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Original Research Article

A study on the obstetric outcome in preterm pre-labour rupture of membranes

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ABSTRACT

Background: The major risks to the baby following preterm pre-labour rupture of membranes (PPROM) are related to the complications of prematurity. Since the goal of management in PPROM is prolongation of pregnancy, the most commonly accepted management scheme for the patient less than 34 weeks is expectant management in the hospital which consists of careful observation for signs of infection, labour or fetal distress in an effort to gain time for fetal growth and maturation.
Methods: Patients admitted in Obstetrics and Gynaecology Department SAT Hospital, Medical College Trivandrum, Kerala with PPROM meeting the inclusion and exclusion criteria were recruited for the study. They were followed in the antenatal, intrapartum and postnatal period and the babies were also followed in the postnatal ward. The maternal and neonatal outcome were analysed and studied.
Results: Maternal chorioamnionitis developed in 12.1% of cases, abruption 1.7%, puerperal pyrexia 8.8%, early onset neonatal sepsis in 22.9% of cases, congenital pneumonia in 17% cases and neonatal deaths in 6.3% of cases. The mean gestational age at delivery in this study was 33.42 weeks with majority of cases delivering between 32-34 weeks.
Conclusions: The study suggests that maternal chorioamnionitis, puerperal pyrexia, congenital pneumonia, early onset neonatal sepsis, neonatal death, and requirement for ICU care occur with increased frequency in cohorts with PPROM. The present study concluded that most common maternal morbidity associated with PPROM was chorioamnionitis, that of neonatal morbidity was prematurity and its complications. A team effort by the obstetrician and neonatologist in a tertiary care setting can ensure healthy and fruitful life for the mother and her baby.

Keywords: Preterm prelabour rupture of membranes, Chorioamnionitis, Neonatal sepsis

INTRODUCTION

Preterm premature rupture of membranes (PPROM) is defined as rupture of membrane before 37 completed weeks of gestation. There appears to be no single etiology for PPROM. It is likely that multiple factors predispose certain patients to PPROM. Choriodecidual infection or chorioamnionitis may predispose to PPROM, Garite.[1] Higher grades of histologically demonstrable chorioamnionitis are associated significantly with the highest rates of neonatal morbidity or mortality, Zhang.[2] Maternal intrapartum consequence of PPROM are predominantly related to induction of labour. The latent phase of labour may be as long as 16-20 hours and hence the patient and attendant staff must be managed accordingly. Digital vaginal examination may contribute to infection according to Lewis, although the data are not strong.[3] The incidence of subclinical chorioamnionitis may be as high as 60% with PPROM, but serious maternal systemic infection is rare (2%). If treatment is initiated promptly. The use of a number of therapeutic agents such as corticosteroids, antibiotics and tocolytic

agents particularly with PPROM may pose additional maternal risk Kappy et al.[4]

Most authors report that prolonged membrance rupture is associated with increased fetal and maternal sepsis Ho and colleagues and with chorioamnionitis, fetal and neonatal morbidity is substantively increased.5 Alexander and co-workers studied 1367 very-low-birth weight neonates delivered at Parkland Hospital. Approximately 7% were born to women with overt chorioamnionitis and their outcomes compared with similar newborn without clinical infection. Those in the infected group had a higher incidence of sepsis, RDS, early-onset seizures, intraventricular hemorrhage, and periventricular leukomalacia. The investigators concluded that these very-low-birth weight neonates were vulnerable to neurological injury attributable to chorioamnionitis.[6]

The population-based study on the clinical significance and outcome of PPROM conducted at Soroka University Medical Centre, Israel, the rates of chorioamnionitis and urinary infection were found significantly higher in the PPROM group compared with women without PPROM. ($p<0.001$).[7]

METHODS

Design of study was Prospective observational study. Duration of the study one year. October 2010 to November 2011.

Study population

Patients admitted in Obstetrics and Gynaecology Department SAT Hospital, Medical College Trivandrum, Kerala with PPROM.

