ORIGINAL ARTICLE

A Comparative Study of Bacterial Vaginosis in Preterm and Term Labor

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Abstract

Purpose: Is there a difference in association of bacterial vaginosis (BV) with preterm labor as compared to term labor? Successful treatment of BV during pregnancy may reduce the incidence of preterm birth as low as 50%. It is important to work toward predicting, and diagnosing the causative factors, and finally taking steps to minimize the preterm deliveries which is of utmost priority in developing countries like India. Therefore, this study is carried out to analyze the occurrence of BV in preterm and term labor.

Materials and methods: This cross-sectional study of 100 laboring women in each group divided in to two groups depending on the gestational age into preterm group and term group and was carried out in a tertiary care center over 2 years (from September 2019 to September 2021) using non-probability simple random sampling technique. The women of both groups were independently segregated as those who fulfilled Amsel's criteria (≥3 out of 4) and those who did not.

Results: In this study, the incidence of BV was found to be 38% in preterm group and 13% in the term group with $\chi^2 = 16.449$, $p = 0.00005$, and odds ratio (OR) = 4.1, that is, OR >1 with the whiff test being most sensitive among four criteria of Amsel's.

Conclusion: Bacterial vaginosis was noted more frequently in women with preterm labor compared to women in term labor. There was a significant impact of socio-demographic factors on occurrence. Amsel's criteria should be utilized as a low cost, easily available screening-diagnostic tool in symptomatic women.

Keywords: Amsel's criteria, Anemia, Bacterial vaginosis, Lower socioeconomic class, Preterm labor.

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Introduction

Obstetrics in its essence is a science which comprises of timely maternal care and counselling in order ensure an uneventful pregnancy. Doing so also allows for the timely diagnosis of maternal and fetal abnormalities and early dispensing of appropriate management protocol for the same in order for every pregnancy to culminate in a healthy mother and a child. The BV is a well-known yet enigmatic clinical disorder which occurs due to an imbalance in the actual vaginal flora with a diminution in the normally predominant lactobacilli and predominance of anaerobic bacteria. It is an overgrowth of normal vaginal bacteria and is the most commonly seen vaginal infection in reproductive age group of women ranging from 10 to 64% of women at any given time. Bacterial vaginosis in early weeks of pregnancy is associated with late miscarriages and preterm birth.[1] It is considered to be one of the leading causes of preventable preterm labor. The exact mechanism for causation of preterm labor is unknown but it is thought that the products of anaerobic bacteria stimulate the decidua and may cause preterm labor by elevated levels of cytokines, phospholipase A2, and the release of prostaglandin.[2] There are many socio-demographic factors which also influence this condition. Successful treatment of BV during pregnancy may reduce the incidence of preterm birth as low as 50%. Although it seems crucial to screen and treat symptomatic as well as asymptomatic pregnant women, there is insufficient data to imply this in routine practice.[3]

Therefore, this study is carried out to analyze the association of BV in preterm and term labor.

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Materials and Methods

Inclusion Criteria for Group I (Preterm Labor) (*n* = 100)

- Pregnant women with gestational age between 28 weeks and 36 weeks 6 days.
- Established or suspected preterm labor.
- In latent phase of labor: Cervical dilatation of at least 1 cm but less than 4 cm, and effacement of at least 80%.
- Intact fetal membrane.
- Single gestation.

Inclusion Criteria for Group II (Term Labor)

- The gestational age 37 weeks and onward.
- In latent phase of labor: Cervical dilatation of at least 1 cm but less than 4 cm, and effacement of at least 80%.
- Intact fetal membranes.
- Single gestation.

Exclusion Criteria for Both Study Groups

- Cervical incompetency.
- History of antepartum hemorrhage (APH) or placenta previa or abruptio placenta.
- Intra uterine fetal death (IUFD).
- Absence of membranes.
- Multiple gestation.
- Grand multigravida.
- Polyhydramnios.
- Mullerian anomalies of uterus.
- Rhesus isoimmunization.
- Medical disorders for example diabetes mellitus, chronic/gestational hypertension, renal disease, hypo/hyperthyroidism, cardiac disorders, etc.
- Unwilling women who did not give consent.
- Women who responded to tocolytics successfully and continued pregnancy beyond 37 weeks in the preterm group.
- History antibiotics usage in the past 2 weeks.

