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A Clinical Study on Fetomaternal Outcome in Preterm Prelabour Rupture of Membranes

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Abstract: ***Introduction: Premature rupture of membranes before 37 weeks of gestation is known as preterm premature rupture of membranes (PPROM). PPROM complicates 2% of pregnancies and accounts for 30% of preterm delivery. It is an important cause of perinatal morbidity and mortality. Objectives of the study were to determine incidence, risk factors, maternal and fetal outcome in PPROM cases attending tertiary care hospital in Jhalawar. Methodology: It is a hospital based prospective observational study conducted in the department of obstetrics and gynaecology at Jhalawar Medical College over a period of six months from February 2020 to July 2020. 125 PPROM patients from 24-36+6 weeks of gestation were included in the study and close monitoring of maternal and fetus status was done and followed during the delivery and postnatally. Results: The incidence of PPROM was 3.99%. PPROM was mainly presented in 20-30yrs age group (89.6%), unbooked cases (84.4%) and lower socioeconomic class (64.8%). Mean gestational age was 34.1 weeks. The risk factors like history of abortion (23.2%), history of previous preterm or PPROM (16.7%) in multigravida females, multiple pregnancy (8.8%), polyhydramnios (3.2%), anaemia (93.6%), genital infections (9.6%), UTI (14.4%) and fetal malpresentations (11.2%) were present. 78.4% cases had vaginal delivery and 21.6% underwent LSCS. 16 cases underwent direct LSCS and among rest 55% cases were induced and 45% cases delivered after spontaneous progression. Duration of leaking (>24 hrs) was significantly associated with higher NICU admission (p=0.04), low 5-minute APGAR score (p<0.05) and increased chorioamnionitis occurrence (p=0.003). Maternal morbidity was 5.6%. Perinatal morbidity was 40.8% and neonatal mortality was 12%. Conclusion: Currently, there is no effective way of preventing spontaneous rupture of fetal membranes and the management of PPROM varies according to the gestational age. Therefore, prevention of risk factors like maternal infections and malnourishment during antenatal period may lead to better outcome with regular follow up. Also, timely management to treat PPROM would control neonatal and maternal morbidities.***

1. Introduction

As per WHO and FIGO, preterm labour is defined as "labour resulting in birth before 37 completed weeks (259 days) of gestational age, based on the first day of last menstrual period".[1] Preterm premature rupture of membranes (PPROM) is defined as spontaneous rupture of fetal membranes before 37 completed weeks and before labour onset (ACOG 2013d).[2] PPROM complicates 2% of pregnancies and accounts for 30% of preterm delivery.[3]

The various risk factors are: history of PPROM in previous pregnancy, repeated genitourinary infections, repeated second trimester abortions, cervical incompetence; various social factors related to this are: low socioeconomic status, smoking, irregular antenatal visits, inadequate nutrition during pregnancy. Pregnancy related causative factors are: malpresentation, polyhydramnios, multiple pregnancy, cervical encirclage, Fetal abnormalities.[1,2] Subclinical intrauterine infection has been implicated as a major aetiological factor in the pathogenesis and consequential maternal and neonatal morbidity in PPROM.[4]
Diagnosis is made by the history of watery discharge per vaginum supported by clinical examination.[2]Maternal complications commonly associated with PPROM are: i. Chorioamnionitis ii. Placental abruption iii. Retained placenta iv. PPH v. Endometritis. Commonly associated neonatal complications are: i. Prematurity ii. Sepsis iii. RDS iv. Early onset seizures v. Intraventricular haemorrhage vi. Periventricular leukomalacia.[2]

PPROM is a common problem seen in obstetrics and the main challenges faced are early diagnosis, monitoring and treatment. The aim of the study is to determine incidence, risk factors, maternal and fetal outcome among PPROM cases.

2. Methods

This is a prospective observational study was carried out in the department of Obstetrics and Gynaecology, Jhalawar medical college, Jhalawar, Rajasthan, India between February 2020 to July 2020. Out of 3,132 delivered cases during the study period, 125 patients presented with spontaneous preterm premature rupture of membranes from 28-0 to 36-6weeks gestation and were followed up till discharge after their delivery.

After excluding women with pregnancy 37 completed weeks, with established labour, with ante partum haemorrhage, chronic kidney disease and cardiac disease; one hundred and twenty five patients with preterm premature rupture of membranes were recruited in this study. Both primigravida and multi gravid women, who consented to participate in this study, whose pregnancy duration was between 28-0 weeks to 36-6 weeks, with spontaneous rupture of the membrane, not in active labour were included in this study.

