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ARTICLE

Determinants of Premature Rupture of Membrane (PROM) and Feto-Maternal Outcome in a Tertiary Care Hospital of Bangladesh

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ABSTRACT

Background: Premature rupture of membranes (PROM) affects 4% to 10% of full-term pregnancies globally. PROM accounts for roughly one third of all preterm births. **Aim:** To find out the feto-maternal outcome of Premature Rupture of Membrane with it's risk factors. **Methods:** It was a hospital based prospective study conducted in the Department of Obstetrics and Gynecology in Dinajpur Medical College & Hospital, Dinajpur. Study participants were 50 admitted patients with Pre-mature Rupture of Membrane (PROM) in the Obstetrics and Gynecology Department. Data was collected by a checklist and structured Bangla questionnaire and analysis was done by using SPSS version 20. **Results:** Majority of PROM patients belonged to the age group 21-24 years which was 19 (38.0%). The mean (±SD) age of the patients was 26.04±5.2 years. A total of 35 (70.0%) patients delivered within 24 hours of rupture of membrane and 9 patients (56.2%) had past history of MR or abortion, 3 (18.8%) had history of PROM in previous pregnancy. A total of 23 (46.0%) cases had sexual contact within 1 week of rupture of membranes. E.Coli was the most common pathogen 5 (41.7%) associated with positive High vaginal Swab (HVS) culture. Majority of the patients 31 (62.0%) developed labour pain within 12 hours of PROM. Sixteen (32.0%) patients developed morbidity included puerperal sepsis, UTI, PPH, wound dehiscence, and retained placenta. APGAR score at 5 minutes was >7 in 30 (60%) babies. Out of 47 alive babies. 19 (40.4%) were affected by the consequences of PROM and birth process. Among them asphyxia was more common 7 (35%) than other morbidities. Total 10 of them required admission in neonatal ward and most of the morbidity of the newborn appeared within 1 to 3 days of delivery. **Conclusion:** Early identification and management of PROM can reduce negative feto-maternal outcomes.

Keywords: PROM, Feto-Maternal Outcome, Obstetrics and Gynecology

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INTRODUCTION

Premature rupture of membranes (PROM) refers to the breaking of the chorioamnionitis membrane before labor begins, affecting about 4% to 10% of full-term pregnancies globally [1]. It happens before 37 weeks which occurs in about 25% of cases [2,3]. About 70% of PROM cases happen at term, but over 50% can occur preterm in referral centers. PROM accounts for roughly one third of all preterm births [2,3]. In Bangladesh, studies reported, incidences of PROM is approximately 2-30% of all pregnancies and it accounts for 33% of preterm births

[4]. After membranes rupture, 46% of women experienced labor within 1 to 15 hours [5]. The latency period decreases as the pregnancy progresses, with 54% of deliveries occurring within 24 hours of rupture [6]. In a tertiary care facility in Bangladesh, 9.3% of expectant mothers experienced PROM, with a higher rate among younger women aged 21-25 years [7]. Many of these cases involved women from lower socioeconomic backgrounds, with one study showing that 66.66% of cases belonged to this group [8].

Some possible risk factors of PROM include infections in the uterus, cervix, or vagina, excess stretching of the amniotic sac due to too much fluid or multiple babies, cigarette smoking, previous cervical surgeries, history of PROM or preterm PROM in past pregnancies [9,10]. Women with PROM can face complications such as wound infections, lack of amniotic fluid, fever after childbirth, and infections of the membranes surrounding the baby [11]. Chorioamnionitis, an infection affecting the amniotic fluid, occurs in 1% to 5% of full-term pregnancies and can lead to severe complications and increased cesarean deliveries [12]. Newborns may also suffer from complications such as respiratory distress syndrome, jaundice, infections, and low birth weight [8,11]. One study found that 34% of newborns admitted to the NICU needed care mainly due to prematurity and its complications [8]. Managing PROM can sometimes lead to serious issues like heavy bleeding and infections, but some studies reported no maternal admissions to the ICU or deaths [13]. Management depends on gestational age, fetal condition, and symptoms of infection, with treatments including corticosteroids for lung development and antibiotics to prevent infections [14].

