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Frequency of Bacterial Vaginosis among Pregnant Women Experiencing Preterm Labor

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ABSTRACT

Background and Objective: Infants born prematurely are at an increased risk of experiencing cerebral palsy, respiratory problems and developmental delays. Bacterial vaginosis, a condition that causes inflammation of fetal membranes, vaginitis, and cervicitis, can lead to the premature rupture of membranes and labor. The main objective of this article is to determine the prevalence of bacterial vaginosis among pregnant women experiencing preterm labor between 20 and 36 weeks of gestation.

Methods: This cross-sectional study was conducted on 100 cases of preterm labor. To investigate variables associated with bacterial vaginosis. Variables related to bacterial vaginosis and relevant epidemiological and clinical data were collected and analyzed. Amsel's criteria were used to diagnose bacterial vaginosis.

Findings: The prevalence of BV among pregnant female with preterm labor was found to be 44 (44%). Among the BV-positive cases, 28 (63.6%) patients aged between 25 and 44 years. 56 people (56%) of those who had a negative bacterial vaginosis test had preterm delivery. A significant correlation was observed between BV and living in urban areas ($p<0.05$). Furthermore, BV was significantly linked with early rupture of membranes ($p<0.05$). Vaginal infections were also more prevalent in BV-negative cases ($p<0.05$). No statistically significant associations were found between BV and threatened abortion or miscarriage.

Conclusion: The results of this study showed that the prevalence of bacterial vaginosis in patients with premature labor is relatively high. Bacterial vaginosis is significantly more common among patients living in urban areas and is associated with premature rupture of membranes and certain types of premature labor.

Keywords: *Preterm Labor, Bacterial Vaginosis, Vaginitis.*

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Introduction

Preterm birth refer to births occurring before 37 weeks of pregnancy and are associated with various complications, including cerebral palsy, respiratory issues, developmental delays, and hearing problems (1). Majority of neonatal deaths and illnesses are attributed to births before 32 weeks of gestation, comprising 2% of all births. Preterm labor is estimated to occur in 6-15% of pregnancies, with 40-50% starting spontaneously and 25% following preterm, and pre-labor rupture of membranes (2). Such deliveries account for 60-80% of non-congenital infant deaths globally, contributing significantly to perinatal morbidity and mortality (3). Infections are responsible for around 40% of preterm labor cases, with bacterial vaginosis (BV) being a notable contributor (4).

The dominant bacteria in the vaginal microbiota of both non-pregnant and pregnant individuals is primarily Lactobacillus spp. BV occurs when there is an imbalance in the vaginal microbiota, characterized by a decrease in normal Lactobacillus and an excessive growth of mixed anaerobic bacteria (5). BV, identified by a transfer of normal vaginal flora to anaerobic microorganisms like Gardnerella vaginalis, Bacteroides, Mycoplasma hominis, Mobiluncus, Fusobacterium, and Pepto-streptococcus, is the most prevalent vaginal infection in females of reproductive age, influencing 5% to 70% of individuals at any given time (6, 7). BV typically presents with an increase in fishy-smelling vaginal discharge, often white or grey in color, and may be accompanied by mild itching or burning during urination. However, some cases may exhibit no symptoms. Pregnant women with BV face twice the risk of preterm birth in comparison to cases without the infection (8). BV during pregnancy is linked with a higher likelihood of adverse results, such as preterm birth, low birth weight, chorioamnionitis, postpartum endometritis, and bothersome vaginal discharge (5). Previous studies have reported BV as a strong risk factor for preterm labor (9-11).

BV diagnosis is made employing Amsel's criteria, including vaginal discharge, the sniff test, vaginal pH above 4.5, and the clue test (12). Treatment typically involves antibiotics such as metronidazole or clindamycin, administered over the second or third trimester of pregnancy. However, recurrence of BV is common in post-treatment (13). Given the reason that there has been no study on Iraqi population, the objective of the current research is to investigate the prevalence of BV in pregnant females experiencing preterm labor between 20 and 36 weeks of gestation in Tikrit, Iraq.

Methods

The research was conducted in Tikrit, Iraq, from January 2022 to July 2022. This cross-sectional study utilized a convenient sample of 100 cases to investigate the variables associated with the absence or presence of BV. The study included individuals who met specific criteria, including a gestational age between 20 and 36+6 weeks (14), experiencing painful uterine contractions exceeding two every 10 minutes, lasting over 45 seconds each, cervical dilatation ranging from 1 to 4 cm, and cervical effacement exceeding 25%. Exclusion criteria included a gestational age of less than 20 weeks, a history of antepartum hemorrhage (APH), urinary tract infections, medical complications, and obstetrical indications for preterm labor (PTL). Relevant epidemiological and clinical data were obtained from each patient, including demographic information and baseline studies, such as an ultrasound performed during pregnancy. The American College of Obstetricians and Gynecologists deemed 20 weeks of gestation to be the age of viability, with a test sensitivity of 97.7%. To test for bacterial vaginosis, Amsel's criteria (15) were applied, which included assessing vaginal pH (>4.5), appearance of a thin, uniform discharge of greyish-white color, presence of clue cells in vaginal smear, and performing the Whiff test. A positive diagnosis of BV required 3 out of the 4 tests to be positive. The research participants were positioned in the dorsal position, and a clean, non-

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lubricated speculum was inserted in the vagina for examination. Vaginal fluid was collected using sterile cotton swabs for further testing, including pH measurement and the Whiff test. The presence of clue cells was observed under a microscope.