Inclusion criteria

Singleton pregnancies complicated by preterm prelabour rupture of membranes, between gestational age 24 weeks to 36 weeks 6 days.

Exclusion criteria

All cases of multiple pregnancy, diabetes, severe pre-eclampsia complicating pregnancy, foetal congenital anomaly detected by ultrasound prior to delivery, Intrauterine foetal demise prior to the onset of PPROM.

Sample size calculation

A pilot study was conducted in the labour room of SAT hospital for the purpose of estimating minimal sample size required for the prevalence study. Using the confidence limit of 31.6% for calculating the minimum sample size required for the study using the formula.

$N=\{z^2\times p\times(100-p)\}\div 1^2$

Where n is the sample size, Z is the level of significance for p value 0.05; z is 1.96

P=31.5, 1=p/5=6.3

n=1.962 × 31.5 × 69.5/6.32=211.8

So, a sample size of 240 was chosen.

Outcome variables

Number and proportion of PPROM cases complicated by each of chorioamnionitis, placental abruption, operative delivery (caesarean section, instrumental delivery), APGAR score at 5 minutes, early neonatal death, early onset neonatal sepsis, neonatal respiratory distress, congenital pneumonia and APGAR score at 5 minutes.

Methodology

All consecutive cases of PPROM fulfilling the inclusion and exclusion criteria in the study period were included (240 cases). Patients were recruited as they were admitted to the labour room of SAT hospital and followed up till their discharge from the hospital

All patient details were collected on a structured proforma after getting their consent. A detailed clinical examination was done after confirming the diagnosis of PPROM by a sterile speculum examination to note the pooling of liquor in the posterior fornix. In equivocal cases, litmus test is done for confirmation.

Special investigation like TC, DC, CRP was done to rule out chorioamnionitis. Chorioamnionitis was diagnosed in the presence of maternal fever (>37.8^{0}c) and one of the following pathological findings: maternal pulse rate>100/min; fetal heart rate>160/min; leukocytosis in the mother>15,000/mn^3; uterine tenderness; foul-smelling vaginal discharge, and C-|reactive protein>I mg/dl) other findings of subclinical infection are a change from reactive to non-reactive pattern in non-stress test and the absence of respiratory movements in bio physical profile.

In labour, she was watched for progress, fetal distress, blood stained liquor and mode of delivery was noted. After delivery, a detailed neonatal examination was done by the pediatrician to determine the APGAR score, birth weight, birth asphyxia respiratory distress and evidence of sepsis. All stillbirths and neonatal deaths were noted.

Postnatally, the patients were observed for postpartum pyrexia, foul smelling lochia and antibiotics were continued. Uncomplicated patients and their babies were discharged on the third postnatal day following a vaginal delivery after pediatric clearance and fifth post-operative day following caesarean section. Babies who required

prolonged observation or admission in neonatal ICU stayed back.

Statistical analysis

Data were analysed using statistical package for Social Sciences (SSPS) version 10. The proportion of each of the mentioned complications in PPROM cases was noted. To elucidate the associations and comparisons between different parameters, chi square test, Fisher's exact probability test and odds ration were used as needed. Pearson's correlation coefficient was used to analyse the relationship between two selected quantitative variables. All statistical tests were two tailed. All p values less than 0.05 was considered significant.

RESULTS

The majority of patients in this study are in the age group 20-24 years. The mean age of the study group was 24.86 years (SD 3.8). 77.5% of cases are primigravidas. The predominance of primigravidas in the PPROM sample is as anticipated. In this study, 2.1% of patients had history of previous preterm delivery.

The maternal complications in the study were chorioamnionitis (12.1%), abruption (1.7%), puerperal pyrexia (8.8%), in the PPROM group and (2.1%), (0.4%), (4.2%) respectively in the non PPROM group.

For the purpose of observing whether the proportion of the complications among PPROM patients is similar to or significantly different from that of general obstetric population attending the labour ward, these frequencies were compared with those in a group of 500 obtained from hospital records satisfying the same exclusion criteria and not having PPROM. These proportions are considered to represent the prevalence of these complications in the general obstetric population of the hospital concurrent with the period of study.