To manage PROM effectively, healthcare providers need to diagnose it early and offer personalized care. This may include administering antibiotics and steroids to reduce risks for both mother and baby [8]. Sometimes, physicians may attempt to delay delivery to prolong the pregnancy. However, this approach carries risks and must be done with close monitoring [11]. PROM is common in maternity wards, yet diagnosing, monitoring, and treating it presents challenges. There is limited research and no national statistics on its occurrence or complications in our country. This study aimed to explore maternal and neonatal outcomes of PROM and identify associated risk factors to enhance our understanding of its effects.

METHODS

Study design and participants

It was a hospital based prospective study conducted in the Department of Obstetrics and Gynecology in Dinajpur Medical College & Hospital, Dinajpur from July 2014 to December 2014. Study participants were the 50 admitted patients with Premature Rupture of Membrane (PROM) in Obstetrics and Gynecology Department of Dinajpur Medical College & Hospital. Both primigravid and multigravid women with PROM with pregnancy more than 28 weeks and history of spontaneous rupture of membrane before initiation of labour were included from a total of 98 patients with H/O of PROM of 1040 admitted pregnant women. Women who were suffering from antepartum haemorrhage (APH), pre-eclampsia, or eclampsia and history of rupture of membrane with established labour were excluded. Clinical profile of mother & neonate was recorded and data was collected by face-to-face interview with a structured questionnaire.

Study Procedure

After admission, detailed history of presenting complaints including duration of pregnancy, duration of rupture of membrane, lower abdominal pain, past history of rupture of membrane, past obstetric history were taken. Gestational age was determined from first date of the last menstrual period (LMP), early ultrasonographic study, clinical examinations and previous antenatal records. Moreover, socio-economic condition and special records e.g. coital habit, previous MR, D&C also were documented. After taking the history general and per-abdominal examination was done for every patient. Then a sterile per speculum examination was done to assess cervical condition and stage of labour, Relevant investigations were also done to confirm diagnosis, management strategy was selected and other possibilities were excluded. All the clinical and laboratory findings were recorded in the case record sheet.

High vaginal swab was taken from all patients findings when per speculum examination was done and was sent for culture and sensitivity. On admission blood

sample was sent for leukocyte count (both the Total Count and Differential Count) for every patient.

Diagnosis of chorioamnionitis was based on the presence of maternal fever (100.4^0 F / 38.7^0C). Patients were monitored 4 hourly to look for signs and symptoms of chorioamnionitis and fetal distress. White blood cell counts were performed daily. If any sign of infection or foetal distress hourly developed, conservative approach was abandoned and delivery was done. After delivery all neonates were examined by a Paediatrician. Neonates with complications were admitted in the Paediatric department for better management. Maternal and foetal conditions were assessed by daily follow up of mother and neonate till their discharge from the hospital.

Method of data processing and statistical analysis

All data were checked for inconsistencies before coding and analysis using SPSS version 20. Descriptive statistics included mean, median, standard deviation for numerical data, and frequencies for categorical data. A chi-square test assessed associations among categorical variables. At 95% confidence level, $p < 0.05$ was considered significant. Ethical standards were maintained, informed written consent of each participant was taken and clearance was obtained from the ERC of Dinajpur Medical College & Hospital, Dinajpur.

RESULTS

Table 1: Socio-demographic Characteristics of Patients (n=50)

Attributes	Number of Patients	Percentage (%)
Age (years)		
<20	12	24.0
21-24	19	38.0
25-29	10	20.0
30-34	7	14.0
>35	2	4.0
Mean (±SD)	26.04 ± 5.2	
Education		
Illiterate	21	42.0
Primary level	13	26.0
High School	8	16.0
SSC level	5	10.0
HSC level	3	6.0
Occupation		
Housewife	46	92.0
Service	4	8.0
Monthly Income (Tk)		
Low income	36	72.0
Low-middle	10	20.0
Middle	4	8.0
Gravida		
Primi	30	60.0
2nd	9	18.0
3rd	7	14.0
4th	2	4.0
≥5th	2	4.0
Diagnosed PROM Patients According to Gestational Age		
Term PROM	27	54.0

Preterm PROM	23	46.0

Table 1 states that 27 (54.0%) were term and 23 (46.0%) were preterm PROM. Majority of patients were primi 30 (60.0%) age of patients ranged between ≤20 and ≥35 years. Most of the study patients were illiterate.

