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Original Research Paper

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BACTERIAL VAGINOSIS AND PRETERM LABOUR: A PROSPECTIVE STUDY OF RISK FACTORS AND MATERNAL–NEONATAL OUTCOMES AT A TERTIARY CARE CENTRE

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ABSTRACT

Background: Bacterial vaginosis (BV) is a common vaginal dysbiosis in pregnancy that has been linked to preterm labour (PTL) through ascending infection and inflammatory pathways, yet the relative contribution of BV severity versus co-existing maternal risk factors remains unclear. **Objectives:** To determine the incidence of PTL among pregnant women with BV, identify associated risk factors, and evaluate maternal and neonatal outcomes. Methods: In this prospective observational study, 150 pregnant women (28–36+6 weeks) with symptomatic BV, diagnosed by Nugent scoring, were recruited at a tertiary care centre over 13 months and followed until delivery. All women received a combination vaginal pessary (clindamycin, clotrimazole, tinidazole). Associations were assessed using chi-square tests and multivariate logistic regression. **Results:** PTL occurred in 82/150 women (54.7%). On multivariate analysis, short cervix (<25 mm) was the strongest independent predictor (adjusted OR 28.50, 95% CI 9.82–82.72, p<0.001), followed by urinary tract infection (OR 5.66), gestational/overt diabetes (OR 4.50), non-adherence to treatment (OR 3.35), low education (OR 3.14), and anaemia (OR 2.57). Nugent score category was not independently associated with PTL. Neonatal complications included low birth weight (50.7%), NICU admission (37.3%), respiratory distress (18.7%), sepsis (13.3%), and neonatal death (2.7%). Puerperal pyrexia was the only maternal complication significantly linked to PTL. **Conclusion:** More than half of women with BV delivered preterm. Once BV is established, cervical status, comorbidities, treatment adherence, and social determinants influence PTL risk more than Nugent score severity alone, supporting a multifactorial antenatal screening approach rather than reliance on BV diagnosis alone.

KEYWORDS : Bacterial vaginosis; Preterm labour; Nugent score; Cervical length; Pregnancy outcome; Neonatal morbidity

INTRODUCTION

Preterm labour (PTL), defined as regular uterine contractions with cervical change before 37 completed weeks, remains a leading cause of neonatal morbidity and mortality, affecting roughly 15 million births globally each year (about 11% of live births). Intrauterine infection and inflammation are increasingly implicated in spontaneous preterm birth, with ascending migration of lower genital tract organisms into the chorioamnion proposed as a key pathway. Bacterial vaginosis (BV), a shift from lactobacillus-dominant to anaerobe-dominant vaginal flora, is the most common cause of abnormal discharge in reproductive-age women and has a reported prevalence of 10–30% in pregnancy. BV-associated organisms produce biofilms and stimulate inflammatory cytokines (IL-1, IL-6, TNF-alpha) and prostaglandins that promote cervical ripening, membrane weakening and uterine contractility. Although epidemiological evidence links BV to preterm birth, premature rupture of membranes, and low birth weight, treatment trials have shown inconsistent benefit, and the relative importance of BV severity versus co-existing maternal risk factors is not well characterised, particularly in Indian tertiary care settings where BV prevalence (10–20%) and preterm birth rates (13–14%) are both high. This study was undertaken to determine the incidence of PTL among pregnant women with BV, identify associated risk factors, and evaluate maternal and neonatal outcomes at a tertiary referral centre.

MATERIALS AND METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology of a tertiary care centre over 13 months, after Institutional Ethics Committee approval and written informed consent. Pregnant women aged ≥18 years with singleton pregnancy, gestational age 28–36+6 weeks, and symptoms suggestive of BV were enrolled by consecutive sampling. Women who had received antibiotics in the preceding two weeks, multiple gestation, PPROM at presentation, cervical incompetence, uterine anomalies, other genital infections, or fetal anomalies were excluded. Sample size (n=150) was calculated using an expected BV-related PTL proportion of 54% (from Devi et al., 2022), 8% absolute precision, and 95% confidence. High vaginal swabs were taken from the posterior fornix and vaginal pH tested; samples were assessed by Gram stain and Nugent scoring (score ≥7 = BV positive). All diagnosed women received a combination vaginal pessary (clindamycin, clotrimazole, tinidazole) and were followed until delivery for treatment adherence and pregnancy outcome (term versus preterm). Data were analysed in Microsoft Excel; associations were tested using the chi-square test, with multivariate logistic regression to identify independent predictors of PTL (p<0.05 considered significant).

RESULTS

The mean maternal age was 26.71 ± 4.72 years (range 18–42), with most women in the 25–29 year group (40.7%). Secondary education was most common (46.7%), and 80.0% belonged to Kuppuswamy socioeconomic Classes III–V. Primigravidae comprised 38.7% of the cohort. Presenting symptoms included white discharge (98.7%) and foul odour (87.3%). On Nugent scoring, 85.3% had a confirmed BV score (7–10) and 14.7% an intermediate score (4–6); 63.3% of women were anaemic and 14.7% had gestational or overt diabetes.