This study and its protocol were approved by the authority of the health institution at Tikrit University (Code: TUJ., EC: 1-4-2022, 178). Also, we used the American Psychological Association's ethical issues. The involved applicants (or their relatives) provided a written informed agreement. The whole research was done based on the Helsinki Declaration. Data input and analysis are conducted utilizing the SPSS-18. The chi-square and t-test are used to investigate the proportions of different variables among the study groups. Statistical significance was determined at a p-value less than 0.05. The data were presented using pie charts.

Results

The prevalence of BV among patients with preterm labor was 44 (44%). Among the positive cases with BV, 28 (63.6%) were aged 25-44 years old, compared to 32 (57.1%) of those negative for BV. However, this relationship was not statistically significant, as presented in Table 1.

Table 1. The relation between bacterial vaginosis and age

Age	Bacterial Vaginosis test result		
	Positive Number(%)	Negative Number(%)	Total Number(%)
15-24 years	16(36.4)	24(42.9)	40(40)
25-44 years	28(63.6)	32(57.1)	60(60)
Total	44(100)	56(100)	100(100)

X^2=0.433, df=1, p>0.05 not significant

Regarding the geographical distribution, most of the positive BV cases are from urban areas (32; 72.7%) compared to 12 (27.3%) from rural areas, while the negative BV cases comprised 28 (50%) from both urban and rural areas. This distinct is significant ($p<0.05$), as indicated in Table 2.

Table 2. The relation between bacterial vaginosis and residence

Residence	Bacterial Vaginosis test result		
	Positive Number(%)	Negative Number(%)	Total Number(%)
Urban	32(72.7)	28(50)	60(60)
Rural	12(27.3)	28(50)	40(40)
Total	44(100)	56(100)	100(100)

X^2=5.303, df=1, p<0.05 significant

Furthermore, the majority of positive BV cases were multipara (32; 72.7%), whereas 24 (42.9%) of the negative cases were multipara. Conversely, the lowest proportion was observed among nullipara, with 4 (9.1%) positive cases and 8 (14.3%) negative cases. This distinct is significant ($p<0.05$), as presented in Table 3.

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Table 3. The relation between bacterial vaginosis and Parity

Parity	Bacterial Vaginosis test result		
	Positive Number(%)	Negative Number(%)	Total Number(%)
Nullipara	4(9.1)	8(14.3)	12(12)
Para one	8(18.2)	24(42.9)	32(32)
Multipara	32(72.7)	24(42.9)	56(56)
Total	44(100)	56(100)	100(100)

X^2=9.168, df=1, p<0.05 significant

Additionally, 1 (2.3%) of the positive cases experienced early rupture of membranes, whereas none (0%) of the negative cases had this condition, showing a statistically significant relationship (Table 4).

Table 4. The relation between bacterial vaginosis and Rupture membrane

Early rupture membrane	Bacterial Vaginosis test result		
	Positive Number(%)	Negative Number(%)	Total Number(%)
No	43(97.7)	56(100)	99(99)
Yes	1(2.3)	0(0)	1(1)
Total	44(100)	56(100)	100(100)

X^2=19.7, df =1, p<0.05 significant

Vaginal infection was found in 4 (14.3%) positive cases compared to 4 (33.3%) negative cases. Threatened abortion was reported in 16 (57.1%) positive cases and 8 (66.7%) negative cases. Miscarriage occurred in 4 (14.3%) positive cases but none in the negative cases. Preterm labor was observed in 4 (14.3%) positive cases and none in the negative cases. However, this relationship was not significant, as presented in Table 5.

Table 5. The correlation of BV and past medical history

Past history	Bacterial Vaginosis test result		
	Positive Number(%)	Negative Number(%)	Total Number(%)
Vaginal infection	4(14.3)	4(33.3)	8(20)
Threatened abortion	16(57.1)	8(66.7)	24(60)
Miscarriage	4(14.3)	0(0)	4(10)
Preterm labor	4(14.3)	0(0)	4(10)
Total	28(100)	12(100)	40(100)

X^2=5.079, df=3, p>0.05 not significant

Regarding specific labor types, 32 (72.7%) of the positive BV cases had spontaneous preterm labor (SPAL), while 32 (57.1%) of the negative cases had SPAL. Symptomatic preterm labor (SPL) was present in 8 (18.2%) positive cases and 4 (7.1%) negative cases. Indicated preterm labor (IPL) occurred in 4 (9.1%) positive cases and 20 (35.7%) negative cases. These findings indicated a statistically significant relationship, as demonstrated in Table 6.

