Original Research Article

Feto-maternal outcome in pre-term pre-labour rupture of membranes

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Abstract

Objective: To assess the fetal and maternal outcome among cases presenting with pre-term pre-labour rupture of membranes(pPROM) and to find out association of different factors (demographic, obstetric and medical history) and presenting features with its incidence. Design: A Prospective observational study from 1st May, 2014 to 30th June, 2015.Setting and Study Population: The study was conducted in Department of Obstetrics and Gynaecology at Kurji Holy Family Hospital, Patna, Bihar in women with pPROM and giving consent to participate in the study. **Method:** The calculated sample size was100. Detailed history of every patient was taken through a pre-structured proforma. Rupture of membranes was diagnosed by history of a sudden gush of watery discharge per-vaginum or slow continuous leak. Confirmation of diagnosis was done by a sterile speculum examination and demonstration of alkaline pH of fluid by nitrazine test. Plan of management was decided on the basis of gestational age, cervical condition, presentation of fetus and presence of any symptoms and signs of infection. The results were tabulated and data analysed using Statistical Package for Social Sciences (SPSS) version 15.0. Chi- square test was used to compare proportions and independent samples t-test was used to compare continuous data. p value < 0.05 indicated statistically significant association. Outcome measures Maternal outcome was measured in terms of latency period till delivery, mode of delivery, placental abruption/cord prolapse, clinical chorioamnionitis, post-partum haemorrhage and puerperal sepsis including endometritis till hospital stay. Fetal outcome was measured in terms of birth weight, APGAR at 1 minute and 5 minutes, NICU admission, respiratory distress syndrome, hypoglycemia, septicemia, neonatal jaundice and fetal/ neonatal mortality. **Results:** Among women completing the study (n=94), 27 (28.7%) had gestational age <34 weeks and 67 (71.3%) presented at gestational age ranging between 34 weeks to 36 weeks 6 days. Mode of delivery was predominantly through vaginal route (74.5%). Indications for Caesarean section were fetal distress (50%), oligohydramnios (25%), non-progress of labour (16.6%) and abruptio placentae (8.3%) respectively. Majority of patients had a latency period of < 24 hours (72.8%).92.8% patients delivered within 48 hours of membranes rupture. Overall maternal complication rate was 39.3%. Post-partum complications were more common. Wound infection (19.1%), puerperal sepsis (10.6%), antepartum clinical chorioamnionitis (12.7%), placental abruption (2.1%), Post-partum haemorrhage (2.1%) and retained placenta(1.06%) were seen. A total of 63.8% babies had birth weight < 2.5 kg. Low APGAR(<7) at 1 minute and 5 minutes was recorded in 31.9% and 8.5% neonates respectively. NICU admission rate was 45.7%. Neonatal sepsis was seen in 21.3% cases, neonatal jaundice in 27.1%, neonatal hypoglycemia in 8.5% and neonatal respiratory distress syndrome was seen in 12.8% babies. Perinatal mortality rate was 8.5% and gestational age <34 weeks was significantly associated with still births and neonatal complications. **Conclusion** In cases of pPROM, expectant management with proper vigilance beyond 34 weeks of gestation might help in reduction of pre-maturity related morbidity without compromising maternal safety. Maternal complications in pPROM are difficult to predict and are generally affected by previous obstetric history only, however, these complications along with gestational age in pPROM affect the perinatal outcome.

Key Word: Chorioamnionitis, NICU, neonatal septicemia, neonatal jaundice, neonatal respiratory distress syndrome, pPROM.