Table 1: Comparison in obstetric outcome between PPROM cases and controls.

Parameter		With PPROM (n=240)	Without PPROM (n=480)	Chi square	P value
		N (%)	N (%)		
Age (years)	<20	18 (7.5)	27 (5.4)	3.313	>0.05
	20-24	107 (44.6)	221 (44.2)		
	25-29	94 (39.20)	190 (38.1)		
	30-35	17 (7.1)	53 (10.6)		
	>35	4 (1.7)	9 (1.7)		
Socio economic status	High	4 (1.67)	11 (2.08)	2.3	>0.05
	Medium	47 (19.58)	108 (21.7)		
	Low	189 (78.75)	381 (76.25)		
Parity	Primi	186 (77.5	298 (59.6)	22.746	<0.001
	Multi	54 (22.5)	202 (40.4)		
Mode of delivery	Vaginal	207 (86.4)	412 (86.4)	2.8	>0.05
	LSCS	30 (12.3)	57 (11.5)		
	Instrumental	3 (1.3)	11 (2.1)		
Apgar at 5 minutes	<4	16 (6.7)	6 (1.25)	69.023	<0.001
	5-7	30 (12.5)	9 (1.7)		
	8-9	192 (80.80)	478 (95.6)		
Chorioamnionitis		29 (12.1%)	10 (2.1)	31.23	<0.001
Abruption		4(1.7%)	2 (0.4)	3.025	>0.05
Puerperal pyrexia		21 (8.8%)	20 (4.2)	6.259	<0.05
Neonatal sepsis		55 (22.9%)	4 (0.83)	104.03	<0.001
Congenital pneumonia		41 (17.1%)	4 (0.83)	72.514	<0.001
Neonatal death		15 (6.3%)	3 (0.6)	27.445	<0.001
Neonatal ICU stay		143 (59.6%)	42 (8.75)	324.036	<0.001

The proportion of chorioamnionitis placental abruption, pueperial pyrexia, early neonatal sepsis, congenital pneumonia is significantly higher in PPROM cases. 29 individuals (12.1%) of PPROM group had chorioamnionitis compared to only 2.1% in the non PPROM group. The z value for the difference in proportion between PPROM and non PPROM groups for abruption is 22.62 and the p value for this difference is <0.0001. Purperal pyrexia is significantly more in the PPROM group (Table 1).

Total 26 out of 127 cases in 28-34 weeks group had maternal chorioamnionitis (20.4%). 3 out of 106 cases in 34-37 weeks group had maternal chorioamnionitis

(3.8%). The difference between the frequencies of chorioamnionitis in these two groups is statistically significant (Table 2).

Table 2: Gestational age at PPROM and maternal chorioamnionitis.

Gestational age at PPROM (weeks)*	Maternal chorioamnionitis	
	Yes	No
24-28	-	7
	-	3.30%
28-34	26	101
	89.70%	47.90%
34-37	3	103
	10.30%	48.80%
Chi square: 17.919; p<0.001		

Two out of 127 cases in 28-34 weeks group had abruption (1.5%) one out of 106 cases in 34-37 weeks group had abruption (0.94%). The increased frequency in the former group is statistically significant (Table 3).

Table 3: Gestational age at PPROM and abruption.

Gestational age at PPROM (weeks)	Abruption	
	Yes	No
24-28	1	6
	25.00%	2.50%
28-34	2	125
	50.00%	53.00%
34-37	1	105
	25.00%	44.50%
P value<0.05		

Twenty out of 127 cases in 28-34 weeks group had puerperal pyrexia (15.7%) One out of 106 cases in 34-37 weeks group had puerperal pyrexia (0.94%). The increased frequency in the former group is statistically significant (Table 4).

Table 4: Gestatational age at PPROM and puerperal pyrexia.