This case control study of 100 laboring women in each group divided into two groups depending on the gestational age (preterm group: 28–36.6 weeks; term group: 37 weeks and onward) was carried out in a tertiary care center over 2 years (from September 2019 to September 2021) using non-probability simple random sampling technique after obtaining permission from the institutional ethics committee and informed consent from the subjects. The women of both groups then independently segregated as those who fulfilled Amsel's criteria (≥3 out of 4) and those who did not. The procedure of Amsel's criteria fulfillment and diagnosis of BV is explained descriptively below. The overall fetal and maternal prognosis was closely evaluated during labor.

Amsel's Criteria

- Vaginal discharge characteristically thin, homogenous, and white.
- Vaginal pH more than 4.5.
- Whiff test also known as amine test is described as follows: When 10% KOH is added to the vaginal discharge, there is an offensive amine odor.
- Clue cells positive (vaginal epithelial cells with borders obscured by adherent coccobacilli on wet mount preparation or gram stain).

To call it as BV, any three out of the above four criteria should be present.

This study also looks for different socio-demographic factors (socioeconomic status, educational status, body mass index (BMI), anemia, urinary tract infection (UTI), and the history of preterm births) and their impact on occurrence of BV.

Observations

In total, 200 women of both groups were tested for BV using Amsel's criteria. First case group had 100 women of preterm labor. Amongst them 38 were positive for BV (38%) while the second control group of 100 women of term labor; 13 were positive for BV (13%) as depicted in Figure 1. This difference was found to be statistically significant, $\chi^2 = 16.449$, $p = 0.00005$, and OR = 4.1 (i.e., OR >1). Thus, women with BV had a significantly higher chance of experiencing preterm labor as compared to BV negative women. With a relative risk ratio of 1.79 attributing that BV has 1.79 times more chances of culminating in to preterm labor. The mean age of women who were included in this study is around 25 years with minimum age of women included in the study is 19 years and maximum age of women is 35 years.

In our study, the participants were categorized on their socioeconomic status using the revised BG Prasad's socioeconomic status classification as elaborated in Table 1.

Out of the 200 women, majority of them (110) belonged to Classes III and IV (lower middle and middle class of BG Prasad's classification). The BV positives of both groups are described as follows: 10–12% were of lower class (Class V) while 1–2% were of BV negatives of both groups were of Class V. The preterm group is described as follows: Bacterial vaginosis positive were more in lower middle class (Class IV) (31 women out of total 38) compared to the majority of BV negative women were in the middle class (Class III) (40 women out of 62). This difference was statistically significant ($\chi^2 = 10.33$, $p = 0.01$).

In term group, 26% women had primary education up to 10th grade and majority of them were in BV positive group ($\chi^2 = 7.65$, $p = 0.05$).

The mean BMI of BV positive women in preterm group was 20.6 ± 1.05 kg/m^2 and in term group 20.17 ± 1.08 kg/m^2 with overall mean of 20.38 kg/m^2. This showed statistically significant association of lower BMI with occurrence of BV (p <0.0001).

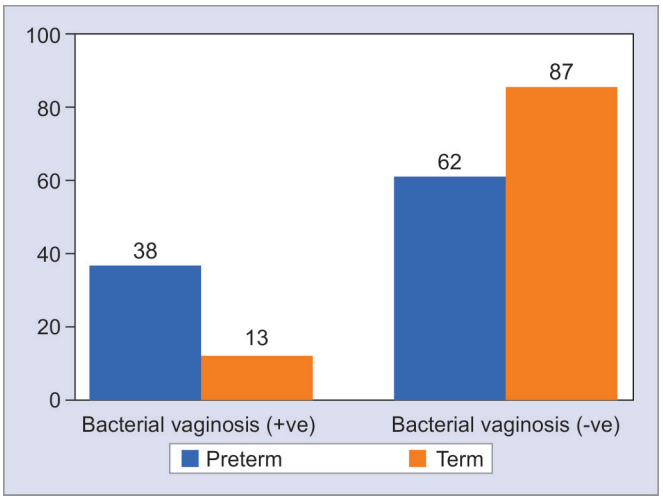

Fig. 1: Comparison of presence of BV in preterm and term groups

Table 1: Revised BG Prasad's socioeconomic status

Social class (according to BG Prasad's classification)	*₹/month*
I (Upper class)	7770 and above
II (Upper middle class)	3808–7769
III (Middle class)	2253–3808
IV (Lower middle class)	1166–2253
V (Lower class)	<1166

