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Original Research Article

PATTERN OF VAGINAL FLORA IN PATIENTS WITH PRETERM PREMATURE RUPTURE OF MEMBRANES

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ABSTRACT

Background: Preterm premature rupture of membranes (PPROM) is the spontaneous rupture of the foetal membranes before 37 completed weeks and the onset of labour. It is responsible for 40% of all preterm births and is associated with a high perinatal mortality rate of 60-80%. Thus, it is important to diagnose the correct causative organism and aim for targeted therapy. **Aims and objectives:** To study vaginal flora pattern in patients with presenting preterm premature rupture of membrane and study most common microorganism responsible for bacterial vaginosis.
Materials and Methods: A hospital-based cross-sectional observational study on 73 clinically diagnosed cases of preterm premature rupture of membranes, the GMCH Department of Obstetrics and Gynaecology was conducted after written consent. Detailed history, examination, high vaginal swab and relevant investigations was done and recorded.
Result: In the High Vaginal Swab Culture, Normal flora was seen in 67(91.8%) cases, E. coli was seen in 4(5.5%) cases, and in each 1 case, Klebsiella species and S. aureus were seen. It was observed that a positive high vaginal swab was statistically significantly associated with maternal complications. Higher level of CRP >5 mg/L was associated with higher maternal (p=0.018) and neonatal (p=0.18) complications. A positive growth was statistically significantly associated with a higher level of CRP >5 mg/L (p = 0.005).
Conclusion: The most common isolate in our study was E. coli. We observed positive high vaginal swab is associated with high CRP levels.
Keywords: Vaginal Flora, Preterm Premature Rupture of Membranes.

INTRODUCTION

Preterm premature rupture of membranes (PPROM) refers to the rupture of amniotic membranes before 37 weeks of gestation and before the onset of labour.[1] It occurs in 3% of all pregnancies and is implicated in 30–40% of preterm deliveries.[2,3] PPROM increases the risk of maternal infections such as chorioamnionitis and neonatal complications like sepsis, respiratory distress syndrome (RDS), and perinatal mortality.[4-6]
The etiopathogenesis of PPROM is multifactorial, with ascending infections from altered vaginal microbiota being a key contributor.[7,8] The indigenous vaginal microbiota, dominated by Lactobacillus species, acts as a protective barrier.[9] However, disruption of this flora, especially colonisation by E. coli, Klebsiella, or Staphylococcus aureus, can compromise the fetal membranes, leading to their premature rupture.[7]
This study was undertaken to analyse the microbial profile in PPROM and assess its association with inflammatory markers and clinical outcomes.

MATERIALS AND METHODS

This was a hospital-based cross-sectional study conducted in the Department of Obstetrics and Gynaecology at Gauhati Medical College and Hospital from December 2023 to December 2024.
A total of 73 women aged 20–45 years with singleton pregnancies between 28 and <37 weeks of gestation and clinically diagnosed with PPROM were included. Women with systemic illnesses, recent antibiotic use,

or fetal anomalies were excluded. After obtaining informed consent, detailed histories were recorded. General and obstetric examinations were performed. High vaginal swabs were collected from the posterior fornix using sterile technique and sent for gram staining and culture. A midstream urine sample was also collected. Blood samples were tested for complete blood count and C-reactive protein (CRP). Samples were processed using blood agar, MacConkey agar, chocolate agar, and Sabouraud dextrose agar. Organisms were identified by Gram staining, colony morphology, and biochemical tests.
Data on maternal age, socioeconomic status (based on Modified Kuppuswamy Scale), booking status, parity, gestational age at PPROM, and laboratory parameters (CRP, TLC, swab culture) were collected.
Statistical Analysis: Data were analysed using chi-square and Fisher's exact test. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 73 antenatal patients diagnosed with preterm premature rupture of membranes (PPROM) were included in this cross-sectional study. Table 1 shows the demographics of the patients. The largest proportion of patients (n = 29; 39.7%) was in the 21–25-year age group. These results indicate a higher prevalence of PPROM in women of early reproductive age. The majority of patients belonged to the lower socioeconomic classes, with 50.7% (n=37) in Class V (lower class). This socioeconomic distribution suggests a potential link between lower income levels and increased risk of PPROM.
As shown in Table 1, a striking 80.8% (n = 59) of patients were unbooked, having not received adequate antenatal care or presented without prior visits. Only 19.2% (n=14) were booked, highlighting a major gap in antenatal service utilisation among patients with PPROM.
The majority of patients (n=43; 58.9%) presented with PPROM between 34 and 36 weeks of gestation, and the mean gestational age was 33.9 ± 2.4 weeks. Multigravidas accounted for 68.5% of the cases.
In the High Vaginal Swab Culture, Normal flora was seen in 67(91.8%) cases, E. coli was seen in 4(5.5%) cases, and in each 1 case, Klebsiella species and S. aureus were seen. Table 2. It was observed that a positive high vaginal swab was statistically significantly associated with maternal complications with p values of 0.006. Table 3
High CRP levels >5 (mg/L) was seen in 33(45.2%) cases. Higher level of CRP >5 mg/L was statistically significantly associated with maternal complications, with p values of 0.018. The cases with >5 mg/L CRP, 20(60.60%) cases had neonatal complications, and 13(39.4%) cases did not have complications. However, no significant correlation was observed with a P value of 0.184.
In our study, all 6(100.00%) cases who had positive growth on high vaginal swab culture had >5 mg/ml CRP. From this analysis, it was observed that positive growth was statistically significantly associated with a higher level of CRP >5 mg/L with p values 0.005.