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INTRODUCTION

Preterm prelabour rupture of membranes (pPROM) is defined as rupture of the amniotic membranes before 37 weeks of gestation and before the onset of labor, while extreme PPROM occurs before 26 weeks gestation. The incidence of PPROM in all pregnancies is 2-3%, and comprises 30-40% of preterm deliveries[1,2]. It has been estimated that 10% of perinatal deaths are directly or indirectly attributable to PPROM. The aetiology is multifactorial and risk factors for PPROM include intra-amniotic infection, placental abruption and invasive uterine procedures (e.g. amniocentesis, cordocentesis, chorionic villus sampling, cervical cerclage)[3]. Infection (mostly bacterial infection) constitutes the major factor associated with PPROM, which activates the release of pro-inflammatory cytokines by the decidua and amniotic membranes, in which many bioactive substances like prostaglandins and metalloproteases are released. On one hand, the prostaglandins act by stimulating the contraction of the uterus; while on the other hand, the metalloproteases relax and soften the cervix, leading to membrane rupture[2]. Other risk factors are thought to include race/ethnicity. For example, Black and Hispanic women are at a higher risk in comparison to White women. Available hospital services, marital status, parity, history of preterm birth, in utero exposure to diethylstilbesterol, in vivo fertilization for index pregnancy, pregnancy complications such as gestational and pre-existing diabetes mellitus, antepartum bleeding and anemia, maternal weight gain, smoking, illegal drug use, uterine distension (e.g., polyhydramnios, multifetal pregnancy) are other factors associated with pPROM. Typically women with pPROM present with a large gush or steady trickle of clear vaginal fluid. The clinical signs of pPROM may become less accurate after 1 hour has elapsed[3]. The interval between pPROM and the onset of labour is influenced by many factors including gestational age. Women with pPROM have a 50% chance of going into labour within 24 to 48 hours and 70 to 90% chance within 7 days. If pPROM occurs between 24 and 28 weeks gestation the latency period before birth is generally longer than if occurring closer to term[2]. Incidence of pPROM in India is not available though most Indian studies document an incidence of 7 to 12% for PROM of which 60-70% occur at term[3]. In Bangladesh too, incidence of preterm PROM is not known but incidence of PROM in Dhaka Medical College Hospital was reported to be 8.12%[4] and 1.94% at Holy Family Red Crescent Hospital[5] . pPROM is associated with an increase in perinatal mortality and an increase in neonatal morbidity. Perinatal complications include respiratory distress syndrome, infections, intraventricular haemorrhage, pulmonary hypoplasia, skeletal deformities, cord prolapse, and malpresentation. Situation in developing countries like India is more alarming. The facilities for diagnosis, treatment and age of viability are also lesser as compared to developed countries. Unrecognized and inadequately treated conditions can lead to maternal asymptomatic and symptomatic chorioamnionitis. The mechanism of pPROM is unknown, no standards for diagnosis exist and most facets of management are controversial. As prevention is difficult due to obscurity of etiology, one has to concentrate more on the management of pPROM to reduce its complications. The proficiency of an obstetrician is a pregnancy that results in a healthy infant and a minimally traumatized mother.

AIM AND OBJECTIVES

The study was carried out to evaluate the feto-maternal outcome among patients presenting with preterm premature rupture of membranes at Kurji Holy Family Hospital, Patna. This aim was fulfilled with the help of following objectives:

1. To assess the fetal and maternal outcome among cases presenting with pPROM.
2. To find out association of different factors (demographic, obstetric and medical history and presenting features) with incidence of pPROM.

MATERIAL AND METHODS

Study design: prospective observational study

Setting: the study was conducted in department of obstetrics and gynaecology at kurji holy family hospital, patna.

Study population: women presenting to the department of obstetrics and gynaecology at kurji holy family Hospital, Patna with preterm pre-labour rupture of membranes (pPROM) and giving consent to participate in study.

Duration of study: Starting from 1st may, 2014 to 30th June, 2015.

Sample size

The sample size was calculated on the basis of a study conducted by dars *et al.* (2015) who reported an incidence of adverse fetal outcome in 27% of pPROM cases. The sample size was calculated using the following formula (snedecor and cochran, 1989)

$$N = c^2 \frac{p(1-p)}{e^2}$$

Where "p" is the prevalence (27% or 0.27), c^2 is a constant at a certain confidence level (its value at 95% confidence limit and 80% power is 1.96) while e is the error allowance (taken as 10% or 0.10). Now putting these values in the above equation we get:

$$n = 1.96^2 * 0.27*(1-0.27) / 0.1^2$$
$$= 3.84 * 0.2 / 0.01$$
$$= 3.84 * 20 = 76.8 \sim 77$$

Thus the calculated sample size was 77, however, after adding for contingency @25% and rounding off to nearest 10^{th} value we targeted a sample size of 100.

Permissions and approvals

The study was approved by institutional ethical review board. Informed consent was obtained from all the patients enrolled in the study.

Inclusion criteria: all women with singleton pregnancy and gestational age between 28 weeks to 36 weeks 6 days presenting with pPROM and not in active labour.

Exclusion criteria: pre-eclampsia/diabetes, symptoms of chorio-amnionitis at the time of admission**,** fetal growth restriction (FGR)**,** fetal distress/death**,** congenital anomaly of fetus**,** cord prolapse at the time of admission.

