidity also increased, with 50% of the participants with interval 24hours and more suffering morbidity as opposed to 12.1% who delivered within 12hours. The observed difference was statistically significant with a p-value of 0.060 suggesting that longer the interval between PROM and delivery the chances of maternal

morbidity increases. Whereas the interval between PROM and delivery increased the morbidity among infants also increased where 75% of the neonates born 24hrs or later post PROM suffering from neonatal morbidity as opposed to 15.2% who were delivered within 12hours of PROM. The observed difference was statistically significant with p-value of 0.018 suggesting the chances of neonatal morbidity increases with increase in the interval between PROM and delivery. These findings are in accordance with the study conducted by Surayapalem et al [12] and Sansare et al [16].

### **Limitations of the study**

In the present study only females with term pregnancy were included. The study was conducted with a relatively small sample size and hence the findings cannot be generalized to the entire population. Thus, it warrants a need for study to be done with a substantially larger sample size to make more generalized conclusions.

### **Conclusion**

To conclude in present study, majority was primigravidas and the most common age group was 25 to 29 years belonging to socioeconomic class 2. Maternal morbidity and neonatal morbidity were associated with increased duration of PROM to delivery and infection of the female genital tract with pathogens. Hence an appropriate and accurate diagnosis of PROM is essential for favorable outcome in pregnancy. Hence it is always advisable to develop new scoring strategies involving demographic variables with previous history to identify high risk cases to treat them prior to rupture.

### **Recommendations**

- Aetiology of PROM remains unknown in majority of the cases, but an antenatal infection in pregnant women should raise an alarm for future PROM.
- Chances of LSCS and instrumental delivery are significant in women with PROM, this should be

kept in mind and explained to the patient accordingly.

- PROM is accompanied with increased maternal and neonatal morbidity therefore the cases should be handled with utmost care. As the PROM to delivery interval increases the chances of maternal and neonatal morbidity also increase, therefore attempt should be made to keep the interval low either by induction of labour or LSCS.
- Chances of infection increase in cases with PROM, most commonly gram-negative bacilli are observed to be the causative organisms, therefore appropriate antibiotics should be given females with PROM.
- Further research with a larger sample size is recommended to ascertain the findings of the present study and to make more generalised observations.

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