Table 1: Demographics of study population

		Frequency	Percent
Age grading (years)	≤20	7	9.6
	21-25	29	39.7
	26-30	16	21.9
	>30	21	28.8
Socioeconomic status	III (Lower middle)	9	12.3
	IV (Upper lower)	27	37
	V (Lower)	37	50.7
Booked/Unbooked	Booked	14	19.2
	Unbooked	59	80.8
Parity	Primigravida	23	31.5
	Multigravida	50	68.5
Gestational age grading	28-<32 weeks	13	17.8
	32-<34 weeks	17	23.3
	34-36 weeks	43	58.9
Previous h/o PPROM	Yes	35	47.9
	No	38	52.1

Table 2: Microbiology and Lab results

		Frequency	Percent
High Vaginal Swab Culture	E. coli	4	5.5
	Klebsiella species	1	1.4
	S. aureus	1	1.4
	Normal flora	67	91.8

Urine Culture	E. coli	4	5.5
	K. pneumoniae	1	1.4
	No growth	68	93.2
Leukocytes	Normal	34	46.6
	Raised	39	53.4
CRP (mg/L) grading	≤5	40	54.8
	>5	33	45.2

Table 3: Correlation between Maternal Complications and CRP levels and High Vaginal Swab Culture

High Vaginal Swab Culture	Maternal Complications		Total	P value
	Yes	No		
Positive growth	4(66.7%)	2(33.3%)	6(8.20%)	**0.006**
No growth	12(17.9%)	55(82.1%)	67(91.80%)	
CRP (mg/L) grading	High Vaginal Swab Culture			
	Positive growth	**No growth**		
≤5	0(0.00%)	40(59.70%)	40(54.80%)	**0.005**
>5	6(100.00%)	27(40.30%)	33(45.20%)	

DISCUSSION

PPROM remains a critical obstetric challenge, contributing significantly to prematurity and its associated complications. The demographic profile in our study showed the majority of patients were aged 21–25 years, consistent with previous findings by Akter et al. and Rani et al., indicating this age group as the most active reproductive window.[10,11]

Socioeconomic disparities were evident, with more than half of the participants belonging to the lower class. This mirrors the observations of Pandey et al. and Not et al., who linked low socioeconomic status with higher risk of PPROM due to malnutrition, infections, poor hygiene, and limited access to prenatal care.[12,13] Alarmingly, 80.8% of patients were unbooked, lacking adequate antenatal follow-up. Studies by Mohokar et al. and Patil et al. corroborate this, identifying unbooked status as a strong predictor of adverse outcomes, including infection and maternal sepsis.[14,15]

In terms of microbial findings, the predominance of E. coli (5.5%) aligns with previous Indian studies by Rani et al. and Mangtani et al., which highlighted E. coli and S. aureus as the common isolates in PPROM cases.[7,11] However, our study had a comparatively lower rate of pathogenic isolation (8.2%), suggesting that subclinical infections may play a subtle yet significant role in membrane weakening.

Importantly, a statistically significant association was observed between CRP levels >5 mg/L and positive culture results ($p = 0.005$). This finding is consistent with Sujata et al., who demonstrated that CRP is a sensitive marker for intrauterine infection, particularly chorioamnionitis.[16]

Our study further revealed that maternal complications were more prevalent in those with positive cultures ($p = 0.006$), and elevated CRP was significantly associated with maternal morbidity ($p = 0.018$). This underscores the need for early microbial screening and CRP measurement in PPROM patients to anticipate complications and guide management.

Despite the high rate of neonatal admissions (61.6%), no statistically significant association was observed between positive vaginal cultures and neonatal complications. However, 83.3% of neonates born to mothers with positive cultures had complications, indicating a possible clinical trend, even if not statistically significant.

CONCLUSION

The findings from this study reinforce the role of pathogenic vaginal flora, particularly E. coli, in a subset of PPROM cases. The strong association of positive culture results with raised CRP levels and maternal complications highlights the need for vigilant monitoring of inflammation markers and early microbiological testing. Interventions focused on antenatal care access and early diagnosis can significantly improve maternal and neonatal outcomes in PPROM.

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