METHODS

Detailed history of every patient was taken through a pre-structured proforma. Rupture of membranes was diagnosed by history of a sudden gush of watery discharge per-vaginum or slow continuous leak. Confirmation of diagnosis was done by a sterile speculum examination and demonstration of alkaline pH of fluid by nitrazine paper. Cervical effacement and dilatation was assessed at the same time. Gestational age was calculated from LMP and early pregnancy USG scan. All routine investigations including TLC, DLC were send at the time of admission. Plan of management was decided on gestational age, cervical condition, presentation of fetus and any symptoms and signs of infection. All patients at gestational age < 34 weeks were given a course of ante-natal steroid coverage with inj. Dexamethasone6mg i.m.12 hourly for 48 hours after admission. All patients received prophylactic antibiotic coverage with inj. Ampicillin 500 mg i.v. 6 hourly for 48 hours then changed to oral form for 5 days. In cases selected for conservative management, fetal surveillance was checked by daily fetal kick counts and auscultation of fetal heart sound 4hourly. Non-stress test was done biweekly or more frequently if required. USG for fetal well-being and bio-physical profile was done weekly. Mother was advised bed rest with bathroom facilities and to wear a sterile vulval pad. To detect signs of Chorio-amnionitis, recording of temperature, pulse, blood pressure, fundal height, abdominal tenderness, inspection of vulval pad for colour, smell and amount of loss of liquor was done 4hourly. Delivery indications during conservative management were fetal distress/ death, cord prolapse, oligohydramnios/excessive loss of liquor, haemorrhage and clinical chorioamnionitis.

Chorio-amnionitis was diagnosed clinically by presence of at least 2 of following criteria:

1. Fever > 100.4ºF (at >2 times with 1 hour interval)
2. Maternal tachycardia (> 120/min)
3. Fetal tachycardia (> 160 /min)
4. Uterine tenderness
5. Foul smelling vaginal secretions
6. Maternal leucocytosis (WBC >20000)

Maternal outcome was measured in terms of latency period till delivery, mode of delivery, placental abruption/cord prolapse, clinical chorioamnionitis, post-partum haemorrhage and puerperal sepsis including endometritis till hospital stay. Fetal / Neonatal outcome was measured in terms of birth weight, APGAR at 1 min and 5 min, NICU admission, respiratory distress syndrome, hypoglycemia, septicemia, neonatal jaundice and fetal/neonatal mortality.

Statistical Analysis: The data was analyzed using Statistical Package for Social Sciences (SPSS) version 15.0. Chi-square test was used to compare the proportions whereas Independent samples't' test was used to compare the continuous data. Confidence level of the study was 95% and a p- value<0.05 showed statistically significant association.

RESULTS

100 patients were enrolled initially, out of which 94 patients could complete the study. Table 1 shows the demographic profile and obstetric history of the patients enrolled in the study:

Table 1: Distribution of subjects enrolled in the study according to age and education

SN	Characteristic	No. and % of patients
1.	Age	
	≤20 Years	8
	21-25 Years	54
	26-30 Years	33
	31-35 Years	3
	>35 Years	2
	Mean Age±SD (Range) in years	24.88±3.71 (19-38)
2.	Education	
	Below High School	41
	High School and above	59

Age of patients enrolled in the study ranged from 19 to 38 years with a mean age of 24.88±3.71 years. Majority of patients were aged 21-25 years (54%). There were only 2 (2%) women aged >35 years. Most of the women in our study population were educated upto High School or above (59%). There were 41 (41%) women who were educated below High School.

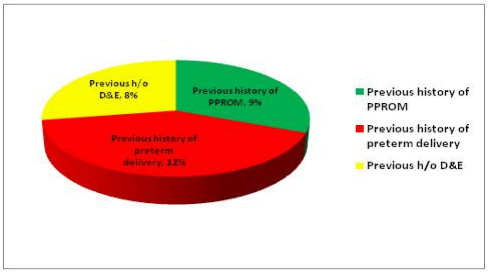
Table 2: Obstetric History of patients enrolled in the study

SN	Characteristic	No. and % of patients
1.	Parity	
	P0	68
	P1	24
	P2	5
	P3	3
2,	No. of previous abortions	
	None	80
	One	16
	Two	4
3.	Mode of last delivery (n=32)	
	LSCS	2 (6.2%)
	Vaginal	30 (93.8%)

Majority of women were nullipara (P0) (68%) followed by para 1 (24%), para 2 (5%) and para 3 (3%) women. A total of 20 women had previous history of spontaneous abortions – 16 women (16%) had one abortion and 4 women (4%) had two abortions earlier. Among 32 multigravida patients, 30 women (93.8%) had previous vaginal deliveries while 2 women (6.2%) had caesarean section.

