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Original Research Article

Prevalence of bacterial vaginosis in pregnant women and its association with adverse perinatal outcomes

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ABSTRACT

Introduction: Increased vaginal discharge in pregnant women in many instances is not pathological. Vulvovaginal infections like bacterial vaginosis (BV), candidiasis or trichomoniasis can result in abnormal vaginal discharge. Bacterial Vaginosis is diagnosed more frequently in women with established preterm labor (PTL) or delivery and with preterm rupture of membranes. Adverse pregnancy outcomes such as spontaneous abortion, PTL, premature delivery, preterm premature rupture of the membranes (PPROM), amniotic fluid infection, postpartum endometritis, and post-cesarean wound infections have been reported.
Materials and Methods: We conducted this study to determine the prevalence of bacterial vaginosis in 246 pregnant women and its association with adverse perinatal outcomes. Prevalence of bacterial vaginosis in pregnant women attending the antenatal clinic was studied using Nugent's scoring system. Perinatal outcomes were also assessed.
Results: The prevalence of bacterial vaginosis was maximum in the age group 21-25 years (46.43%), followed by 26-30 years (25%). The association of perinatal outcome and bacterial vaginosis among patients showed that PROM, LBW and IUGR infant had more bacterial vaginosis with a statistically significant association with bacterial vaginosis ($P<0.05$).
Conclusion: Bacterial vaginosis is a major public health problem prevalent in pregnant women and associated with adverse perinatal outcomes. Research should continue to evaluate the risks and benefits of medications to the mother and fetus. More focus needs to be placed on the prevention of preterm labor and premature rupture of membranes rather than the treatment of preterm labor once it occurs.

1. Introduction

Increased vaginal discharge in pregnant women in many instances is not pathological.[1] However, abnormal vaginal discharge is the result of vulvovaginal infections that include bacterial vaginosis (BV), candidiasis or trichomoniasis.[1–3] Vaginal flora of a normal asymptomatic reproductive age woman includes multiple aerobic as well as anaerobic species.[4] Of these, anaerobes outnumber aerobic species and the ratio is approximately 10:1.[5] BV is a polymicrobial syndrome. It is characterized by a shift in vaginal flora. Lactobacilli are predominant flora that are gradually replaced with anaerobes such as Gardnerella vaginalis, Prevotella, Bacteroides and Mobiluncusspecies and other bacteria including Mycoplasma and Ureaplasma species.[6] BV is one of the most common conditions encountered in sexually transmitted diseases (STD), genitourinary medicine or other reproductive health clinics throughout the world.[6,7] The condition had been previously called Haemophilusvaginalis vaginitis, nonspecific vaginitis and G. vaginalis vaginitis.[8] Bacterial vaginosis is diagnosed more frequently in women with established preterm labor (PTL) or delivery and with preterm rupture of membranes. It is sometimes accompanied by discharge, odor, pain, itching, or burning sensation and is especially common during pregnancy. It can result in adverse pregnancy outcomes like spontaneous abortion, PTL, premature delivery, preterm premature rupture of the membranes (PPROM),

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amniotic fluid infection, postpartum endometritis, and post-cesarean wound infections.[9] The adverse perinatal outcome following preterm delivery is considerable, accounting for up to 70% of perinatal mortality worldwide. Neonatal complications like prematurity, low birth weight babies, neonatal infections with neurodevelopmental problems leading to cerebral palsy have also been implicated.[9] Today, Nugent scoring is the most frequently used laboratory-based diagnostic tool for detecting bacterial vaginosis and it is considered as the gold standard. Nugent's scoring is employed along with magnification, using oil immersion. Because of adverse maternal and fetal outcomes associated with BV in pregnancy, pathological vaginal discharge needs to be appropriately evaluated and adequately treated in our environment.[7] Despite over 20% prevalence of BV in pregnancy, published data regarding the epidemiology of BV in pregnancy in developing countries are few. Hence, the present study was conducted to study the prevalence of bacterial vaginosis in pregnant women and its association with adverse perinatal outcomes. Also**,** we evaluated the association between predisposing factors for bacterial vaginosis and the effect of metronidazole treatment in patients with bacterial vaginosis.

