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The Effects of Symptomatic Bacterial Vaginosis in the Second Trimester of Pregnancy on Pregnancy Outcome

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ABSTRACT: A prospective cohort study was designed to evaluate the correlation between the presence of bacterial vaginosis and pregnancy outcomes. 192 pregnant women in the second trimester of pregnancy with vaginal discharge were included in the study.The study group consisted of 50 pregnant women positive for the presence of bacterial vaginosis. 138 pregnant women without bacterial vaginosis constituted the control group and both groups were compared in respect to the pregnancy outcomes. Neither the timing of the delivery nor the presence of chorioamnionitis, wound infections or postpartum endometritis showed a statistically significant difference between the groups ($p > 0.05$). The incidences of both preterm labor and premature rupture of membranes were found to be significantly higher in the group of patients with bacterial vaginosis ($p < 0.05$). The presence of bacterial vaginosis in the second trimester of pregnancy increases the rates of premature rupture of membranes as well as preterm labor. Other complications of pregnancy exhibited a somewhat similar increase in number however these figures were statistically insufficient to prove a significant correlation inbetween. We suppose that a new study group of a substantially larger scale will demonstrate a significant increase in these complications as well.

Keywords: Bacterial vaginosis; premature rupture; preterm delivery; second trimester.

INTRODUCTION

Bacterial vaginosis (BV) is an infection experienced in 6-32% of pregnant women, characterized with the imbalance created by the decrease of lactobacillus and increase of mixed anaerobic bacteria such as Gardnerella vaginalis, Bacteroides species and Mobiluncus species in vaginal flora (Nugent et al., 1991; McGregor and French, 2000; Yefet et al., 2025). While BV can be asymptomatic, increased amount of gray-white vaginal discharge with a fishy smell can accompany the clinical picture, however no infection findings will be observed in vaginal mucosa.

It was shown in numerous case-control studies and cohort studies that bacterial vaginosis is associated with premature birth, preterm premature rupture of membranes (PPROM), chorioamnionitis, postpartum endometritis and wound site infections in pregnant women (Martius and Eschenbach, 1990; Flynn et al., 1999; Svare et al., 2006; Brocklehurst et al., 2013; Ng et al., 2023; Wu et al., 2025). However, different cohort studies defending no association between BV and preterm labor also exist (Jacobsson et al., 2002; Oakeshott et al., 2004; Thorsen et al., 2006).

The purpose of this study is to determine whether the presence of symptomatic bacterial vaginosis in pregnant women within their second trimester is associated with premature birth, PPROM, chorioamnionitis, postpartum endometritis and wound site infections.

MATERIALS AND METHODS

This prospective cohort study is performed on pregnant women on their second trimester (weeks 14-26) who applied to Izmir Aegean Obstetrics and Gynecology Research and Training Hospital pregnancy outpatient clinic between July 2010 - February 2011 after approval was taken from local ethics committee of the hospital (Ethics committee number: Ethics committee approval was obtained with the decision numbered 2010/3 and dated 11.08.2010). Pregnant women with no complaint of discharge, with preterm labor history, determined to have intrauterine growth retardation, diabetic and hypertensive pregnant women and multiple pregnancies were excluded form the study and 192 pregnant women were included in the study. Procedures that will be performed were explained to the pregnant women and their written consents were obtained.

After detailed medical histories were taken, vaginal examination were performed with sterile speculum. A swab sample was taken from posterior vaginal wall. Nugent score, assumed to be a gold standard in the diagnosis of bacterial vaginosis, was used in the examination of samples (Nugent et al., 1991). For this, swab sample was spread on slide and gram-staining was performed in microbiology laboratory and they were examined by Microbiology speacialist. All scorings were performed by the same microbiology specialist. For scoring, presence of large gram (+) bacilli (lactobacillus), small gram labile bacilli (*G. vaginalis*),

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small gram (–) bacilli (*Bacteroides spp.*) and curly gram labile bacilli (*Mobilincus spp.*) were examined. Presence of each morphotype was graded according to the bacilli count in a single immersion oil area. If there is no bacteria in the area, it was graded as 0, if less than one as 1+, if between 1-4 as 2+, if between 5-30 as 3+, if above 30 as 4+. According to these values, scoring was performed between 0-10. According to Nugent scoring system, patients were classified within three groups as 'normal vaginal flora' (0–3), 'intermediate' (4-6) and 'bacterial vaginosis' (7-10). Group that was assigned intermediate (4-6) score was accepted to be BV negative.