Table 3: Previous history of PPROM, Preterm delivery and other obstetric events (n=32)

SN	Characteristic	No. and % of patients
1.	Previous history of PPROM	9
2.	Previous history of preterm delivery	12
3.	Previous h/o DandE	8



Previous history of PPROM was reported in 9 women (9%) while 12 women (37.5%) had history of previous pre-term deliveries. 8 (8%) women underwent D and E after abortions.

Table 4: Distribution of study Population according to Gestational Age

SN	Gestational age at presentation	No. and % of patients
1.	28 wk-33 weeks 6 days	29
2.	34 wk-36 weeks 6 days	71

The gestational age of patients ranged from 28 weeks to 36 weeks 6 days. Majority of them (71%) presented after completing 34 weeks of pregnancy.

Table 5: Cervical Effacement and Dilatation at the time of admission

SN	Characteristic	No. and % of patients
1.	Cervical effacement	
	0-30%	79
	30-50%	21
2.	Dilation of cervix (cm)	
	Closed	25
	1.0-3.0 cm	75

At the time of admission, cervical effacement was seen to be <30% in 79% women and between 30-50% in 21% of women. Cervical os was closed in 25 patients (25%) while 75 patients (75%) had 1-3cm cervical dialatation.

Table 6: Associated Complaints at Presentation

SN	Characteristic	No. and % of patients
1.	Pain abdomen	19
2.	White discharge P/V	17
3.	Burning micturition	20
4.	None	44

At the time of presentation, a total of 19 women (19%) complained of abdominal pain, 17 women (17%) had history of white discharge p/v in past few days while 20 women (20%) reported of burning micturition . A total of 44 women (44%) had no associated complaints. A total of 6 (6%) cases were lost to follow up/discharged on patient request and hence were excluded from further assessment.

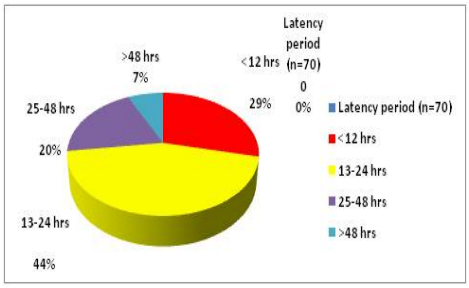
Table 7: Mode of Delivery (n=94)

SN	Characteristic	No. of patients	%
1.	LSCS	24	25.5
2.	Vaginal	70	74.5

70 patients (74.5%) delivered through vaginal route while 24patients (25.5%) needed caesarean delivery.

Table 7: Latency period till delivery (n=70)

S.No.	Time duration	No. of patients	%
1.	≤12 hrs	20	28.6
2.	13-24 hrs	31	44.3
3.	25-48 hrs	14	20.0
4.	>48 hrs	5	7.1



Latency Period

Latency period was defined as the time duration from rupture of membranes to delivery of the baby. It was noted that 29% women delivered within 12 hours of rupture of membranes and rest 44% also delivered within 24 hours.20% women delivered between 25-48 hours while 7% delivered after 48 hours.

Table 8: Complications/Indications for LSCS (n=24)

SN	Indications	No. of patients	%
1.	Fetal distress	12	50.0
2.	NPOL	4	16.6
3.	Oligohydramnios (AFI <5 cm)	6	25.0
4.	Abruptio placentae	2	8.3

Out of 24 cases in whom caesarean section was performed, the most common indication was fetal distress (n=12; 50.0%) .Oligohydramnios (n=6; 25%), non-progress of labour (n=4; 16.6%) and placental abruption (n=2; 8.3%) were other indications.

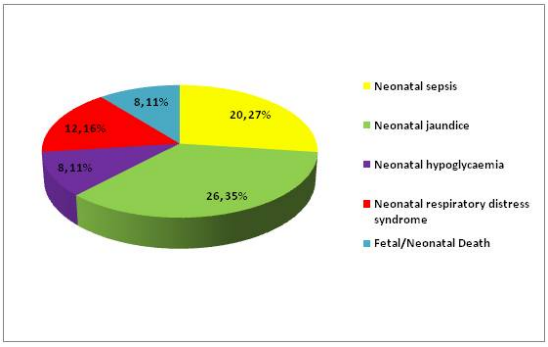
Table 9: Maternal outcome/complications (n=94)*

SN	Characteristic	No. of patients	%
1.	No complications	57	60.6
2.	Complications	37	39.3
a.	Clinical chorioamnionitis	12	12.7
b.	Abruptio placentae	2	2.1
c.	Wound infection	18	19.1
d.	Puerperal sepsis/ Endometritis	10	10.6
e.	Retained placenta	1	1.06
f.	Post partum haemorrhage	2	2.1

*Some women had more than one complication Maternal complications were seen in 37 patients. Some had 1 or more complications. Most common complication in our study population was post-partum wound infection (n=18; 19.1%) followed by clinical chorioamnionitis (n=12; 12.7%). Puerperal sepsis/endometritis in 10 (10.6%), placental abruption in 2 (2.1%), post-partum haemorrhage in 2 (2.1%) and retained placenta in 1(1.06%) women was seen respectively.