Gestational age at PPROM (weeks)	Puerperal pyrexia	
	Yes	Nil
24-28	-	7
		3.20%
28-34	20	107
	95.20%	48.90%
34-37	1	105
	4.80%	47.90%
P value<0.001		

Total 3 out of 7 cases in 24-28 weeks group had neonatal sepsis. (42.8%). 39 out of 125 cases in 28-34 weeks group had neonatal sepsis (30.7%). 13 out of 106 cases in 34-37 weeks group had neonatal sepsis. (12.2%) The difference between the frequencies of neonatal sepsis in these two groups is statistically significant (Table 5).

Table 5: Gestational age at PPROM and neonatal sepsis.

Gestational age at PPROM (weeks)	Neonatal sepsis	
	Yes	No
24-28	3	4
	5.50%	2.20%
28-34	39	86
	70.90%	47.60%
34-37	13	93
	23.60%	50.30%
Chi square: 12.750; p<0.01		

Total 3 out of 7 cases in 24-28 weeks group had congenital pneumonia (42.8%). 28 out of 125 cases in 28-34 weeks group had congenital pneumonia. (22.04%). 10 out of 105 cases in 34-37 weeks group had congenital pneumonia (9.4%). The difference between the frequencies of congenital pneumonia in these two groups is statistically significant (Table 6).

Table 6: Gestational age at PPROM and congenital pneumonia.

Gestational age at PPROM (weeks)	Congenital pneumonia	
	Yes	No
24-28	3	4
	7.30%	2.00%
28-34	28	97
	68.30%	49.70%
34-37	10	96
	24.40%	48.20%
Chi square: 9.871; p<0.01		

Table 7: Gestational age at PPROM and neonatal death.

Gestational age at PPROM (weeks)	Neonatal death	
	Present	Absent
24-28	6	1
	40.00%	0.40%
28-34	8	117
	53.30%	52.70%
34-37	1	105
	60.70%	46.9%
Chi square: 80.221; p<0.001		

Total 6 out of 7 cases in 24-28 weeks group had neonatal deaths. (85.7%). 8 out of 125 cases in 28-34 weeks group

had neonatal deaths (6.29%). 1 out of 106 cases in 34-37 weeks group had neonatal deaths. (0.94%) The difference between the frequencies of neonatal deaths in these two groups is statistically significant.

DISCUSSION

The mean age in this study was 24.86 years. 44.6% of patients were in the age group 20-24 yrs. In a study by Noor et al in Ayub Medical College in 2008, 58.8% were in the age group of 21-25 years. Among 240 patients, 78.5% of them belong to lower socioeconomic status. In a study done by Noor et al 68.2% were under lower socioeconomic group.[8]

In the present study, 77.5% were primigravidas compared to 22.5% multigravidas.

In a study conducted by Gandhi et al 60.7% were primigravida.[9] The mean gestational age at PPROM in this study was 33.02 with 52.9% of case occurring between 28-34 weeks, 44.2% occurring between 34.36 weeks and 3% between 24-28 weeks. In a study by Nicaise and Gire among PPROM patients between 24-34 weeks of gestation, the mean gestational age for onset of PPROM was 30.8 weeks and for delivery was 31.4 weeks.[10]

In this study, 22.9% of cases had early onset neonatal sepsis despite the administration of antibiotics. There were 15 neonatal deaths among cases, 17% of cases had congenital pneumonia, and 12% of cases had respiratory distress syndrome. Majority of the babies were of low birth weight which puts great burden on neonatal intensive care facilities. Number of babies with low Apgar scores was also high. 6.7% had APGAR scores <4 at 5 minutes. Neonatal sepsis and congenital pneumonia were found to be higher at gestational age of 28-34 weeks (70.9% and 68.3% of sepsis and pneumonia respectively), in which group we usually follow conservative management. Neonatal deaths & maternal chorioamnionitis were also found to be higher between 28 to 34 weeks of gestation.

Puerperal pyrexia was seen in 8.8% of cases. A study by Khashoqqi in 2008 reported an incidence of 6.8% for post-partum endometritis in cases of PPROM.[11]

The two groups are similar with respect to the distribution across categories of age and socioeconomic status. PPROM group had significantly higher number of primis. Low apgar scores were more frequent in deliveries complicated by PPROM. The proportions of chorioamnionitis, placental abruption, puerperal pyrexia, early neonatal death, early onset neonatal sepsis, congenital pneumonia was significantly higher in PPROM cases.