Table 2: Distribution of Past History of Patients

Attributes	Number of Patients	Percentage (%)
History of MR (n=16)		
One	4	25.0
Two	1	6.2
H/O Abortion (n=16)		
One	3	18.8
Two	1	6.2
Perinatal Death	4	25.0
PROM in Previous Pregnancy	3	18.8
Time of Last Sexual Contact Duration (hours) (n=50)		
<48 hours	3	6.0
48 hours to 1 week	20	40.0
1 week to 1 month	15	30.0
>1 month	12	24.0
Mean ± SD	13.4 ± 9.7 (1-42)	
Associated Diseases (n=50)		
Urinary tract infection (UTI)	23	46.0
Lower genital tract infection	8	16.0
Sexually transmitted disease (STD)	3	6.0
Without any associated diseases	16	32.0

Table 2 shows 9 patients (56.2%) had past history of MR or abortion. History of PROM in previous pregnancy was in 3 (18.8%) cases. A total of 23 (46.0%) cases had sexual contact within 1 week of rupture of membranes. The mean time of last sexual contact was 13.4±9.7 hours. About 34 (68%) patients had associated with some sort of maternal illness. Among them 23 (46%) had urinary tract infection (UTI).

Table 3: Organisms Associated with Positive High Vaginal Swab (HVS) Culture

Attributes	Number of Patients	Percentage (%)
Growth (n=50)		
Negative	38	76.0
Positive	12	24.0
Bacteria (n=12)		
Escherichia coli	5	41.7
Staphylococcus	3	25.0
Klebsiella	1	8.3
Proteus	1	8.3
E. Coli + Staphylococcus	2	16.7
Interval Between PROM Onset and Labour Pain (n=50)		

Latent Period (hours)		
6	13	26.0
7-12	18	36.0
13-24	6	12.0
25-48	4	8.0
49-72	3	6.0
>72	2	4.0
No pain	4	8.0
Duration Between PROM and Delivery (Hours) (n=50)		
<12	15	30.0
12-24	20	40.0
25-48	10	20.0
>48	5	10.0

Table 3 shows that 12 (24%) patient had positive high vaginal Swab (HVS) culture. E.Coli was the most common pathogen 5 (41.7%) with positive high vaginal Swab (HVS) culture. Majority of the patients 31 (62.0%) developed labour pain within 12 hours of PROM and only 2 (4.0%) developed labour pain after 72 hours followed by 4 (8.0%) cases had no labour pain.

Table 4: Distribution of Mode of Onset of Labour and Delivery (n=50)

Attributes	**Spontaneous Labour (n=29)**	**Induced/Augmented Labour (n=21)**	**P-Value**
	n	**%**	**n**
Gravida			
Primi	10 (34.5)	20 (95.2)	
Multi	19 (65.5)	1 (4.8)	0.010*
Mode of Delivery	**NVD (n=24)**	**C/S (n=26)**	
Primi	10 (20.0)	20 (40.0)	0.108
Multi	14 (28.0)	6 (12.0)	

Note: p-value* = Significant as determined by the chi-square test.

Table 4 shows that mode of onset of labour was spontaneous in 29 (58.0%) patient, out of which 10 (34.5%) were primi and 19 (65.5%) cases were multi. Induction/ Augmentation was done in 21 (42.0%) cases- among them 20 (95.2%) were primi and only 1(4.8%) was multigravid patient. The difference was statistically significant ($p<0.05$) between two groups. NVD took place in 24 (48.0%) cases and 26 (52.0%) cases were delivered by C/S with a higher rate among primi patients which was 20 (40.0%).

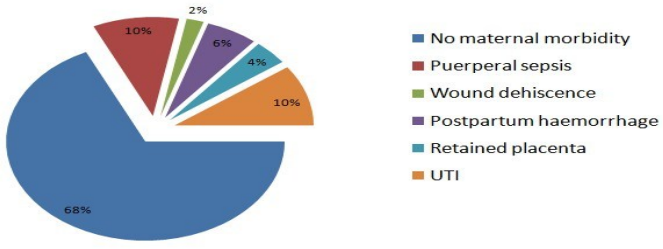

Figure 1: Distribution of maternal morbidity (n=50)

Figure 1 shows that 16 (32.0%) patients developed morbidity among them 5 (10.0%) patients developed puerperal sepsis, 5 (10.0%) developed UTI, PPH in 3 (6.0%) patient, wound dehiscence in 1 (2.0%) and retained placenta in 2 (4.0%) patients. There was no maternal death.