Table 10: Neonatal outcome and complications(n =94)

SN	Characteristic	No. of patients	%
	Gender of baby		
1.	Female	30	31.9
	Male	64	68.1
	Birth weight		
2.	<2 kg	16	17.0
	2-2.5 kg	44	46.8
	>2.5 kg	34	36.2
3.	Apgar <7 at 1 min	30	31.9
4.	Apgar <7 at 5 min	8	8.5
5.	NICU Admission	43	45.7
6.	Neonatal sepsis	20	21.3
7.	Neonatal jaundice	26	27.1
8.	Neonatal hypoglycaemia	8	8.5
9.	Neonatal respiratory distress syndrome	12	12.8
10.	Fetal/Neonatal Death	8	8.5



Neonatal Complications

Majority of babies born were males (68.1%). Birth weight of 16 (17.0%) babies was <2 kg, 44 (46.8%) had birth weight 2-2.5 kg and remaining 34 (36.2%) had birth weight >2.5 kg. A total of 30(31.9%) neonates had Apgar score <7 at 1 min whereas at 5 min, 8 (8.5%) had Apgar score <7. NICU admission was done in 43 (45.7%) cases. A total of 20 (21.3%) cases had clinical evidence of neonatal sepsis. There were 26 (27.1%) neonates with neonatal jaundice. Neonatal hypoglycaemia was seen in 8 (8.5%). A total of 12 neonates (12.8%) had respiratory distress syndrome. Stillbirth/Neonatal death was reported in 8 (8.5%) neonates.

Table 9: Association of latency period with gestational age (n=70)

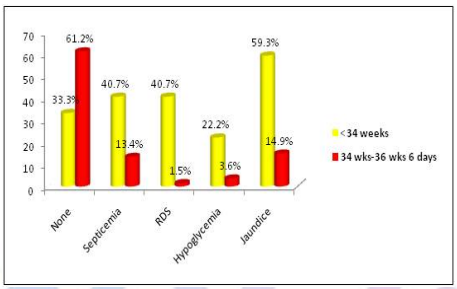
SN	Latency period (hrs)	<34 weeks (n=23)		34 wks-36 wks 6 days (n=47)	
		No.	%	No.	%
1.	<12 hr	4	17.4	16	34.0
2.	12-24 hr	7	30.4	24	51.1
3.	24-48 hr	7	30.4	7	14.9
4.	>48 hr	5	21.7	0	0.0
	χ^2=15.065 (df=2); p=0.002				

Among cases in whom emergency caesarean section was not done (n=70), majority of patients with gestational age 34 wks or above had membrane rupture to delivery interval within 24 hrs (40/47; 85.1%) whereas majority of those who had gestational age <34 weeks had rupture to delivery interval > 24 hrs (n=12/23; 52.1%). Statistically, this difference was significant (p=0.002).

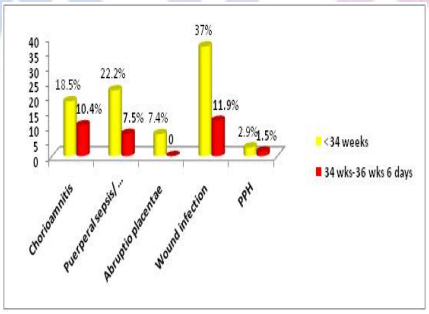
Table 10: Association of gestational age with other feto-maternal outcomes

SN	Characteristic	<34 weeks (n=27)		34 wks-36 wks 6 days (n=67)		Statistical significance	
		No.	%	No.	%	χ^2	P
	Mode of delivery						
1.	LSCS	4	14.8	20	29.8	2.44	>0.10
	Vaginal	23	85.2	47	70.2		
	Fetal outcome						
2.	Alive	22	81.5	67	100	13.104	<0.001
	Stillborn	5	18.5	0	0		
	Birth weight	n=22					
3.	<2.0 kg	14	51.9	2	3.0		
	2.0-2.5 kg	13	48.1	31	46.3	40.715	<0.001
	≥2.5 kg	0	0.0	34	50.7		
	Apgar at 1 min	n=22					
4.	7-10	11	50.0	48	71.6		
	4-6	6	27.3	16	23.9	7.61	<0.05
	<4	5	22.7	3	4.5		
	Apgar at 5 min	n=22					
5.	7-10	16	72.7	65	97.0		
	4-6	3	13.6	2	2.98	74.76	<0.001
	<4	3	13.6	0	0.0		
6.	NICU admission at birth	16	72.7	27	40.3	2.82	>0.05
7.	Neonatal morbidity	n=22					