In the group of 500 deliveries without PPROM, 85 were preterm deliveries. The early neonatal complication rate of this subset was compared with that of the study group.

The fetal outcomes like early neonatal sepsis, congenital pneumonia and neonatal deaths of cases were compared with preterm subset without premature rupture of membranes to find out if there was a significant role for early rupture of membranes exclusive of the effects of prematurity in influencing neonatal outcome. Neonatal sepsis and congenital pneumonia in the non PPROM preterm group was 2.4% only (as against a high proportion of 23% and 17% among PPROM cases). Neonatal deaths were also lower in the preterm subgroup without premature rupture of membrances. Prematurity and infection contributed to longer neonatal ICU stay in cases. A comparative study of outcome of preterm neonatal with and without history of PPROM in 2009 by Khanal, Zhang et al, concluded that neonatal death was more in the former group ($p<0.001$).[12]

Cases having rupture of membranes at 28-34 weeks were found to have significantly higher frequency of maternal chorioamnionitis, abruption, puerperal pyrexia, neonatal sepsis and congenital pneumonia than in the group without rupture of membranes at 34-37 weeks. This may be because of the fact that expectant management is being followed in our hospital in patients with rupture of membranes between 28-34 weeks which might be contributing to longer latency and adverse maternal and neonatal outcome. 6 out of 7 cases in 24-28 weeks group had neonatal deaths (85.7%). 8 out of 127 cases in 28-34 weeks group had neonatal deaths (6.29%). There was only one death in 106 deliveries in the 34-37 weeks group.

A comparison of adverse maternal and fetal outcome variables in preterm deliveries with and without PPROM that occurred between 28-34 weeks of gestation; that is the group in which we resorted to expectant management, was done. It showed that compared to preterm delivery group with intact membranes, the group with premature rupture of membranes the group with premature rupture of membranes had significantly high association with chorioamnionitis and neonatal sepsis. But association with other outcome variables could not be established. This indicates that in PPROM cases belonging to 28-34 weeks, spontaneous premature rupture of membranes was an added risk factor for chorioamnionitis and neonatal sepsis in addition to prematurity. But membrane rupture did not provide added risk over and above prematurity with regard to the incidence of congenital pneumonia, abruption and neonatal death.

CONCLUSION

The study suggests that maternal chorioaminonitis, puerperal pyrexia, congenital pneumonia, early onset neonatal sepsis, neonatal death, and requirement for ICU

care occur with increased frequency in cohorts with PPROM.

Though less convincingly, the study also suggests that PPROM patients have an increased risk of abruption. Studies with much larger sample sizes would be needed to confirm this inference.

The mean gestational age at PPROM in this study was 33.02 weeks. Maternal chorioamnionitis developed in 12.1% of cases, early onset neonatal sepsis in 22.9% of cases, congenital pneumonia in 17% cases and neonatal deaths in 6.3% of cases. The mean PPROM delivery interval between 24 to 37 weeks of gestation was 3.5 days in this study. The mean gestational age at delivery in this study was 33.42 weeks with majority of cases delivering between 32-34 weeks.

In the intentional delivery group, that is after 34 weeks, no statistically significant difference in the incidence of neonatal sepsis, chorioamnionitis or any other outcome variables studied, were seen when the PPROM group was compared to the preterm group with intact membranes.

When PPROM cases were compared to preterm cases with intact membranes of the same gestational age at delivery (28-34 weeks), spontaneous PPROM were found to be an added risk factor for chorioamnionitis and neonatal sepsis in addition to prematurity. This the group in which we resort to expectant management.

Careful planning and management of pregnancy in women with history of PPROM is essential to increase the likelihood of a healthy outcome for the mother and infant. Hence patients with such a history may be placed under close surveillance in tertiary care setting.

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