2. Materials and Methods

The present study was a prospective observational hospital-based study performed between May 2017 and August-2019. In this study, pregnant women attending antenatal care at the Department of Obstetrics and Gynecology in a tertiary care hospital were included with the following criteria.

2.1. Inclusion criteria

1. Pregnant women with single intrauterine pregnancy at their first antenatal check-up between 16-20 weeks
2. Patients aged between 18-40 years

Exclusion criteria

1. Patients with active vaginal bleeding.
2. History of cervical insufficiency in past pregnancies.
3. Antimicrobial treatment in the previous two weeks.
4. History of congenital anomalies in past pregnancies.
5. History of Ectopic pregnancy.
6. Systemic diseases such as diabetes mellitus, hypertension, heart diseases.
7. Previous history of PPROM or preterm delivery.

2.2. Data collection

Pregnant women between 16-20 weeks visiting for their routine antenatal check-up was screened using the above inclusion and exclusion criteria. Detailed clinical history to identify risk factors and examination to rule out high-risk pregnancy was performed. High vaginal swabs (HVS) were taken and Nuge was done after Gram-stain. Metronidazole treatment regime was done. Follow-up of all the patients was kept between 28-32 weeks and till delivery to assess perinatal outcomes.

2.3. Methodology

HVS was taken under all aseptic precautions. The vaginal area was cleaned with saline. Under the aseptic condition, the swab was then sent to the laboratory in a swab container in for gram staining.

2.4. Amsel's criteria

The diagnosis was positive for BV if at least three out of the four criteria were fulfilled. These criteria are:

1. Presence of a typical discharge: Discharge is homogenous, usually white or grey in color and coats the inner wall of a vagina. It often smells like fish.
2. pH$>$ 4.5, tested on a pH paper.
3. The whiff's test was performed by pl speculum after the vaginal fluid with a drop of KOH on a microscopic slide. The KOH causes a release of volatile amines from the vaginal fluid. These amines were products of anaerobic bacterial metabolism.
4. Clue cells: These are the epithelial cells of the vagina that get their distinctive stippled appearance by being covered with bacteria. The cells appear to be speckled with cocco-bacilli on a saline smear on gram staining.

2.5. Nugent's criteria

In this, three types of bacteria are evaluated using the Gram-stain which includes the following.

1. Lactobacillus.
2. Bacteroides/Gardnerella.
3. Mobiluncus.

Grading is done as below.

1. Grade 1: $<$ 1 cell/field.
2. Grade 2: 1-5 cells/field.
3. Grade 3: 6-30 cells/field.
4. Grade 4: $>$30 cells/field.

The two bacteria namely, Lactobacillus and Bacteroides/Gardnerella, were scored between zero to four. However, Mobiluncus was only graded from 0-2.

The final score was calculated as below.

1. Normal: 0-3.
2. Intermediate bacterial count: 4-6.
3. Bacterial vaginosis: 7-10.

The mode of treatment was metronidazoleoral tablet 250 mg thrice a day for seven days n confirmed bacterial vaginosis patients.

Perinatal outcomes were assessed for association with instrument or cesarean delivery, preterm, or early rupture of the membranes, mortality, low birth weight, IUGR, asphyxia, intrauterine death, etc

2.6. Ethical Consideration

The institutional ethical committee approved the study.

2.7. Sample size

Total of 246 pregnant women attending OPD in the Department of Obstetrics and Gynecology were included in the study.

2.8. Statistical analysis

Data was captured in Microsoft excel 2007 and was analyzed using SPSS version 22 Continuous variables were described as means (standard deviation) or medians (interquartile range) depending on the distribution of data. If applicable, for qualitative and quantitative data, test like the Chi-square test and t-test /ANOVA was used for comparison of variables. P-value < 0.05 was considered as significant.

3. Results

The Table 1 shows parity distribution among pregnant women. Out of 246 cases, parity of 1-2 were the most common type (70.33%) followed by nullipara women (21.54%).