50 pregnant women determined to be bacterial vaginosis positive according to this scoring system (Nugent score 7-10) formed the study group. 138 BV negative pregnant women (Nugent score 0-6, 'Clue cells' negative) formed the control group. 4 pregnant women, gram staining result of whom is reported to be inadequate for scoring, were excluded from the study.

Age, gravida, parity, gestational week, presence of preterm membrane rupture and preterm labor, birth week, delivery method, maternal morbidity results before and after birth were evaluated. Diagnoses of chorioamnionitis, wound infections and postpartum endometritis were determined with clinical and laboratory findings.

SPSS **(**Statistical Package for the Social Sciences) 19 program was used for the analysis of data. Mann Whitney U test and fisher exact tests were used for performing the analysis of data. Data was examined with 95% confidence interval level and it was assumed to be significant if p value was lower than 0,05.

RESULTS

BV prevalence of our study group was found as 26%. No statistically significant difference was determined between groups according to age, gravida, parity and average gestational week ($p > 0,05$) (Table 1).

Table 1. *Distribution of age, gravida, parity and gestational week in BV(+) and control group patients*

	BV[a](+)Average ± SD[b]	CONTROL Average ± SD
Age	27.02 ± 6.10	26.94 ± 4.87
Gravida	2.22 ± 1.20	2.01 ± 1.00
Parity	0.84 ± 0.77	0.70 ± 0.79
Gestational Week	17.20 ± 3.38	16.72 ± 2.61

** There was no statistically significant difference between the BVa(+) and control groups in terms of age, gravida, parity, and gestational week ($p > 0.05$). The mean values and standard deviations of these variables were comparable between the two groups.*

10 of 50 pregnant women determined to have bacterial vaginosis (20%) had preterm labor, while 13 women (9.4%) had preterm labor in control group of 138 pregnant women. ($p<0,05$) (Table 2).

Table 2. *Results of preterm labor in BV(+) and control group patients*

		BV[a](+) n (%)	CONTROL n (%)
Preterm Labor	none	40 (80%)	125 (90,6%)
	present	10 (20%)	13 (9,4%)

** The prevalence of preterm labor was significantly higher in the BVa(+) group compared to the control group ($p < 0.05$). a: bacterial vaginosis*

PPROM was determined in 10 of BV(+) pregnant women (20%), and in 8 (5,8%) of control group. Difference between two groups was determined to be statistically significant ($p<0,05$) (Table 3).

Table 3. *PPROM results in BV(+) and control group patients*

		BV[a](+) n (%)	CONTROL n (%)
PPROM[b]	none	40 (80%)	130 (%94,2)
	present	10 (20%)	8 (%5,8)

** There was a statistically significant difference between the BVa(+) and control groups regarding the incidence of PPROM ($p < 0.05$). a: bacterial vaginosis; b: preterm premature rupture of membranes*

According to the delivery method, BV(+) and control group patients are presented in Table 4. No statistically significant difference was determined between two groups.

Table 4. *Distribution of delivery method in BV(+) and control group patients*

		BV[a](+) n (%)	CONTROL n (%)
Delivery Method	NSL[b]	24 (%48)	65 (%47,1)
	C/S[c]	26 (%52)	73 (%52,9)

** There was no statistically significant difference in the mode of delivery (NSD vs. C/S) between the BVa(+) and control groups (p > 0.05). a: bacterial vaginosis; b: Normal spontaneous labor; c: C-section (cesarean delivery)*

Data obtained as a result of evaluating chorioamnionitis, wound infections and postpartum endometritis are presented in Table 5. No statistically significant difference was determined between two groups (p > 0,05) (Table 5).