Table 5: Distribution of Foetal Outcome

Attributes	**Number of Patients**	**Percentage (%)**
APGAR Score at 5 Minutes (n=50)		
>7	30	60.0
5-7	15	30.0
<5	2	4.0
0	3	6.0
Mean ± SD	7.8 ± 0.5 (4-9)	
Weight (kg) (n=47, excluding 3 stillbirths)		
>2.5	30	63.8
1.5-2.5	16	34.0
1.0-1.5	1	2.2
Mean ± SD	2.7 ± 0.4 (1.0-3.3)	
Neonatal Outcome (n=47, excluding 3 stillbirths)		
No morbidity	28	59.6
Morbidity	19	40.4
Conservative Treatment / Admission		
Condition	**Conservative (%)**	**Admission (%)**
Asphyxia (7 cases)	5 (25.0)	2 (10.0)
RTI (3 cases)	1 (5.0)	2 (10.0)
Jaundice (5 cases)	3 (18.0)	2 (12.0)
Neonatal sepsis (4 cases)	0 (0.0)	4 (20.0)
Appearance of Complications (Duration) (n=19)		
Asphyxia		
Within 1 hour	5	26.31
Within 5 hours	2	10.52
RTI		
1-3 days	2	10.52
3-5 days	1	5.26
Jaundice		
Within 24 hours	1	5.26
2-3 days	3	15.78
4-5 days	1	5.26
Neonatal Sepsis		
3-4 days	3	15.78
4-5 days	1	5.26

Table 5 shows that APGAR score at 5 minutes was >7 in 30 (60%). The mean APGAR score was 7.8±0.5 with range from 4 to 9. 30 (63.8%) babies had birth weight >2.5 kg. The mean weight (kg) was 2.7±0.4 kg with range from 1 .0 to 3.3 kg. out of 47 alive babies- 19 (40.4%) were affected by the consequences of PROM and birth process. Among them asphyxia was more common 7 (35%) than other morbidity. Total 10 of them required admission in neonatal ward and most of the morbidity of the newborn appear within 1 to 3 days.

DISCUSSION

In this research, the majority of cases of PROM were found in people aged 21 to 24 years, making up 38% of the total. The average age was 26.04 years ranging from 15 to 39 years. Other studies showed similar results, with 53% of PROM cases occurring in the younger group aged 20 to 24 years [15]. One survey found that most cases were in the 20 to 29 years age group, accounting for 63 percents [16]. A study from Dhaka Medical College Hospital reported an average age of 27.24 years, with a range of 15 to 40 years [17]. In this research, most of the women were first-time mothers (60%). Similar study frequently observed this condition in first-time pregnancies, accounting for 61.8% [15]. Premature rupture of membranes (PROM) mostly occurs in first-time pregnancies, with a rate of 50.45% [1]. In our study, 27 cases (54.0%) were classified as term pregnancies, while 23 cases (46.0%) were identified as preterm PROM. Socioeconomic status is reflected through the education of mothers, occupation and monthly income of the family. Majority (42%) of the patients was illiterate and 26% had education level of primary or below.

A study resulted that 60-80% of PROM cases occur in term pregnancies, while 20-40% occur before 37 weeks of pregnancy [18]. Term PROM was more common at 69.2%, compared to preterm PROM at 30.8% [15]. In this investigation at DjMCH, 54% of PROM cases occurred in term pregnancies, while 40% in preterm pregnancies. This differs from findings in a study done at Dhaka Medical College Hospital [17]. A bad obstetric history, which includes experiences like miscarriage, abortion, perinatal death, and PROM in previous pregnancies, increases the risk of PROM in future pregnancies. Among the cases studied, 56.2% had a history of miscarriage or abortion, and 18.8% had experienced PROM in earlier pregnancies. Previous research showed that having an abortion (AOR = 3.7), a history of cesarean delivery (AOR = 3.46), and a past occurrence of PROM (AOR = 4.77) are linked to a higher risk of experiencing PROM again [1]. Nearly half (46%) of the women had sexual activity within the week before their water broke in the present study. The average time since their last sexual encounter was about 13.4 hours, with a range from 1 to 42 days. In this study, lower genital tract infections, urinary tract infections (UTIs), and sexually transmitted diseases (STDs) caused PROM in 34 cases, which is 68%. This number is close to what another study found, that was 72% [17].