Table 2 shows the characteristics of vaginal discharge among patientsColour of the vaginal discharge: It was observed that maximum numbers ofpatients had clear color discharge (37.39%) followed by grey (33.74%) and yellow (28.86%) colored discharge. The statistical analysis of the data showed that there was no specific pattern of patients with respect to the color of the vaginal discharge. The thickness of vaginal discharge: The maximum number of patients hadthick consistency of discharge (56.5%) followed by frothy (26.02%) and watery (17.48%) consistency. The odor of vaginal discharge: The maximum number of patients had no foul smell discharge (51.62%) followed by foul smell discharge (48.37%). The statistical analysis of the data showed that there was no specific pattern of patients with respect to the odor of the vaginal discharge.

Table 3 shows Amsel's criteria among patients. It was observed that the maximum numbers of patients had Amsel's criteria <3.

Table 4 shows Nugent's score among the patients. It was observed that Nugent's patients score 7-10 (bacterial vaginosis) was in 28 (11.38%) patients.

Table 5 shows that the prevalence of bacterial vaginosis among patients was 11.38%.

Table 6 shows perinatal outcomes among patients. The maximum numbers of patients had low birth weight (5.69%), followed prematurity (3.25%), NICU admission (4.47%), IUGR (1.22%) and PROM (0.81%).

Table 7 shows results about the association between bacterial vaginosis and perinatal outcome among studied patients. BV and PROM: The study results show that PROM occurred in only two patients and both these cases were also positive for bacterial vaginosis. However, another 10.6% i.e. 26 patients, also had bacterial vaginosis but PROM was absent in those cases. BV and LBW: The study results indicated that patients significantly highpercentage of patients with BV delivered infants having low birth weight, which showed that there is a significant ($P<0.05$) association between BV and LBW. BV and IUGR: The study results show that IUGR occurred in only three patients and bacterial vaginosis was present in these cases. However, another 10.2% i.e. 25 patients, also had bacterial vaginosis, but IUGR was absent in those cases.

Table 8 shows bacterial vaginosis in patients with metronidazole treatment. It was observed that only 3 (7.7%) patients had bacterial vaginosis treated with metronidazole.

4. Discussion

Bacterial Vaginosis (BV) is a common medical problem in women that can be associated with significant morbidity and complications. Bacterial vaginosis being one of the common etiology of vaginal discharge during pregnancy, merits early and accurate diagnosis as it can lead to adverse outcomes such as premature rupture of membranes, chorioamnionitis, preterm delivery, postpartum endometritis. The present observational study was conducted to determine the prevalence of bacterial vaginosis in pregnant women antenatal clinic. It was observed that the maximum number of patients had clear discharge (37.39%) followed by grey (33.74%) and yellow colored discharge. The maximum numbers of patients had thick consistency of discharge (56.5%) followed by frothy (26.02%) and watery (17.48%) consistency. The foul-smelling discharge was observed in 48.37% of pregnant women. In SM Ibrahim et al[10] study, a yellow, watery and malodorous discharge was reported in most patients with BV. Regarding the discharge characteristics, there are discrepant results. Some report the classical description of thin, gray, homogenous and frothy[11] and others a description of white and yellow, which is similar to our findings. In the present study, the prevalence of bacterial vaginosis among patients was 11.38%. SM Ibrahim et al.reported the prevalence of BV among pregnant women to be 17.3%. In study by Kamga et al[12] observed the BV prevalence of 26.2% in pregnant women. Age showed significant association with bacterial vaginosis ($P<0.05$) while parity and education

Table 1: Distribution of patients according to parity

Parity	No of patients	Percentage
0	53	21.54
1-2	173	70.33
3-4	17	06.91
>4	03	01.22
Total	246	100
Chi–square 291.171; df: 3, P=<0.05; Table Value: 7.82		

Table 2: Distribution of patients according to vaginal discharge characteristic

Vaginal discharge characteristics		No of patients (n=246)	Percentage	P value
Colour	Clear	92	37.39	Chi–square 2.707; df:2, P= Not Significant; Table Value: 5.99
	Yellow	71	28.86	
	Grey	83	33.74	
Consistency	Thick	139	56.50	Chi–square 62.122; df: 2, P=<0.05; Table Value: 5.99
	Watery	43	17.48	
	Frothy	64	26.02	
Odor	Foul smell	119	48.37	Chi–square 0.26; df: 1, P= Not Significant; Table Value: 5.99
	No smell	127	51.62	