Table 2: Study showing Amsel's criteria parameters, Sn, Sp, PPV, and NPV

		BV						
Groups	*Clue cells*	*Negative*	*Positive*	*Total*	*Sn*	*Sp*	*PPV*	*NPV*
Vaginal discharge	Negative	98	12	110	0.764	0.657	0.433	0.890
	Positive	51	39	90				
pH >4.5	Negative	115	6	121	0.569	0.950	0.88	0.771
	Positive	34	45	79				
Whiff test	Negative	140	3	143	0.941	0.939	0.842	0.979
	Positive	9	48	57				
Clue cells	Negative	148	19	167	0.627	0.993	0.969	0.886
	Positive	1	32	33				

There was a significant association between the previous recurrent abortions and BV ($\chi^2 = 12.72^*$, $p = 0.005$).

Out of the total 36 UTI positive women, 16 women had BV ($\chi^2 = 4.8$, $p = 0.027$).

Presence of anemia was also found to be significantly associated with BV group ($\chi^2 = 19.05$, $p = 0.0002$).

Lastly, all four parameters of Amsel's criteria were studied to know their significance in diagnosing BV by elaborating their sensitivity (Sn), specificity (Sp), positive predictive value (PPV), and negative predictive value (NNP) in Table 2.

Discussion

In this study, the incidence of BV was found to be 38% in preterm group and 13% in the term group with ($\chi^2 = 16.449$, $p = 0.00005$) and OR = 4.1 (OR >1). In the study, by Ranjan et al.[4] The test for BV was positive for 24% of cases and 8% of control (p <0.05, OR = 3.63,95% CI: 1.0812.18), showing its association with preterm labor. Nelson[5] found that BV was present in 15% of preterm labor and 11.5% of term labor.

Cammack et al.[6] concluded in his study that lower socio-economic nature is consistent with prevalence of BV. Sudha et al.[7] found that symptomatic BV was more common in lower socio-economic class (24.8%) than the upper class.[8]

Dingens et al.[9] stated that college degree was less likely in BV positive women. In the study done by Yzeiraj–Kalemaj et al.[10] found that 28.4% of the patients with low education (elementary school) level resulted positive for BV; otherwise, only 14.5% of the patients with high education level (high school or university) were positive for BV ($p = 0.008$).

Brookheart et al.[11] saw a significant association of BMI and BV. They hypothesized that higher estrogen levels in obese women could increase glycogen content of vaginal epithelial cells which in turn can promote lactobacillus colonization leading to healthier vagina.

Purwar et al.[12] found that the previous abortions and preterm births are significantly associated with BV ($p = 0.003$, OR = 2.26). In this study, 11 BV positive women experienced recurrent abortions. ($\chi^2 = 13.68$, $p = 0.001$). In the study done by Donders et al.,[13] history of recurrent abortions and also subsequent early pregnancy losses were found to be 5 times more when clinical BV was present (relative risk ratio = 5.4). In this study, 16 women have UTI with BV ($\chi^2 = 4.8$, $p = 0.027$). Sumati et al.[14] showed that women with BV have significantly increased risk of UTI, with an odds ratio of 13.75. Harmali et al.[15] reported that 22.4% BV positive women with UTI compared to 9.7% of those without it. Neggers et al.[16] studied that there were significant inverse associations between severe BV and intakes of folate (0.4, 0.2–0.8).

Chaijareenot[17] in his study showed that both vaginal pH and whiff test demonstrated 100% sensitivity. However, vaginal pH (58.9%) had lower specificity than the whiff test (97.3%). So, the whiff test is the best clinical criteria of Amsel's criteria in the diagnosis of BV. Shachi et al.[18] has inferred that whiff test is most sensitive and Clue cell test is most specific among Amsel's criteria.

Conclusion

Bacterial vaginosis and its relation to preterm labor is still not well understood. The occurrence of BV in preterm labor is 38%. The occurrence in term labor is 13%. There was significant association of BV with preterm labor ($p = 0.00005$, OR = 4.1, relative risk ration = 1.79) as well as significant impact of socio-demographic profile (education, socioeconomic status, BMI, and anemia) on the occurrence of BV. Bacterial vaginosis should be in back of every obstetrician's mind when any pregnant women of early gestational weeks or any women of reproductive age visits them with complaint of characteristic vaginal discharge. Amsel's criteria should be utilized as low cost, easily available screening-diagnostic tool in symptomatic women. The positively diagnosed women should timely receive treatment for the same.

Compliance with Ethical Standards

All procedures performed in this study involving human participants were in accordance with the ethical standards of the institution.

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