SN	Characteristic	<34 weeks (n=27)		34 wks-36 wks 6 days (n=67)		Statistical significance	
		No.	%	No.	%	χ^2	P
	None	4	33.3	54	61.2	43.1	<0.001
	Septicemia	11	40.7	9	13.4	8.568	0.003
	RDS	11	40.7	1	1.5	26.620	<0.001
	Hypoglycemia	6	22.2	2	3.6	9.147	0.002
	Jaundice	16	59.3	10	14.9	18.904	<0.001
	Maternal outcome						
	Chorioamnionitis	5	18.5	7	10.4	1.127	0.289
8.	Puerperal sepsis/ Endometritis	6	22.2	4	7.5	4.057	0.044
	Abruptio placentae	2	7.4	0	-	0.823	0.364
	Wound infection	10	37.0	8	11.9	7.829	0.005
	PPH	1	2.9	1	1.5	0.452	0.501
9.	Neonatal death	3	13.6	0	-	1.3	>0.2



Association of Gestational age with neonatal morbidity



Association of Gestational age with Maternal outcomes

LSCS rate was higher in >34 weeks (29.8%) as compared to ≤34 weeks group (14.8%) (p=>0.1). All the 5 stillborn cases were born in the cases with gestational age <34 weeks, thereby showing a significant association between gestational age and stillbirth (p<0.001). Majority of patients with gestational age 34 wks-36 wks 6 days had birth weight ≥2.5 kg as compared to none among those with gestational age <34 weeks, thus showing a statistically significant association (p<0.001). With respect to Apgar score at 1 min and 5 min intervals, too, proportion of babies with Apgar score <7 was significantly higher in cases with gestational age <34 weeks as compared to those with gestational age 34 wks-36 wks 6 days (p<0.001). Rate of NICU admission was higher in cases with gestational age <34 weeks (72.7%) as compared to those with gestational age ≥34 weeks (40.3%) yet this difference was not significant statistically (p>0.05). Similarly, rate of neonatal morbidity (66.7%), septicaemia (40.7%), RDS (40.7%), Hypoglycemia (22.2%) and jaundice (59.3%) was also higher in lower gestational age cases as compared to those with higher gestational age (38.8%, 13.4%, 1.5%, 3.6% and 14.9% respectively). The difference between two groups was significant statistically too (p<0.05). Among maternal complications, rate of clinical chorioamnionitis (18.5%), puerperal sepsis (22.2%), wound infection (37.0%) and PPH (2.9%) was higher in lower gestational age group as compared to higher gestational age (10.4%, 7.5%, 11.9% and 1.5% respectively) and the difference between two groups was also significant statistically for all these complications except PPH. Both the cases of abruption placentae were in lower gestational age group,

however, they did not lead to a significant difference between two groups (p=0.364). All neonatal deaths occurred in lower gestational age group (n=3;13.6%) in our study. However, it was not significant statistically (p >0.2).

