Original Article

Clinical Assessment of Risk Factors for the Development of Premature Rupture of Membranes (PROM) at a Tertiary Care Hospital in Bangladesh

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Abstract

Background: Premature Rupture of Membranes (PROM) continues to be an important obstetric problem because of its links with increased maternal and neonatal complications. Identifying factors that predispose women to PROM is crucial, especially in low-resource settings where timely prevention and management can make a significant difference. This study examines the clinical and demographic factors associated with PROM among pregnant women attending a tertiary hospital in Bangladesh.

Objective: The study aimed to assess the major risk factors related to PROM. More specifically, it sought to compare nutritional status, genital tract infections, and past reproductive history between women presenting with PROM and those with intact membranes.

Methods: This case-control study was carried out at Dhaka Medical College Hospital. 75 women diagnosed with PROM were included as cases, and an equal number of pregnant women without PROM served as controls. Information was gathered using structured interviews, clinical assessments, and review of hospital records. Statistical tests were used to determine the significance of associations between various potential risk factors and PROM.

Result: Several factors showed a significant association with PROM, including maternal illiteracy, a past history of abortion, previous PROM, low body mass index, malnutrition, and lower genital tract infections. Conversely, maternal age, occupation, and having regular antenatal check-ups did not show statistically meaningful relationships with PROM in this study group. These results point to the influence of largely preventable or manageable factors.

Conclusion: The study underscores the importance of addressing malnutrition, reproductive health education, and early detection of genital infections to reduce the risk of PROM. Recognizing these risk factors early and intervening appropriately may help improve maternal and neonatal outcomes in similar healthcare settings.

Keywords: Premature Rupture of Membranes (PROM); Genital Tract Infections; Malnutrition; Case-Control Study.

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Introduction

Premature rupture of membranes (PROM) stands as a common complication encountered during pregnancy.[1] Spontaneous rupture of the fetal membranes typically occurs during the active phase of labour, but when this happens earlier than usual, it becomes problematic.[1,2] Prelabour rupture of membranes refers to spontaneous membrane rupture beyond the 28th week of pregnancy but before the onset of labour.[2] PROM occurring beyond 37 completed weeks but before labour onset is termed term PROM, affecting approximately 6 to 10 percent of all births.[2,3] Preterm PROM occurs before 37 completed

weeks, affecting about one percent of all pregnancies, and is linked to 30 to 40 percent of preterm births, making it a key cause of prenatal death.[1]

The precise etiology of PROM remains largely unknown, though possible causes involve either a reduction in membrane strength, an increase in intrauterine pressure, or a combination of both.[2,4] Evidence suggests an association between upper genital tract infections and PROM, potentially acting through the ascension of organisms from the placenta and deciduas.[4,5] Organisms found in the vaginal flora, such as Group B *streptococci* and *Staphylococcus aureus*, may degrade collagen and weaken the fetal membranes.[5] Clinically identified risk factors include low socio-economic status, malnutrition, high parity, recurrent genito-urinary infections, and anemia.[5,6]

PROM contributes significantly to perinatal morbidity and mortality, often requiring increased operative procedures.[4,7] While developed countries have seen considerable research into PROM, studies focusing on this subject remain limited in the study's location.8 PROM is frequently observed in local obstetric wards. Therefore, a proper evaluation of associated risk factors, alongside appropriate diagnostic facilities and adherence to a standard management protocol, is essential for improving maternal and fetal outcomes.[6] The purpose of this case-control study was to evaluate and correlate the risk factors for PROM in women presenting at a tertiary care hospital.[6,9] The findings from this hospital-based assessment will subsequently inform the need for larger studies on the general population to fully ascertain the factors influencing PROM development.[1]

Materials and Methods

This case–control study was conducted at Dhaka Medical College Hospital from January 2009 to June 2010 and included 150 pregnant women-75 with PROM before labour (Group A) and 75 matched controls with intact membranes (Group B). Cases were over 31 weeks' gestation, had PROM confirmed on speculum exam, and had cervical dilation under 3 cm. Women already in labour, with malpresentation, severe pre-eclampsia/ eclampsia, or PROM with antepartum hemorrhage were excluded. Data were collected through a structured questionnaire. Gestational age was determined from menstrual history, antenatal records, clinical exam, and ultrasound. PROM was confirmed by observing amniotic fluid pooling or ultrasound signs of low fluid. All participants underwent high vaginal swab culture, blood tests (CBC, blood group, RBS, CRP, HBsAg, VDRL), and urine analysis and culture. Data were analyzed with SPSS, using a significance level of $p < 0.05$. Tests for Ureaplasma Urealyticum, Mycoplasma, and Chlamydia were not done due to limited lab facilities.