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Table 6. The relation between bacterial vaginosis and type of labor

Labor	Bacterial Vaginosis test result		
	Positive Number(%)	Negative Number(%)	Total Number(%)
SPAL*	32(72.7)	32(57.1)	64(64)
SPL**	8(18.2)	4(7.1)	12(12)
IPL***	4(9.1)	20(35.7)	24(24)
Total	44(100)	56(100)	100(100)

X^2=10.714, df=2, p<0.05 significant *Spontaneous actual preterm labor, **Spontaneous preterm labor, ***Induction of preterm labor

Discussion

Based on the findings of this research, the prevalence of BV among pregnant females with preterm labor is found to be 44%. Although no significant association is detected for BV and age, a significant link was identified between BV and residing in urban areas. Furthermore, multiparous women exhibited a higher prevalence of BV determined to nulliparous women. BV was also significantly related to early membranes rupture.

The findings of this research give strong evidence proving the relation of BV and adverse pregnancy cases, regardless of racial and cultural disparities. BV remains a significant risk factor for unfavorable pregnancy cases, particularly premature labor (16, 17). Our research findings validate the strong association between BV and preterm labor (PTL), as observed in previous studies of similar nature. For instance, Kampan et al. (17) stated a BV prevalence of 44% in those who experienced preterm delivery. Similarly, Hill (18) obtained comparable results, with a 44.5% prevalence of BV among their cohort of women with PTL. Various diagnostic approaches exist for BV, including Amsel's criteria, bacterial culture, quantitative polymerase chain reaction, and Gram stain. Among these, Amsel's criteria, widely utilized by healthcare professionals worldwide, rely on clinical evaluation. Multiple studies have compared the diagnostic performance of these methods (19). According to (20-22), they found that the specificity and sensitivity of Amsel's test in their cohort were 99% and 37% higher, in comparison to the Nugent score. Bacterial cultures demonstrated limitations in terms of sensitivity and specificity. Although studies indicate that the Nugent score is a more appropriate approach than Amsel's criteria, it is less employed in clinical settings due to being time-consuming and experts required for interpretation. Therefore, Amsel's criteria continue to be the mostly tested diagnostic standards for bacterial vaginosis. In our research, we found that the Whiff test showed the highest accuracy (97.7%). The priority of the Whiff test over the detecting of clue cells is its simplicity and feasibility for bedside testing, whereas the latter is a laboratory-based test. The Whiff test also exhibited good sensitivity, approximately 95.5%. A negative clue test result indicates the absence of bacterial vaginosis with a high degree of certainty. Our study holds significance as identifying risk factors can assist reduce the prevalence of BV and mitigate its negative consequences, such as preterm labor. This is crucial considering the established fact that treating BV does not mostly result in reduction of adverse pregnancy cases related to it. Therefore, it is vital to detect risks and, if possible, address them to reduce the prevalence of BV. We considered history, parity, and geographic location (urban vs. rural) as risk variables. Notably, we found a significant relation among BV and previous preterm deliveries and early membrane rupture. Our research also revealed a significant distinct of rural and urban women in terms of the frequency of BV. Although one might expect rural women to have a lower incidence, previous studies have shown that rural living is not a risk factor for bacterial vaginosis. Several important researches, such as the

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investigation by Bhalla et al., (23) have explored the incidence of BV in both urban and rural areas (reference needed). The study found an overall diagnosis rate of bacterial vaginosis in 32.8% of individuals. Urban slums had the highest prevalence at 38.5%, followed by rural areas at 28.7%, and urban middle-cases areas at 25.5%. There was little difference observed between the middle class in rural and urban areas.

In this study conducted in Tikrit, Iraq, we found a high prevalence of BV in cases experiencing preterm labor. BV was present in 44% of the patients, highlighting its significant association with preterm labor. While no significant link was seen in BV and age, there was a notable link between BV and urban areas. Multiparous women had a higher prevalence of BV in comparison to nulliparous females. Additionally, BV was deduced to be mainly related to early rupture of membranes.

The BV diagnosis by utilizing Amsel's criteria proved effective in identifying the infection. However, it is worth noting that the recurrence of BV post-treatment is common, indicating the need for further interventions. Our study contributes to the understanding of BV prevalence among the Iraqi population, shedding light on the importance of identifying risk factors to reduce the incidence of BV and mitigate its negative consequences, particularly in relation to preterm labor.

Further research is required to explore interventions and strategies for preventing and managing BV, considering the limitations associated with bacterial cultures' sensitivity and specificity. Additionally, efforts should be made to raise awareness among healthcare professionals regarding alternative diagnostic tools such as the Whiff test, which offers simplicity and bedside applicability. By identifying and addressing risk factors, we can strive to reduce the burden of BVs and its associated adverse pregnancy outcomes.

This study found that the prevalence of BV in cases with preterm labor is relatively high. Factors such as age and parity were not statistically related to BV. However, BV was mainly more common among patients from urban areas. BV was also linked to early rupture of membranes and specific types of preterm labor.

Conflict of interest: The authors declare no conflict of interest.

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