Detailed history was taken including age, booking status, socio-economic status, time of onset of draining, amount of fluid lost, colour, odour, association with pain or bleeding per vagina, perception of foetal movements, menstrual history, obstetric history, past and personal history. General physical examination was done. Systemic examination included CNS, cardiovascular and respiratory systems.

Per abdominal examination was done for height of uterus, position of foetus, engagement of presenting part, condition

of uterus- contracted/relaxed, uterine tenderness, foetal heart sound – present/ absent.

Per speculum examination was done to check for pooling of amniotic fluid, colour, smell of fluid. • pH of the vaginal fluid was checked. High vaginal swab was taken and sent for gram stain and culture sensitivity. Per vaginal examination was avoided.

Investigations like complete blood count, CRP, urine routine and microscopy and ultrasound were done. Prophylactic intravenous antibiotics were given. Decision of active or expectant management was done on the basis of gestational age, bishop score, corticosteroid cover and accordingly induction of labour was done using prostaglandins (Dinoprostone gel). Time of induction was noted, progression of labour was monitored, induction to delivery interval and leaking to delivery interval were noted.

Maternal vitals charting was done. Foetal heart rate was frequently monitored and onset of any complications like foetal distress, foetal heart variations, chorioamnionitis were looked for. For any kind of foetal distress or obstetrical complication decision of LSCS was taken.

Soon after delivery APGAR score, congenital anomalies, immediate complications, birth injuries, signs of asphyxia were recorded. Babies were followed up in the post-natal phase, associated neonatal morbidity and mortality were checked. Maternal morbidity was checked for during puerperal period.

Statistical analysis

Data was collected by standard questionnaire from the patients after taking consent. All data was checked and edited after collection and analysed statistically by computing proportions and percentages. The statistical inference was obtained by computing chi square test for difference between any two values and considered statistically significant if the P value was <0.005.

3. Results

Table 1: Distribution of maternal demographic variables

Demographic variable	No. of Cases (n=125)	Percent	
1. Age			
a)<20 years	6	4.80%	Mean age = 24.3 years
b)20-30 years	112	89.60%	
c)>30 years	7	5.60%	
2) Booking status			
a) Booked	19	15.20%	
b) Unbooked	106	84.80%	
3) Gravida			
a) 1	53	42.40%	
b) 2	40	32%	
c) 3	15	12%	
d) 4	14	11.20%	
e) >4	3	2.40%	
4) Socio-economic status			
a) upper middle	7	5.60%	
b) lower middle	8	6.40%	
c) upper lower	29	23.20%	
d) lower class	81	64.80%	
5) BMI			
a) Underweight (<19.5)	43	34.40%	Mean BMI = 21.3kg/m2
b) Normal (19.5-24.9)	64	51.20%	
c) overweight (25-29.9)	16	12.80%	
d) Obese (>30)	2	1.60%	
6) Gestational age			
a) 24-33+6 weeks	46	36.80%	Mean gestational age = 34.1 weeks
b) 34-36+6 weeks	79	63.20%	

- Total number of deliveries during the study period were 3,132 and total PPROM delivered cases were 125. The incidence of PPROM was 3.99%. Mean age was 24.3 years.
- Highest number of PPROM cases were observed in the age group of 20-30 years (89.6%) and comparatively less in both the extremes of ages.
- Here, PPROM was observed to be higher in unbooked cases (84.4%) and lower socioeconomic class (64.8%).
- In this study, maximum number of PPROM cases were observed in Primigravida (42.4%) followed by second gravida (32%) and rest were multigravida.
- Maximum number of PPROM cases had normal BMI (51.2%) followed by underweight cases (34.4%) and least were obese. Mean BMI of the study was 21.3kg/m^2.

- Here, 36.8% cases were belonging to early preterm and 63.2% were of late preterm. The mean gestational age of PPROM presentation was 34.1weeks.