Result

Univariate analysis showed several risk factors significantly associated with PROM, including illiteracy, previous history of abortion and PROM, vaginal bleeding in the first trimester, lower genital tract infection, malnutrition, and leucocytosis. Factors not found to be statistically significant included age, occupation, regular or irregular antenatal care (ANC), and C-reactive protein (CRP).

Although age was not a significant risk factor overall, pregnant women with PROM were more common in the extreme age groups (15–25 years and 30–39 years). Gestational age was significantly associated with PROM, with patients in the 34–37 weeks group showing a significantly higher incidence of PROM than controls (Figure 1).

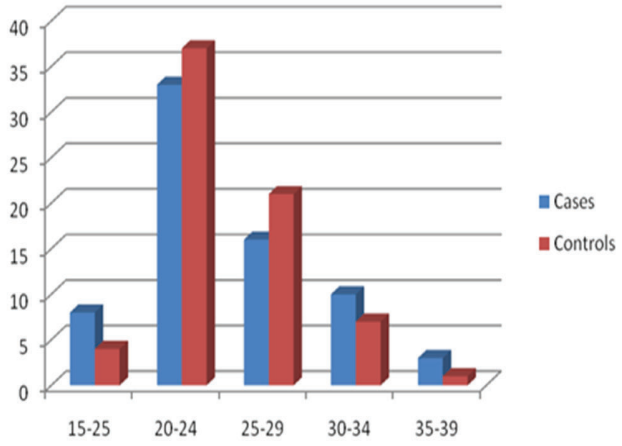

Figure 1: Age Distribution of Cases and Controls

The table shows that maternal educational level differed significantly between Group A and Group B ($p = 0.016$). Illiteracy was more common in Group A, 8 (10.7%), than in Group B, 1 (1.3%). Similarly, a higher proportion of mothers in Group B had higher secondary education or

above 24 (32.0%) compared with Group A 14 (18.7%). Most mothers in both groups had secondary-level education 43 (57.3%) in Group A and 41 (54.7%) in Group B.

Table 1: Educational Level of Mothers

Education	Group A No (%)	Group B No (%)	p-value
Illiterate	8 (10.7)	1 (1.3)	
Primary	10 (13.3)	9 (12.0)	0.016*
Secondary	43 (57.3)	41 (54.7)	
Higher secondary or above	14 (18.7)	24 (32.0)	

*Significant on Chi-square test; Group A= cases (75); Group B = controls (75)

Past obstetric history differed significantly between groups (p=0.002), with "no abnormality" more frequent in Group B. Reported category totals are below 75 in both groups; the test therefore uses the available counts shown in the table.

Table 2: Past Obstetric History

History	Group A No (%)	Group B No (%)	p-value
MR	2 (2.67)	6 (8.00)	
Abortion	12 (16.00)	3 (4.00)	
PROM in previous pregnancy	20 (26.66)	10 (13.33)	0.002*
Preterm delivery	11 (14.67)	6 (8.00)	
No abnormality	30 (40.00)	50 (66.67)	

*Statistically significant at p<0.05. Group A=cases; Group B=controls.

Pearson Chi-square test (4×2) was applied to the reported category counts.

For anaemia severity, a Fisher–Freeman–Halton exact test was used because of sparse cells; the overall distribution was not significant (p=0.065). Pearson Chi-square tests were used for binary features with adequate expected counts, and Fisher's exact test for sexually transmitted disease. Only malnutrition showed a clear significant group difference (p<0.001).

Table 3: Distribution of the Clinical Features

Clinical features	Group A n (%)	Group B n (%)	p-value
Anaemia			0.065
Mild	20 (26.7)	29 (38.7)	
Moderate	19 (25.3)	8 (10.7)	
Severe	2 (2.7)	1 (1.3)	
Absent	34 (45.3)	37 (49.3)	
Hypertension	11 (14.7)	9 (12.0)	0.631
Respiratory disease (Chronic bronchitis)	27 (36.0)	20 (26.7)	0.218
UTI	25 (33.3)	22 (29.3)	0.597
Lower genital tract infection	43 (57.3)	31 (41.3)	0.050
Malnutrition	42 (56.0)	19 (25.3)	<0.001*
Sexually transmitted disease	1 (1.33)	0 (0)	1.000

*Statistically significant at p<0.05. Group A=cases; Group B=controls.

