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Original Research Article

Vaginal Microflora in High Vaginal Swab in Preterm Prelabour Rupture of Membranes (PPROM): A Prospective Observational Study

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Abstract:

Background: Preterm prelabour rupture of membranes (PPROM) is a major contributor to preterm birth and neonatal morbidity. Ascending genital tract infections and altered vaginal microflora are strongly implicated in its pathogenesis.

Objective: To evaluate the pattern of vaginal microflora in women with PPROM and its association with maternal and neonatal outcomes.

Methods: This prospective observational study was conducted at Sheikh Bhikhari Medical College and Hospital (SBMCH), Hazaribagh, from July 2025 to December 2025. A total of 60 pregnant women diagnosed with PPROM between 28–37 weeks of gestation were included. High vaginal swabs were collected and analyzed microbiologically. Statistical analysis was performed using chi-square test and p-value <0.05 was considered significant.

Results: Among 60 cases, 70% showed positive microbial growth. The most common organism isolated was *Escherichia coli* (28.6%), followed by *Klebsiella* spp. (19.0%) and *Candida* spp. (16.7%). Significant association was found between positive cultures and adverse neonatal outcomes (p=0.03).

Conclusion: Altered vaginal microflora plays a significant role in PPROM and is associated with poor perinatal outcomes. Early detection and targeted antimicrobial therapy may improve outcomes.

Keywords: PPROM, Vaginal Microflora, High Vaginal Swab, Preterm Birth, Infection.

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Introduction

Preterm prelabour rupture of membranes (PPROM) refers to rupture of fetal membranes before the onset of labor and prior to 37 completed weeks of gestation. It complicates approximately 2–3% of pregnancies but is responsible for nearly one-third of preterm births worldwide [1]. PPROM is associated with significant maternal and neonatal morbidity including chorioamnionitis, neonatal sepsis, respiratory distress syndrome, and increased perinatal mortality [2].

The etiology of PPROM is multifactorial; however, infection and inflammation are considered the most significant contributors. Ascending infection from the lower genital tract leads to weakening of the fetal membranes through the release of inflammatory cytokines, matrix metalloproteinases, and prostaglandins [3].

The normal vaginal flora is predominantly composed of Lactobacillus species, which help maintain an acidic pH and prevent colonization by pathogenic organisms [4]. Disruption of this balance, known as vaginal dysbiosis, can lead to bacterial vaginosis and increased susceptibility to ascending infections [5].

Several studies have demonstrated a strong association between abnormal vaginal microflora and PPROM [6]. Common organisms implicated include Escherichia coli, Klebsiella, Group B Streptococcus, Gardnerella vaginalis, and anaerobes [7]. The presence of these organisms can trigger inflammatory pathways that compromise membrane integrity [8].

High vaginal swab (HVS) culture remains a simple and effective method to identify microbial patterns and guide antibiotic therapy [9]. Understanding the microbiological profile in PPROM patients is crucial for preventing complications and improving neonatal outcomes [10].

This study aims to evaluate the vaginal microflora in PPROM cases and its clinical significance at a tertiary care center in eastern India.

Materials and Methods

Study Design: Prospective observational study

Study Place: SBMCH, Hazaribagh

Study Duration: July 2025 to December 2025

Sample Size: 60 patients

Inclusion Criteria

- Pregnant women with PPROM (28–37 weeks gestation)
- Singleton pregnancy

Exclusion Criteria

- Active labor
- Recent antibiotic use (within 7 days)
- Multiple pregnancy

Methodology

After obtaining informed consent, detailed history and clinical examination were performed. High vaginal swabs were collected under aseptic precautions and sent for microbiological analysis including Gram staining and culture.

Statistical Analysis: Data were analyzed using SPSS software. Chi-square test was applied. p-value <0.05 was considered statistically significant.

Results

A total of 60 pregnant women diagnosed with PPROM were included in the study. The collected data were analyzed to determine demographic characteristics, microbiological profile, and associated neonatal outcomes.

The majority of participants belonged to the 18–25 years age group (46.7%), followed by 26–30 years (33.3%) and above 30 years (20.0%), as shown in **Table 1**.

Table 1: Age Distribution of Study Participants

Age Group (years)	Number (n=60)	Percentage (%)
18–25	28	46.7
26–30	20	33.3
>30	12	20.0

High vaginal swab culture revealed that 42 out of 60 patients (70.0%) had positive microbial growth, whereas 18 patients (30.0%) showed no growth. These findings are summarized in **Table 2** and illustrated in **Figure 1**.