Table 2: Association of various risk factors with PPROM

Risk factors	No. of cases (n=125)	Percent
1) Smoking		
a) Present	0	0.00%
b) Absent	125	100%
2) Previous h/o abortion		
a) Present	29	23.20%
b) Absent	96	76.80%
3) Previous h/o PPROM and preterm delivery in multigravida (n=72)		
a) Present	12	16.70%
b) Absent	60	83.30%
4) Multiple pregnancy		
a) Present	11	8.80%
b) Absent	114	91.20%
5) Polyhydramnios		
a) Present	4	3.20%
b) Absent	121	96.80%
6) Anaemia	117	93.60%
a) Mild	23	18.40%
b) Moderate	93	74.40%
c) Severe	1	0.80%
7)Genitourinary infections		
a) Genital swab culture		
i) Positive	12	9.60%
ii) Negative	113	90.40%
b) Urinary tract infection		
i) Present	18	14.40%
ii) Absent	107	85.60%
8) Fetal malpresentations		
a) Present	14	11.20%
b) Absent	111	88.80%

- Smoking is a well-known risk factor for PPROM, although in ourstudy, none of the patient had history of smoking.
  In present study, 42.4% of PPROMcases were primigravida and57.6%cases were multigravida. 40.2% of multigravida had history of previous abortions,which makes 23.2 % of all PPROMcases. 16.7% of multigravida PPROM cases had history of previous PPROM and preterm delivery.
- Multiple pregnancy and polyhydramnios are important and known risk factors. In our study, 8.8% of cases had multiple pregnancy and 3.2% of cases had polyhydramnios. Anaemia and poor nutrition are also a well-defined risk factor and 93.6% cases were anaemic in this study.
- Maternal genitourinary infections are among the most common known causes of PPROM. In our study, 9.6% of the cases had genital infections and 14.4% of cases had UTI. Together they both comprised of 24% of the cases which presented with maternal infections.

Table 3: Analysis of investigation in PPROM cases for evidence of maternal infection

Investigations	No. of cases (n = 125)	Percent
1)Vaginal swab culture		
a) Positive	12	9.60%
b) Negative	113	90.40%
2) C reactive protein		
a) Positive	38	30.40%
b) Negative	87	69.60%
3)TLC (N = 15000)		
a) Raised	44	35.20%
b) Normal	81	64.80%
Total maternal infection (1+2+3)	54	43.20%

- These tests were done to evaluate for the evidence of infections. Total maternal infection was calculated when either one or two or all three investigations were indicating infection. In present study, overall 43.2% cases had infection. 9.6% of the cases had positive vaginal swab culture, 30.4% cases showed CRP positivity and TLC was raised in 35.2% cases.

Table 4: Distribution of PPROM cases according to Type of Labour and mode of delivery

Type of labour	VD	LSCS	Total (n=109)	Chi sq = 1.72	p value = 0.188
1. Induced	56 (93.3%)	04 (6.7%)	60 (55%)		
2. Spontaneous	42 (85.7%)	07 (14.3%)	49 (45%)		
3. Total	98	11	109		

- Maximum number of PPROM cases had VD (78.4%) and rest LSCS (21.6%).
- Among all cases, 16 cases underwent direct LSCS due to various indications. Out of 109 cases left, 55% cases required induction of labour, whereas 45% cases delivered after spontaneous progression. With the p value of 0.188, no association was seen between the type of labour and mode of delivery.

Table 5: Distribution of PPROM cases according to duration of leaking and its analysis with NICU admission and 5 min APGAR

Duration of leaking (hours)	No. of cases (n = 125)	NICU admission		5 min APGAR (n=125)	
		Yes	No	<7	≥7
<12 hrs	59 (47.2%)	18 (30.5%)	41 (69.5%)	04 (6.8%)	55 (93.2%)
12 – 24 hrs	59 (47.2%)	24 (40.7%)	35 (59.3%)	07 (11.8%)	52 (88.2%)
>24 hrs	07 (5.6%)	06 (85.7%)	01 (14.3%)	06 (85.7%)	01 (14.3%)
Total	125 (100%)	48 (38.4%)	77 (61.6%)	17 (13.6%)	108 (86.4%)
		Chi sq = 6.06 p value = 0.04		chi sq = 26.9 p value = 0.0000013	

- NICU admission (p= 0.04) and 5 min APGAR score < 7 (p < 0.05) were significantly associated with the duration of leaking. As duration of PPROM increases, NICU admissions increases and cases with APGAR score <7 also increases.

Table 6: Analysis of perinatal morbidities and mortality among PPROM cases

Perinatal complications	No of cases (n= 125)	Percent
A.Total morbidities	51	40.8%
1.RDS	21	16.8%
2.NEC	01	0.8%
3.Birth asphyxia	05	04%
4.Sepsis	06	4.8%
5.Hyperbilirubinemia	08	6.4%
6.Extreme Prematurity	09	7.2%
7.IUD	01	0.8%

Mortality causes	No. of cases (n = 15)	Percentage
1. Extreme Prematurity	09	60%
2. RDS	03	20%
3. Sepsis	03	20%
Total (n=125)	15	12%

- Perinatal morbidity rate was 40.8%. It was mainly due to RDS (16.8%), extreme prematurity (7.2%), hyperbilirubinemia (6.4%), sepsis (4.8%), birth asphyxia (4%) and IUD (0.8%).
- Neonatal mortality rate was 12%. Extreme prematurity (60%), RDS (20%) and sepsis (20%) were causes for mortality.