Table 1. Baseline Characteristics of Study Participants (n = 150)

Variable	Category	n (%)
Maternal age (years)	Mean ± SD: 26.71 ± 4.72 (range 18–42)	
Education	Secondary / Graduate+ / Primary / Illiterate	70 (46.7)/35 (23.3)/30 (20.0) /15 (10.0)
Socioeconomic status (Kuppuswamy)	Class III–V / Class I–II	138 (80.0) / 30 (20.0)
Gravida	Primigravida / Multigravida	58 (38.7) / 92 (61.3)
Anaemia (Hb <11 g/dL)	Present	95 (63.3)
Glycemic status	GDM / Overt DM	16 (10.7)/6(4.0)
Nugent score	Positive BV (7–10) / Intermediate (4–6)	128 (85.3) / 22 (14.7)
Cervical length	Short/very short(<25mm)	40 (26.7)

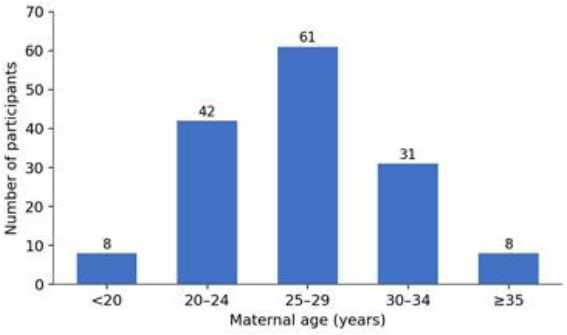

Figure 1. Age Distribution of Study Participants (n = 150)

Preterm labour occurred in 82/150 women (54.7%); 45.3% delivered at term. On univariate analysis, PTL was significantly associated with lack of ANC registration (100% vs 50.7%, p=0.0005), younger maternal age (<25 years: 64.0%, p=0.048), lower education (illiterate 86.7% vs graduate 28.6%, p=0.001), lower socioeconomic class, multigravidity, prior preterm birth (83.3% vs 50.8%, p=0.009), anaemia, UTI, GDM/overt diabetes, non-adherence to treatment (83.3% vs 47.3% in adherent women, p=0.008), and short cervical length. Nugent score category alone did not significantly predict PTL (56.3% vs 45.5%, p=0.312).

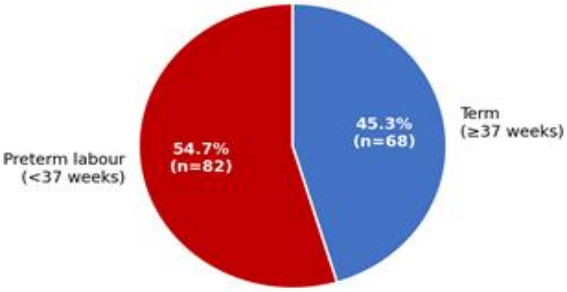

Figure 2. Prevalence of Preterm Labour among Women with Bacterial Vaginosis (n = 150)

Table 2. Key Univariate Predictors of Preterm Labour (n = 150)

Predictor	² value	p-value	Significance
Cervical length (<25 mm)	35.98	<0.001	***
Educational status	17.59	0.001	***
Socioeconomic status	15.42	0.002	**
ANC non-registration	12.16	0.0005	**
Treatment adherence	10.05	0.008	**
Prior preterm labour	6.78	0.009	**
GDM / overt diabetes	7.67	0.006	*
Anaemia	7.54	0.006	*
Gravida	6.86	0.032	*
Maternal age	6.07	0.048	*
Urinary tract infection	6.01	0.014	*
Nugent score category	1.02	0.312	NS

On multivariate logistic regression, short cervix (<25 mm) was the strongest independent predictor of PTL (adjusted OR 28.50, 95% CI 9.82–82.72, p<0.001), followed by UTI (OR 5.66), GDM/overt diabetes (OR 4.50), non-adherence to treatment (OR 3.35), low education (OR 3.14), and anaemia (OR 2.57); the model explained 41.8% of variance with good fit (Hosmer–Lemeshow p=0.42).