DISCUSSION

A total of 100 cases with preterm pre-labour rupture of membranes were enrolled in the study. The confirmation of PPROM was done both clinically as well as through Nitrazine test. Majority of cases enrolled in the study were aged <25 years (n=62; 62%) with mean age observed to be 24.88 +3.71 years which is close to the mean age of pPROM patients reported by Akter *et al* (2010)[6]. There is considerable argument regarding the association of maternal age with incidence of PPROM in differentstudies[7,8]. The age difference in different studies could be due to difference in age of marriage, consummation and active sexual life. Majority of women in our study were educated upto High School or above (59%) and belonged to middle and upper middle strata of society which in general reflects the general profile of the patients attending our facility. Some studies in developed countries have shown an association between lower socioeconomic strata and increased prevalence of pPROM mainly due to nutritional differences in different socioeconomic groups[9]. However, no such association was seen in our study. In this study, majority of women were nullipara or para 1 (92%). Contrary to our findings, Noor *et al*. (2007)[10] reported majority of their patients to be multipara. One of the reasons for lower proportion of patients with higher parity in present study could be the highly urbane and increasing tendency of smaller family size[11]. Recent empirical evidence from India also supported that parity has no role in determining risk of pPROM[12]. In present study, a total of 20 (20%) women had history of one or more abortions. 8 patients (8%) had D&E after abortion. Previous history of abortion is a known risk factor for PPROM[6,13]. The proportion of patients with previous history of abortion in present study (20%) was close to that reported by Al-Riyami et al[14] who reported 13/44 (29.5%) of women in their study to have a history of abortion. In present study, among multigravida women (n=32), majority (n=30/32; 93.8%) had previous vaginal deliveries. There were 2 cases with previous history of caesarean section. However, among these 12 (37.5%) had a history of preterm labour. A total of 9 (9%) had history of pPROM too. Preterm labour and previous pPROM are known risk factors for pPROM[15]. In present study, only third trimester cases of pPROM were included and majority of the cases reported at a gestational age >34 weeks (71%). Noor *et al*. (2007)[10] in their study reported the proportion of patients with gestational age >35 weeks to be 35.2%. The gestational age at PPROM is dependent on a host of factors including presence of risk factors like maternal hypertension, diabetes, smoking habits etc.[16]. However, in present study we ruled out inclusion of cases with pre-eclampsia/diabetes and this could be the reason for higher proportion of patients in late gestational age group. Moreover, most of the pregnancies in present study were booked (78%) and were receiving proper antenatal care. At the time of enrolment,56% patients presented with additional complaints like pain abdomen (19%) burning micturition (20%) and white discharge p/v (17%) in last few days. 44% patients were otherwise stable and did not have any added complaint. The final outcome could be assessed in 94 patients, as a total of 6 patients withdrew from the study. The caesarean section rate in remaining 94 patients was 25.5%. A carefully planned expectant strategy helps to minimize the caesarean rate. The caesarean rate in present study was similar to that reported by Al-Riyami *et al*. (2013)[14] (27%) and Ibishi *et al*. (2015)[17] (28%). Although some workers have reported a higher caesarean rate[18], however, the rate of caesarean section varies in different centres depending on the type of management strategy being used, level of infrastructure facilities and patient/ surgeon's choice apart from indications suggestive of caesarean section. In present study, none of the case with malpresentation (breech) was enrolled. Features of clinical chorioamnitis were seen in 12 cases. Complications like abruptio placentae was also seen in only two cases. This might be one of the reasons for relatively lower caesarean rate in our study population as these factors have been shown to be contributory towards an increased caesarean rate[19]. In present study, in majority of cases latency period lasted only upto 24 hrs (72.8%). On calculating the mean rupture-onset of labour intervals, the value came out to be 23.76 hrs respectively. This period is a bit higher as compared to that reported by Akter *et al*. (2010)[6] who found these values to be 18.87 hours. In specific conditions, such as among carriers of Group B Streptococcus, mean latency period has been reported to be as high as 11.2 days. The difference in latency period might be dependent on the gestational age[20] . In present study, majority of patients presented at a gestational age 34 weeks or above whereas the study of Group B streptococcus carriers[21] included only those patients who had a gestational age of <34 weeks. In present study, the criteria of inclusion of patients and proportion of patients with higher gestational age was similar to that of Akter *et al*. (2010)[6] and hence this similarity in latency period. In this study, puerperal sepsis/endometritis and wound infection rate among mothers was only 10.6% (10/94) and 19.1% (18/94)respectively. The rate of endometritis was higher than that reported by Furman *et al*. (2000)[22] (2.8%) however wound infection rate was much lower (25.7% vs 19.1%). Wound infection and puerperal sepsis in pPROM