Table 7: Analysis of maternal complications among PPROM cases with duration of leaking

Duration of leaking	No. of cases (n=125)	Maternal complication			
		Chorioamnionitis		PPH	
		Present	Absent	Present	Absent
<12 hrs	59 (47.5%)	-	59 (100%)	03 (5.08%)	56 (94.92%)
12 – 24 hrs	59 (47.5%)	01 (1.6%)	58 (98.4%)	01 (1.6%)	58 (98.4%)
>24 hrs	07 (5.6%)	02 (28.5%)	5 (71.5%)	-	07 (100%)
Total	125 (100%)	03 (2.4%)	122 (97.6%)	04 (3.2%)	
		Chi sq = 11.43 P value = 0.0032		Chi sq = 0.63 p value = 0.7265	

- Maternal morbidity was 5.6%. It was mainly due to chorioamnionitis (2.4%) and PPH (3.2%). Chorioamnionitis was significantly associated with increased duration of leaking (p = 0.003).

Table 8: Distribution of neonatal morbidity according to type of management

Gestational age	Type of management	Neonatal complication			Maternal complications		
		Present	Absent		Present	Absent	
<34 weeks	a) Active (22) b) Expectant (24)	19 (86.4%) 20 (83.3%)	03 (13.6%) 04 (16.7%)	Chi sq = 0.08 p value = 0.7	02 (9.1%) 01 (4.2%)	20 (90.9%) 23 (95.8%)	Chi sq = 0.006 p value= 0.93
≥34 weeks	a) Active (54) b) Expectant (25)	10 (18.5%) 01 (4%)	44 (81.5%) 24 (96%)	Chi sq = 1.96 p value = 0.16	03 (5.6%) 01 (4%)	51 (94.4%) 24 (96%)	Chi sq = 0.06 p value = 0.79
Total	125	50	75		07	118	

- When gestational age <34weeks or >34 weeks, neonatal and maternal complications were not associated whether active or expectant management was done.

4. Discussion

The present study revealed an incidence of PPROM to be 3.99%. This was comparable with the incidence rates of studies conducted by Jayaram et al (3.8%) and Canavan et al (3%).[5,6] But study conducted by Pandey et al revealed an incidence of 7.7% which was high compared to this study.[7]

In the present study, 89.6% of cases were of 20-30 years of age group and was found comparable to the studies of Mohan SS et al, Mohokar SA et al and Dars S et al with maximum no. of cases belonging to the age group of 20 – 30 years.[8,9,10]

In our study, 84.8% cases of PPROM were unbooked and the results were similar to the studies conducted by Mohokar SA et al and Akter S et al, where 84% and 90% cases were unbooked respectively.[9,11] The results were inconsistent with the study by, Mohan SS et al, where 72% of the cases were booked and 28% were unbooked.[8]

In the present study, 42.4% cases were primigravida and were found comparable to a study conducted by Noor S et al, where 42.2% of the cases were primigravida and in another study, by Mohokar SA et al, 48% cases were primigravida and 52% cases were multigravida.[12,9]

In this study, 64.8% cases belonged to lower socioeconomic class. These results were comparable to studies by Noor S et al, Mohokar SA et al and Dars S et al with 68.2%, 58% and 72% cases from low socioeconomic class respectively.[12,9,10]

In this study, 51.2% cases were of normal BMI group with mean BMI of 21.3 kg/m^2. In a study by Hosseini M et al, 47.2% cases had BMI in normal range and a study by Hashima J et al, 52.5% cases had BMI < 25.[13,14] Our study was found comparable to these above studies. A study by Deshmukh VL et al states that overweight and obesity are risk factors for PPROM.[15] In a study by Riyami NA et al, no significant association between BMI and PPROM was observed.[16]

Mean gestational age of the present study was 34.1 weeks. These results were similar to the studies conducted by Sae-Lin P et al, Mohan SS et al and Akter S et al with mean gestational age of 34.7 weeks, 34.1 weeks and 34.7weeks respectively.[17,8,11]

In studies conducted by Shukla P et al and Riyami NA et al, 25% and 29.5% cases had history of previous abortions respectively, which is similar to our study.[18,16] In our study, 16.7% of multigravida PPROM cases had history of previous PPROM and preterm delivery. These results were consistent with the study by Shukla P et al, where 18.5% cases had history of previous preterm delivery.[18]