Table 5. *Distribution of chorioamnionitis, wound infection and postpartum endometritis in BV(+) and control group patients*

	BVa(+) n (%)	Control n (%)
Chorioamnionitis	2 (4%)	1 (0.7 %)
Wound infection	2 (4%)	3 (2.2 %)
Postpartum endometritis	1 (2%)	1 (0.7%)

**There were no statistically significant differences between the BVa(+) and control groups regarding the incidence of chorioamnionitis, wound infection, and postpartum endometritis (p > 0.05). a: bacterial vaginosis*

DISCUSSION

In this study, we evaluated the impact of symptomatic bacterial vaginosis (BV) during the second trimester of pregnancy on pregnancy outcomes. Our findings indicated that women diagnosed with BV had significantly higher rates of preterm labor and premature rupture of membranes (PROM). These results largely align with current literature.

A significant relation is known to be present between presence of BV and various pregnancy complications including preterm labor in early pregnancy (Guerra et al., 2006; Menard and Bretelle, 2012; Oliver and Lamont, 2013). According to a study performed by Riduan et al., presence of BV in particularly early second trimester (weeks 16-20) is a more important risk factor in terms of preterm labor development and compared to weeks 28-32 (Riduan et al., 1993). For this reason, we constituted our study group from pregnant women in gestational weeks between 14-26.

Nugent score, assumed to be a gold standard and used commonly in the diagnosis of bacterial vaginosis, limits clinicians to a certain degree since it requires additional staff and equipment and has a specific time of procedure. However, findings obtained with Nugent score are accepted to be more reliable, compared to evaluations performed just by clinical diagnosis criteria, since they are more subjective, possesses repeatable characteristics and has more sensitivity (Tam et al., 1998). Amsel criteria, multiplex PCR method are also within other methods used apart from Nugent score. In studies comparing Amsel criteria and Nugent score, it was concluded that Nugent score possesses better deterministic characteristics (Sha et al., 2005). Sensitivity and specificity of PCR method is very close to Nugent score, however due to higher cost and difficulties encountered upon application, PCR method is especially used in order to evaluate specific bacteria in bacterial vaginosis cases (Obata-Yasuoka et al., 2002; Sha et al., 2005). In line with all this information, Nugent score is used in BV screening of our study.

20% of BV(+) pregnant women had preterm labor in our study while this ratio was determined to be 9.4% in control group, and 20% of BV(+) pregnant women again had PPROM while 5.8% of pregnant women in control group was determined to have PPROM. Similar results were reported in most of other studies investigating the relation between preterm labor and bacterial vaginosis. In their meta-analysis performed in 2007, Leitich et al reviewed 18 studies including 20232 patients; according to this study BV positive pregnant women have the risk of preterm labor twice as much as BV negative pregnant women (odds ratio: 2.16; 95% CI: 1.56–3.00) (Leitich et al., 2003). In year 2012, in a cohort study including 1336 patients performed by Bothuyne-Queste et al., presence of BV was found to be associated with preterm labor (Bothuyne-Queste et al., 2012). However, there are studies which concluded that bacterial vaginosis were not associated with preterm labor and PPROM (Jacobsson et al., 2002; Oakeshott et al., 2004; Thorsen et al., 2006). Oakeshott et al. did not find a significant relation between BV and preterm labor in their prospective cohort study performed in South London on 1216 pregnant women with bacterial vaginosis (Oakeshott et al., 2004). Also, in a cohort study where Jacobsson et al. determined BV prevalence as 15,6% on 924 Swedish pregnant women, although swab samples were taken at week 12 in average, no statistically significant relation were reported to be determined between preterm labor and BV. However, the fact that these studies were performed on low risk populations in terms of preterm labor and PPROM suggests that it may have been more difficult to determine the effects of BV on pregnancy.