Positive versus negative culture was compared by Pearson Chi-square test and differed significantly between groups (p<0.001). Organism-specific comparisons used Pearson Chi-square when expected counts were adequate and Fisher's Exact test for sparse/zero cells; only Escherichia coli reached p<0.05.

Table 4: High Vaginal Swab Culture

	Group A No (%)	Group B No (%)	p-value
Growth			<0.001*
Negative	47 (62.7)	65 (86.7)	
Positive	28 (37.3)	10 (13.3)	
Escherichia coli	13 (17.3)	5 (6.7)	0.044*
Staphylococcus	4 (5.3)	0 (0)	0.120
Klebsiella	4 (5.3)	0 (0)	0.120
Pseudomonas	6 (8.0)	5 (6.7)	0.754

*Statistically significant at p<0.05. Group A=cases; Group B=controls.

Leucocyte category differed significantly between groups (Pearson Chi-square, p=<0.001). CRP categories were compared using a Fisher–Freeman–Halton exact test because of a sparse middle category and showed no significant difference (p=0.489).

Table 5: Leucocyte Count & CRP Count

Variables	Group A No (%)	Group B No (%)	p-value
Leucocyte count (n=75)			<0.001*
WBC < 10,000	12 (16.0)	36 (48.0)	
WBC > 11,000	63 (84.0)	38 (50.7)	
CRP (n=75)			0.489
Within normal (within 6 mg/dl)	31 (41.3)	37 (49.3)	
Medium increase (6.7-9 mg/dl)	1 (1.3)	2 (2.6)	
Highly increase (>10 mg/dl)	43 (57.3)	36 (48.0)	

*Statistically significant at p<0.05. Group A=cases; Group B=controls.

Discussion

PROM is recognized as a significant obstetric event that may lead to maternal complications, increased operative procedures, and potentially high perinatal morbidity and mortality. Appropriate management requires careful consideration of gestational age, infection status, and the availability of neonatal intensive care.[7]

This study aimed to contribute to the limited literature available in the local context by comparing risk factors in PROM cases against controls.[8] The setting was a tertiary care hospital, a necessity because the true incidence of PROM in the study country is difficult to estimate from hospital data alone, given that an estimated 80 percent of deliveries occur at home.[8,10]

Key findings highlighted the demographic and historical factors associated with PROM. The study confirmed that illiteracy was significantly associated with PROM, suggesting that female education may influence awareness and the timely seeking of medical care.[11,12] The recurrence rate of PROM in a prior pregnancy (26.66%) reinforces that prior PROM is an identified risk factor.[13,14] Consistent with other research, previous abortion history (16%) and preterm delivery history (14.67%) were also identified, highlighting the vulnerability of women with adverse past obstetric histories.[15]

Regarding clinical and nutritional status, low Body Mass Index (BMI) was associated with PROM, confirming findings similar to a study.[16] Furthermore, malnutrition was significantly associated, and the increased prevalence of moderate anemia in cases further supports the role of poor maternal nutritional status.

Infection played a major role; 57.3% of cases had lower genital tract infection, and 37.3% of cases showed positive HVS culture, which was a significant difference compared to controls.[17,18] The identification of *Staphylococcus*, *Klebsiella*, and *Pseudomonas* in HVS cultures as significant factors aligns with the hypothesis that organisms can degrade fetal membranes.[5] The limitation regarding testing for *U. urealyticum*, *Mycoplasma*, and *Chlamydia* means the total infectious burden may be underestimated.[19]

The study showed a significant association between first trimester vaginal bleeding and PROM, a finding supported by other studies.[20,14] While leucocytosis was significantly higher in PROM patients (82.7%), suggesting infection, CRP levels - often used to predict infection development - did not show a significant difference.[21,22]

Conclusion

PROM is a serious maternal complication requiring urgent attention and standardized management. The study successfully identified multiple factors significantly associated with increased risk for PROM, including illiteracy, previous history of abortion or PROM, malnutrition, specific gestational ages (near term), and positive high vaginal cultures. Early identification and management of these predisposing factors are essential steps toward preventing subsequent maternal and fetal complications and promoting healthy pregnancy outcomes.

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