could be attributed to the probable infectious etiology of pPROM[3]. In our environment, the chances of community as well as hospital-acquired infections are quite high and hence could be attributed to be the reason for difference from western studies. On evaluating, the association of maternal complications (puerperal sepsis, wound infection and chorioamnionitis) was found in women with prolonged rupture of membranes. In present study, maternal complications were eventually also associated with a significantly higher risk of NICU admission and neonatal complications. With respect to birth weight of baby – majority had birth weight <2.5 kg (63.8%). Low birth weight is an indicator of prematurity and is a characteristic outcome of pPROM as also evidenced in literature[22,23,24]. In present study, a total of 16/94 (10.6%) babies had birth weight <2 kg which is much lower than 35.2% as reported by Goya *et al.*[24]. However, this difference might be attributed to the difference in gestational age at onset of pPROM and delivery. Goya *et al.*[24] in their study had included women with a maximum gestational age of 34 weeks whereas in present study majority of women presented with a gestational age >34 weeks. Thus, the birth weight of babies could be inferred to be an indicator of gestational age. On subsequent analysis in present study, it was found that all the babies with birth weight <2kg were born to mothers who presented with a gestational age <34 weeks. In fact majority of babies born to mothers presenting with gestational age <34 weeks had birth weight <2 kg (51.9%) as compared to only 3% of those born in >34 weeks gestational age group, thus showing a significant association between gestational age and birth weight. Low birth weight in turn was also found to be significantly associated with foetal/neonatal survival. In present study, all the foetal/neonatal deaths took place in babies with birth weight <2.5 kg. Stewart *et al*. (2006)[25] in their study also found an association between birth weight and survival. In present study, almost one third (30/94; 31.9%) babies had Apgar score <7 at 1 min. Low Apgar score was significantly associated with lower gestational age, maternal complications as well as fetal/neonatal complications. These findings are in agreement with the findings reported in literature that show that low Apgar score has a significant association with PPROM and maternal complications[23,26] . Tanir *et al*. (2003)[27] in their study also showed a significant association between neonatal outcome and Apgar score. A significant association between fetal distress and low Apgar score at all gestational ages has also been shown by DeSouza *et al.* (1975)[28]. Fetal distress is an indicator of compromised status of fetus owing to prematurity or stress generated owing to pPROM and eventually has a bearing on the fetal well-being and survival too. NICU admission rate was quite high (45.7%) as observed in our study. This rate is higher than that reported by El-Din Mohamed *et al*.(2005)[18] (24%). However, this difference might be attributed to relatively lower average gestational age of patients in present study as compared to the referred study. Average neonatal hospital stay of 29.61 days has been reported in pPROM cases by Sephton *et al.* (2011)[29] thus indicating that neonates born after PPROM are susceptible to intensive hospital care even after birth. In present study, NICU admission was higher in <34 weeks group (72.7%) as compared to >34 weeks gestational age group (40.3%), it was also significantly associated with maternal complications, caesarean section and low Apgar score. All these findings establish a cause-effect relationship flowing vertically from mother to neonate and establishing a chain of events leading to poor outcome. Clinical neonatal sepsis rate in present study was 21.3%, thus indicating a higher neonatal sepsis rate. The reason for this could be choice of selecting the criteria for clinical neonatal sepsis. In present study we used the criteria proposed by Sankar *et al*.(2008)[30] that includes prolonged rupture of membranes (>24 hours) as the major risk, low birth weight and low APGAR as the minor risks. PPROM generally has presence of all these factors and hence rate of clinical sepsis might be higher. In a study by Borna *et al.* (2004)[31], no significant association between PPROM and sepsis rate was observed. Dars *et al*. (2014)[32] also reported a relatively lower rate of neonatal sepsis (12%). However, this difference might be owing to use of a different criteria for classification of neonatal sepsis. Culture positive criteria might also have a higher sepsis rate in neonates as indicated by Sephton *et al.* (2011)[29] who reported a culture positive sepsis rate of 26.7%. High sepsis rate is not unusual in pPROM cases as it is significantly associated with neonatal sepsis[33] .In present study, neonatal sepsis eventually was significantly associated with lower gestational age, maternal complications, fetal distress and survival. In a study by Akter *et al.* (2013)[6] , the collective rate of neonatal complications including sepsis was 42%. Neonatal sepsis is an outcome of maternal and fetal factors and in turn affects the neonatal survival too[2] . In present study, fetal/neonatal mortality rate was 12.8%. A perinatal mortality rate of 10.5% has also been reported by Furman *et al*. (2000) [22] in their series of pPROM pregnancies. thus indicating an association between gestational age and mortality. The mortality rate in pPROM is affected by presence of maternal/fetal complications, birth weight, neonatal sepsis, gestational age, latency period [14,25,34] . In present study we found that fetal/neonatal mortality was higher in cases with lower gestational age.

CONCLUSIONS

The findings of our study thus indicate that outcome in pPROM is affected by maternal and fetal complications.

Treatment of symptomatic and asymptomatic bacteriuria and lower genital tract infections in ante-natal period may help in reducing risk. The cases of pPROM should be observed and managed at hospitals with adequate neonatal intensive care facilities. With judicious use of antibiotics, expectant management with proper vigilance in these cases is possible and helps in reduction of pre-maturity related morbidity to baby with minimal compromise to maternal health. Use of ante-natal corticosteroids for fetal lung maturity in <34 weeks gestation helps in reduction of neonatal RDS.

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