Table 3. Independent Predictors of Preterm Labour — Multivariate Logistic Regression

Variable	Adjusted OR	95% CI	p-value
Short cervix (<25 mm)	28.50	9.82–82.72	<0.001
Urinary tract infection	5.66	1.20–26.70	0.021
GDM / overt diabetes	4.50	1.43–14.17	0.006
Non-adherent treatment	3.35	1.52–7.39	0.003
Low education	3.14	1.41–6.97	0.004
Anaemia	2.57	1.27–5.19	0.007

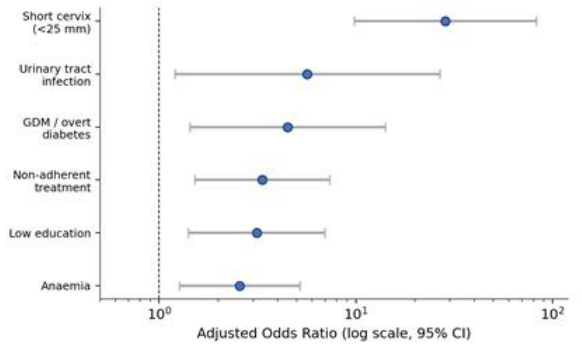

Figure 3. Independent Predictors of Preterm Labour Adjusted Odds Ratios (95% CI)

Neonatal outcomes were significantly worse with PTL: low birth weight occurred in 50.7% overall (all ELBW/VLBW infants were preterm), NICU admission in 37.3% (85.7% of these among PTL), respiratory distress syndrome in 18.7%, neonatal sepsis in 13.3%, jaundice in 10.7%, intraventricular haemorrhage in 4.0%, and neonatal death in 2.7%. Mean 1-minute and 5-minute APGAR scores were lower in preterm neonates (6.1±2.8 and 7.3±2.3) than term neonates (8.4±1.1 and 8.9±0.9, p<0.001). Among maternal complications, puerperal pyrexia was significantly more frequent with PTL (20.7% vs 8.8%, p=0.025); postpartum UTI, wound infection, and postpartum haemorrhage showed no significant difference by PTL status.

Table 4. Maternal and Neonatal Outcomes Associated with Preterm Labour (n = 150)

Outcome	PTL group	Term group	p-value
Low birth weight	71.0% of LBW preterm	—	<0.001
NICU admission	48/56 (85.7%)	8/56 (14.3%)	<0.001
Respiratory distress syndrome	18.7% overall	—	<0.001
Neonatal sepsis	13.3% overall	—	—
Neonatal death	2.7% overall	—	—
Puerperal pyrexia	20.7%	8.8%	0.025
Postpartum UTI	13.4%	8.8%	0.254 (NS)
Postpartum haemorrhage	13.4%	10.3%	0.404 (NS)

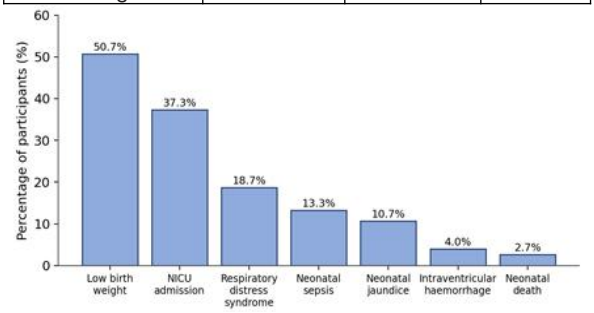

Figure 4. Spectrum of Neonatal Complications among Study Participants (n = 150)

DISCUSSION

More than half of the women with BV in this cohort developed PTL, consistent with regional studies reporting 36–58% BV-associated PTL rates. Notably, Nugent score severity itself was not an independent predictor once other variables were accounted for, suggesting that the clinical consequences of BV in pregnancy are shaped less by microbiological severity and more by cervical competence, coexisting maternal morbidity (anaemia, UTI, diabetes), treatment adherence, and social determinants such as education and socioeconomic status. This pattern aligns with prior Indian studies (e.g., Devi et al., Masand and Melkani, Jain) that similarly found BV prevalence strongly linked to PTL but modulated by obstetric history,

parity, and antenatal care access. The markedly elevated risk with short cervix corroborates cervical length as a key structural pathway linking ascending infection to preterm cervical ripening, reinforcing calls for routine transvaginal cervical length assessment in BV-positive pregnancies. The independent contribution of non-adherence highlights that diagnosis without completed treatment offers limited protection, an issue previously flagged in trials showing inconsistent benefit from BV treatment in unselected populations. The substantial neonatal morbidity observed — LBW, NICU admission, RDS, sepsis, and mortality — underscores the downstream cost of unaddressed PTL risk in this population. Limitations include the single-centre design, absence of a BV-negative comparator group, and reliance on Nugent scoring alone without molecular confirmation.

CONCLUSION

In this tertiary care cohort, bacterial vaginosis in pregnancy was associated with a high burden of preterm labour (54.7%) and substantial maternal and neonatal morbidity. Short cervical length, urinary tract infection, diabetes, anaemia, poor treatment adherence, and low educational / socioecono mic status were independent predictors, while Nugent score severity was not. These findings support a multifactorial antenatal risk-stratification approach — combining BV screening with cervical length assessment, correction of anaemia, and screening for UTI and diabetes — alongside strict reinforcement of treatment adherence, to reduce preterm birth and its complications in BV-positive pregnancies.

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