In our study, 8.8% of cases had multiple pregnancy and 3.2% of cases had polyhydramnios. A study by Leal MC et al, states that multiple pregnancy is a risk factor for preterm birth with or without PPROM with OR 16.42; 95 % CI 10.56–25.53.[19] A study by Silverman RK et al, stated that multiparity is a risk factor for PPROM with p value <0.001 and polyhydramnios is a risk factor for PPROM with p value <0.01.[20]

A study by Akter S et al, stated that anaemia is a risk factor for PPROM by affecting nutrition and immunity of the patient.[11] In a study by Mohan SS et al, only 12.9% of cases presented with anaemia which was very less as compared to our study.[8]

Maternal genitourinary infections are among the most common known causes of PPROM. In our study, 9.6% of the cases had genital infections and 14.4% of cases had UTI. In a study by Mohokar SA et al, 23% of the cases had cervical swab positive culture.[9] In an study by Hosny AE et al, both heavy vaginal infection and UTI were significantly associated with preterm labour with or without PPROM with p values 0.007 and 0.021 respectively.[21] A study by Minkoff H et al, presence of vaginal infections was significantly associated with PPROM with p value < 0.003.[22] In a study by Mohan SS et al, 32.7% cases had lower genital tract infection and 16.3% had UTI.[8]

In our study, 11.2% of the cases presented with fetal malpresentations which was similar with the study by Mohan SS et al and Demol S et al, where 10.2% and 12.8% of cases presented with malpresentation respectively.[8,23]

In this study, 78.4% cases had vaginal delivery and 21.6% underwent LSCS. It was found comparable to the studies conducted by Mohokar SA et al and Riyami NA et al in terms of LSCS rate among the study group.[9,16] A study by Shukla P et al, 85.5% cases had vaginal delivery and 14.5% delivered by LSCS.[18]

In present study, 16 cases underwent LSCS due to various indications without undergoing either expectant or active management. Among 109 cases, 55% cases were induced

and 45% cases were spontaneous. 93.3% of the induced cases had vaginal delivery and 6.7% underwent LSCS.The results were similar with the study conducted by Mohokar SA et al, in which 45% cases had spontaneous delivery and in 55% cases induction or augmentation was done.[9] A study by Trentacoste SV et al, where 87.8% cases had spontaneous onset of labour leading to delivery which was more compared to our results .[24]

Our study was similar to the study conducted by Mohokar SA et al, where 85.7% cases had perinatal morbidity when duration of leaking was >24 hours.[9] Our results were found consistent with the study by Mohan SS et al, where 77.9% cases had neonatal morbidity when duration of leaking was >24 hrs and 16.3% when duration of leaking was <24 hrs.[8]

In a study by Mohokar SA et al, 33% cases had perinatal morbidity which included hyperbilirubinemia (23%), RDS(21%), sepsis(10%), NEC(4%), ROP(2%), HIE(2%), IVH(2%) and birth asphyxia(3%).[9] In a study by Mohan SS et al, perinatal morbidity was 22.4% which included sepsis(6.58%), birth asphyxia(5.38%), RDS(4.4%), hyperbilirubinemia(4.7%) and NEC(1.19%).[8]Our results were comparable with the above studies.

Perinatal mortality of our was found comparable with the studies conducted by Noor S et al, with perinatal mortality rate of 12.9% and a study by Tavassoli F et al, with early neonatal death rate of 8.8%.[12,25] In a study by Mohan SS et al, perinatal mortality was 3.29% which was lesser compared to our results.[8]

In a study by Mohan SS et al, maternal morbidity was 17.4%.[8] A study by Mohokar SA et al, maternal morbidity was 12%.[9] In a study by Noor S et al, maternal morbidity was 16.47%.[12]Therefore, above stated studies were having higher morbidity as compared to our results.

5. Conclusion

PPROM is a significant obstetric problem. Despite various studies most of the aspects of PPROM remain enigmatic. It contributes to increased maternal morbidity as well as perinatal morbidity and mortality. Careful antenatal monitoring, detection and prompt treatment of infection is necessary. Strict aseptic precautions, appropriate therapy, regular follow up are important in the prevention and management of PPROM. Close antenatal monitoring, identification of risk factors like cervicovaginal infection and their management play an important role in the prevention of PPROM. From this study, we arrive at the conclusion that management should not be generalised regime. Multifactorial study of individual cases and management has to plan accordingly, varying from expectant to aggressive therapy.

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