Table 3: Distribution according to Amsel's criteria

Amsel's criteria	No of patients	Percentage
<3	216	87.80
≥3	30	12.20
Total	246	100

Table 4: Distribution according to Nugent's score

Nugent's	No of patients	Percentage
0-3	216	87.81
4-6	02	00.81
7-10	28	11.38
Total	246	100

Table 5: Distribution according to prevalence of bacterial vaginosis

Bacterial vaginosis	No of patients	Percentage
Present	28	11.38
Absent	218	88.62
Total	246	100
Chi–square 146.748; df: 1, P=<0.05; Table Value: 3.84		

Table 6: Distribution according to peri-natal outcome

Perinatal outcome	No of patients (n=246)	Percentage
LBW	14	05.69
Prematurity	08	03.25
PROM	02	00.81
NICU admission	11	04.47
IUGR	03	01.22

Table 7: Association of perinatal outcome and bacterialvaginosis

Perinatal outcome		Bacterial Vaginosis				Total	Total percent	P-value
		Present	Percent	Absent	Percent			
PROM	Present	02	0.8	00	00	02	0.8	Chi–square15.699; df: 1; Table Value: 3.84; P=<0.05;
	Absent	26	10.6	218	88.6	244	99.2	
	Total	**28**	**11.4**	**218**	**88.6**	**246**	**100.0**	
LBW	Present	21	8.2	03	1.2	24	9.4	Chi–square 15.361; df: 1; Table Value: 3.84; P=<0.05
	Absent	07	2.7	215	87.9	222	90.6	
	Total	**28**	**10.9**	**228**	**89.1**	**246**	**100.0**	
IUGR	Present	03	1.2	00	0.0	03	1.2	Chi–square 23.646; df: 1; Table Value: 3.84; p=<0.05
	Absent	25	10.2	218	88.6	243	98.8	
	Total	**28**	**11.4**	**218**	**88.6**	**246**	**100.0**	

Table 8: Distribution according to metronidazole treatment in patients with bacterial vaginosis

Bacterial Vaginosis	No of patients	Percentage
Present	03	07.70
Absent	36	93.30
Total	39	100
Chi–square 27.923; df: 1, P=<0.05; Table Value: 3.84		

showed no statistical significant association with bacterial vaginosis (P>0.05) The perinatal outcome among patients showed the maximum number of patients had low birth weight (5.69%), followed by prematurity (3.25%), NICU admission (4.47%), IUGR (1.22%) and PROM (0.81%). BV was more frequently associated with preterm than term pregnancy, which is similar to a study carried out in the South-Eastern Nigeria.[13] This clearly indicates that pregnant women with complaints of vaginal discharge adequate should be adequately screened to diagnose and treat BV. This can help prevent preterm delivery and complications related to BV. Among all the patients treated with metronidazole for bacterial vaginosis, only three patients required further treatment with metronidazole. As BV has been associated with increased risk of preterm labor and premature rupture of membranes, further studies on a larger scale are needed to evaluate the effectiveness of drug treatments used in pregnancy. Additional research is needed on BV risk factors such as low income, unmarried status, and Black race. Research should continue to evaluate the risks and benefits of medications to the mother and fetus. More focus needs to be placed on the prevention of preterm labor and premature rupture of membranes rather than the treatment of preterm labor once it occurs. We need to increase our understanding of BV and its relationship to pregnancy, preterm labor, and premature rupture of membranes.

5. Conclusion

Bacterial vaginosis is a major public health problem prevalent in pregnant women and associated with adverse perinatal outcomes important being preterm labor. Routine vaginal and cervical swab sample cultures should be performed on all pregnant women during prenatal visits, especially during the second and third trimesters to avoid perinatal complications. As BV has been associated with increased risk of preterm labor and premature rupture of membranes, further studies on a larger scale are needed to evaluate the effectiveness of drug treatments used in pregnancy. Research should continue to assess the risks and benefits of medications to the mother and fetus. More focus needs to be placed on the prevention of preterm labor and premature rupture of membranes rather than the treatment of preterm labor once it occurs.

6. Source of Funding

None.

7. Conflict of Interest

None.

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