Cervico-vaginal infections are the most common cause of PROM. In this study, the rate of positive aerobic High Vaginal Swab (HVS) cultures was 24%. Patients with microbial invasion of the amniotic cavity are more likely to develop clinical chorioamnionitis, endometritis, and neonatal sepsis compared to those with negative amniotic fluid cultures [17]. Escherichia coli was the most common pathogen, found in 5 cases (41.7%) linked to positive HVS cultures. Various studies have shown that the prevalence of microbial invasion of the amniotic cavity in patients with term PROM was 34.4% and 23.2%, respectively [6]. The risk of the infection after PROM is influenced by the number of vaginal examinations, potential pathogens present in the vaginal flora and antibacterial activity of the amniotic fluid. Most of the patients (54%) with term pregnancy and PROM went to labour spontaneously within 24 hours [20]. In this study onset of labour was spontaneous in 29 cases (58%); 31 patients (62%) developed labour pain within 12 hours of rupture of membranes and 4 patients (8%) had no labour pain at all.

In this research, 35 patients (70%) gave birth within 24 hours after labor started. Among them, 24 patients (48%) had a normal vaginal delivery, while 26 patients (52%) had a cesarean section. Another study showed that the cesarean section rate was 43.7%, with vaginal deliveries making up 56.3% [21]. First-time mothers had a higher cesarean section rate of 40%. This research indicates that 32% of mothers experienced health issues after childbirth, with puerperal sepsis being the most common at 10%. This rate exceeds the 5.92% reported in a study of 152 patients with premature rupture of membranes (PROM) [22]. Multiparous women had more cases of chorioamnionitis than primiparous mothers, possibly due to bacteria from previous deliveries infecting the fetal membranes. Furthermore, a higher number of operative deliveries was associated with increased infection risk post-birth [18]. Associated infections were observed include urinary tract infections (10%), postpartum hemorrhage (6%), and retained placenta (4%).

Stillbirth occurred in 3 cases, which is 6%. All these infants were born to mothers who had been pregnant before. During the hospital stay, there were no deaths among the newborns that we studied. We could monitor the babies delivered by Caesarean section during their hospital stay. In this study, 30 babies, or 63.8%, scored higher than 7 on the APGAR test at 5 minutes after birth. The average birth weight was 2.7 kg, plus or minus 0.4 kg. Most importantly, perinatal health issues in 40.4% of the cases, with asphyxia were recorded as the most common problem at 35%. In comparison, a study showed a lower rate of 10.53% for PROM patients [21]. Most cases of health problems in newborns were seen in the first three days after birth. This study noted a 6% rate of perinatal mortality, while another study reported a rate of 20% [22]. Small sample size might affect the findings.

Limitations

The sample size was small due to time limitations and resource availability. The duration of the study was short, and the scope of investigations was restricted. Gestational age was primarily established through patient history, clinical assessments, and ultrasound records, which were not available for all cases. Patients could only be followed up during their hospital stay; once discharged, practical follow-up was not feasible. Additionally, the follow-up period after normal vaginal delivery was too short due to the early discharge of patients resulting from a shortage of hospital beds.

CONCLUSION

Early identification and management can mitigate negative outcomes of PROM. This research revealed the significance of risk factors and the necessity for personalized care to enhance health outcome for mothers and infants in Bangladesh's tertiary healthcare facilities. Key risk factors include sexual intercourse, maternal health issues like urinary tract and sexually transmitted infections, and previous obstetric history such as past PROM and preterm labor were recorded. Further randomized controlled trials with larger samples are needed for more definitive conclusions.

Declarations

Ethics approval and consent to participate

Before data collection, all ethical issues were maintained.

Consent for publication

All authors have approved this manuscript for publication.

Availability of data and materials

The datasets supporting the conclusions of this article are included within the article generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MSA, SS, SH participated in the design of the study, data interpretation and drafted the manuscript. MSA, MFA contributed to the data design, data interpretation and data analysis and critical review of the manuscript. All authors read and approved the final manuscript.

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