Table 2: Culture Positivity in PPROM Cases

Culture Result	Number (n=60)	Percentage (%)
Positive	42s	70.0
Negative	18	30.0

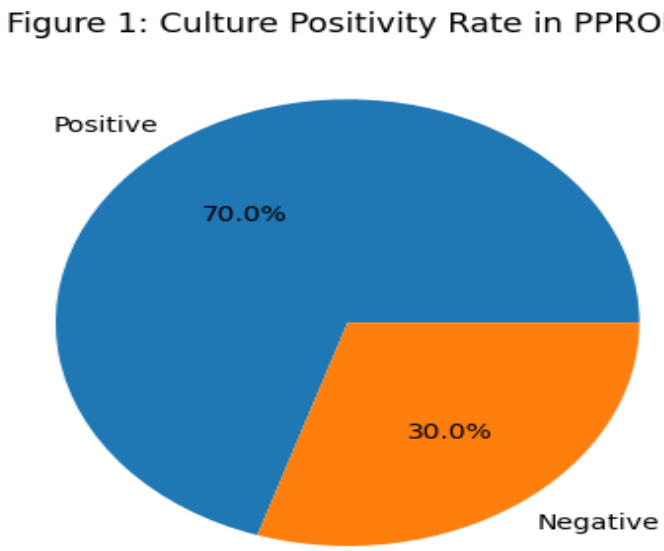

Figure 1: Culture Positivity Rate in PPROM

Among the 42 culture-positive cases, Escherichia coli was the most frequently isolated organism (28.6%), followed by Klebsiella species (19.0%) and Candida species (16.7%). Other isolates

included Group B Streptococcus (14.3%), Staphylococcus species (11.9%), and miscellaneous organisms (9.5%). The distribution of microbial isolates is presented in **Table 3** and graphically represented in **Figure 2**.

Table 3: Distribution of Microorganisms Isolated (n=42)

Microorganism	Number	Percentage (%)
E. coli	12	28.6
Klebsiella spp.	8	19.0
Candida spp.	7	16.7
Group B Streptococcus	6	14.3
Staphylococcus spp.	5	11.9
Others	4	9.5

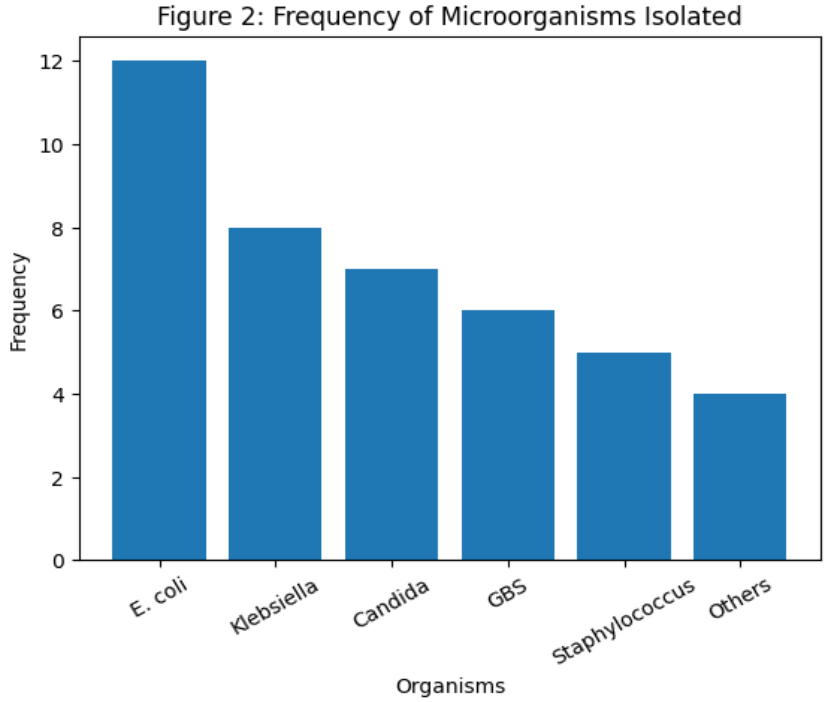

Figure 2: Frequency of Microorganisms Isolated

To evaluate clinical significance, the association between culture results and neonatal outcome (NICU admission) was assessed. Among culture-positive cases, 25 neonates (59.5%) required NICU admission, compared to only 5 neonates (27.8%) in the culture-negative group. This association was statistically significant, as shown in **Table 4**.

Table 4: Association Between Culture Status and NICU Admission

Culture Status	NICU Admission	No NICU Admission	Total
Positive	25	17	42
Negative	5	13	18

Chi-square test demonstrated a statistically significant association between positive culture and increased NICU admission ($\chi^2 = 4.65$, $p = 0.03$).

These findings indicate that the presence of pathogenic vaginal microflora in PPROM is significantly associated with adverse neonatal outcomes.

Discussion

This study demonstrated that a majority (70%) of PPROM cases had positive vaginal cultures, highlighting the role of infection in its pathogenesis. Similar findings were reported by earlier studies [11,12].

The most common organism isolated was E. coli, which aligns with previous research indicating gram-negative organisms as major contributors to PPROM [13,14]. Klebsiella and Candida species were also frequently isolated, consistent with other studies [15].

The presence of Group B Streptococcus (GBS) in 14.3% of cases is clinically significant due to its

association with neonatal sepsis [16]. Early identification and prophylactic antibiotic administration are essential in such cases [17].

A statistically significant association was found between positive cultures and NICU admissions, suggesting that infection contributes to adverse neonatal outcomes. This is supported by multiple studies emphasizing the impact of intrauterine infection on neonatal morbidity [18,19].

The findings reinforce the importance of routine microbiological screening in PPROM cases. Targeted antibiotic therapy based on culture sensitivity can reduce complications and improve prognosis [20].

Conclusion

Vaginal microflora plays a critical role in the pathogenesis and outcomes of PPROM. High prevalence of pathogenic organisms underscores the need for early detection and appropriate management.

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