Most of the previous studies investigated any relation between BV and peripartum infections (episiotomy infection, cesarean wound site infection, postpartum endometritis). Watts et al. reported in their study investigating the effect of BV in post-cesarean development of endometritis that patients with endometritis increased 6-fold in presence of BV (Watts et al., 1990). In our study postpartum endometritis, chorioamnionitis and wound infections were encountered more frequently in BV(+) pregnant women

compared to control group, however, a statistically significant difference was not determined. As a result of evaluation, since total wound site infection number is low in the hospital and due to relatively low case numbers in our study are both thought to be effective on this result. Alternatively, it is estimated that these complications could be detected in higher ratios if the study group is formed from pregnant women on first trimester instead of second trimester within study design.

Upon examining high PPROM and preterm labor ratios in our study, it is thought that importance of screening and treatment indications is increased more in pregnant women determined to have BV. In the meta-analysis of United States Preventive Services Task Force (USPSTF) including three different studies, it was determined that a significant decrease in preterm labor ratio could not be obtained as a result of the treatment of 526 pregnant women determined to have asymptomatic BV and carry low risk factors for preterm labor. In another meta-analysis study of the same group including eight studies, a significant decrease could not be determined n preterm labor ratio as a result of the treatment of 4972 pregnant women with asymptomatic BV diagnosis and carry moderate risk factors for preterm labor (Nygren et al., 2008). According to this data, it is understood that preterm labor and other negative results it caused could not be prevented with applying BV screening and treatment of asymptomatic BV in pregnant women, therefore routine treatment administration is not recommended in asymptomatic pregnant women. However, as in our study group, other clinical studies exist that shows important reduction of BV complications by proper screening measures appropriate for bacterial vaginosis patients and antimicrobial treatment in symptomatic bacterial vaginosis patients (McGregor and French, 2000). Therefore clinicians are recommended to use proper screening measures and administer necessary treatment in patients with symptoms resembling BV. Screening with vaginal swab in primary healthcare institutions is thought to be a very economical method for all symptomatic pregnant women especially upon considering related costs for preterm labor.

Ng et al. reported significantly increased rates of preterm birth and associated neonatal complications in pregnant women diagnosed with BV (Ng et al., 2023). Similarly, Mu et al. identified that vaginal microbiome imbalance in early second trimester is linked to preterm prelabor rupture of membranes (PPROM) (Mu et al., 2023). Consistent with these findings, our study found a notably higher incidence of PPROM in the BV-positive group.

The systematic review by Yefet et al. highlighted that screening and treatment of BV in high-risk pregnancies reduces the rates of preterm delivery (Yefet et al., 2025). These findings support the clinical importance of early diagnosis in symptomatic cases. Furthermore, the network meta-analysis by Wu et al. emphasized the positive impact of BV treatment on maternal-fetal outcomes, particularly when antibiotic therapy is initiated early in pregnancy (Wu et al., 2025).

Bhakta et al., provided data from regions with high BV prevalence, demonstrating that improved diagnosis and management positively affect maternal and neonatal health outcomes (Bhakta et al., 2021). Our findings are consistent with this perspective, underscoring the need for standardized algorithms for managing symptomatic BV cases.

Klebanoff et al., through an individual participant data meta-analysis, showed that antibiotic treatment of BV can reduce the risk of preterm birth (Klebanoff et al., 2023). Our results reinforce the necessity of careful monitoring of untreated BV cases due to these associated risks.

A systematic review by Hoffmann et al. concluded that routine screening for abnormal vaginal flora significantly decreases the odds of preterm birth (Hoffmann et al., 2023). Similarly, Sethi et al. summarized the adverse pregnancy outcomes related to BV, emphasizing the importance of screening and early intervention strategies, particularly in low socioeconomic populations (Sethi et al., 2025).

CONCLUSION

Consequently, bacterial vaginosis determined in symptomatic pregnant women in second trimester, increase frequency of preterm labor and premature rupture of membranes. Therefore, it was decided that multi-center and large-scale conduction of proper screening tests and treatment administrations is necessary in a way to include primary healthcare institutions, in terms of lowering the frequency of these complications and to decrease healthcare costs caused by these negative situations.

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None

CONFLICT OF INTEREST

No conflict of interest was declared by the authors.

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