ORIGINAL RESEARCH ARTICLE

Bacterial vaginosis in pregnancy: prevalence and outcomes in a tertiary care hospital

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Abstract

Bacterial Vaginosis (BV) has recently emerged as a global health issue especially in pregnant women because of its adverse outcomes. Various studies have shown the impact of BV on both mother and baby as well as overall reproductive health of women. The study intended to assess the prevalence of BV in pregnant women visiting our hospital and estimate the risk of associated complications. A retrospective study was done on pregnant women who underwent vaginal swab for BV during the period January 2018- July 2019. BV was diagnosed by Nugent score and obstetric details until delivery were noted for pregnancy outcomes. Out of 217 women included in the study, 44 were diagnosed as positive for BV. Variables were compared between BV positive and negative groups by Chi square and t- test and risk ratios calculated for adverse pregnancy outcomes. Statistical analysis was done using SPSS 20.0 version. Prevalence of BV was found to be 20.3%. BV was significantly associated with preterm labour, premature rupture of membranes, preterm delivery, miscarriage, birth asphyxia, low birth weight, and neonatal intensive care unit admission. The study substantiated the evidence from previous studies that pregnant women with BV are at much higher risk for adverse maternal and fetal outcomes. Early Screening and awareness amongst women may help to prevent this. *(Afr J Reprod Health 2021; 25[1]: 49-55).*

Keywords: Adverse outcome, bacterial vaginosis, pregnancy

Résumé

La vaginose bactérienne (BV) est récemment apparue comme un problème de santé mondial, en particulier chez les femmes enceintes en raison de ses effets indésirables. Diverses études ont montré l'impact de la BV sur la mère et le bébé ainsi que sur la santé reproductive globale des femmes. L'étude visait à évaluer la prévalence de la BV chez les femmes enceintes visitant notre hôpital et à estimer le risque de complications associées. Une étude rétrospective a été menée sur des femmes enceintes ayant subi un prélèvement vaginal pour BV pendant la période janvier 2018-juillet 2019. La BV a été diagnostiquée par le score de Nugent et les détails obstétricaux jusqu'à l'accouchement ont été notés pour l'issue de la grossesse. Sur 217 femmes incluses dans l'étude, 44 ont été diagnostiquées positives pour BV. Les variables ont été comparées entre les groupes BV positifs et négatifs par le Chi carré et le test t et les ratios de risque calculés pour les issues défavorables de la grossesse. L'analyse statistique a été effectuée à l'aide de la version SPSS 20.0. La prévalence de la BV était de 20,3%. La BV était significativement associée au travail prématuré, à la rupture prématurée des membranes, à l'accouchement prématuré, à la fausse couche, à l'asphyxie à la naissance, à l'insuffisance pondérale à la naissance et à l'admission à l'unité de soins intensifs néonatals. L'étude a corroboré les preuves issues d'études précédentes selon lesquelles les femmes enceintes atteintes de BV courent un risque beaucoup plus élevé d'issues maternelles et fœtales indésirables. Le dépistage précoce et la sensibilisation des femmes peuvent aider à éviter cela. *(Afr J Reprod Health 2021; 25[1]: 49-55).*

Mots-clés: Effets indésirables, vaginose bactérienne, grossesse

Introduction

An imbalance of the ecosystem in the female genital tract in the background of various physiological changes in pregnancy predisposes these women to pathogenic microbiota called Bacterial Vaginosis (BV). It is the most frequently reported cause of vaginal infection in women[1]. Lactobacilli constitute 95% of micro flora in a healthy vagina and produce lactic acid and hydrogen peroxide (H2O2) with antimicrobial properties and acidify the vaginal pH to less than 4.5[2]. BV is characterized by the partial

loss of the native lactobacillus in the vaginal mucosa and overgrowth of various other bacteria with formation of a biofilm[3]. Despite the dramatic shift of microflora, some women with BV do not experience any symptoms. Symptomatic women usually present with vaginal discharge accompanied by lower abdominal pain and sometimes vulval itching, dysuria and dyspareunia[4].

BV has recently emerged as a global health issue especially in pregnant women because of its adverse outcomes. There is enough evidence through various studies that BV in pregnancy is associated with increased risk of severe complications including premature rupture of the membranes (PROM), preterm delivery, low-birth-weight (LBW) infants, amniotic fluid infection, chorioamnionitis and post-cesarean and postpartum endometritis[5-7]. A meta-analysis by Leitich et al showed that BV significantly increases chances of preterm delivery in both asymptomatic women and those with preterm labour symptoms[8]. Another meta-analysis reported BV as an important risk factor for prematurity and pregnancy morbidity[9]. The possible pathogenesis to link the infection with the risk of various complications is increased biosynthesis of prostaglandins by the pathogenic bacteria. This happens either through direct effect of some inflammatory mediators released by bacteria namely phospholipase A2 and C[10] or indirectly via inflammation of fetal membranes, chorion and amnion which then produce cytokines and prostaglandins to stimulate labour[11].

However, the results of treatment have been disappointing. Recurrence may occur in up to 80% of women after treatment[12]. There is not enough evidence to prove that treatment of BV during pregnancy may prevent the possibility of associated complications[13]. Only one study showed that treatment of women with both BV and intermediate flora reduced the overall incidence of preterm delivery and miscarriage in the group[14]. It is also documented that the risk of adverse outcomes may persist even when BV resolves during pregnancy[15]. The probable reason is the persistence of the biofilm which has been confirmed by vaginal biopsy even after treatment of BV[16].

The prevalence of BV varies from 5% to 58.5% based on the community studied[17]. The present study intends to estimate the prevalence of BV and the risk of associated adverse outcomes in pregnant women visiting hospital for antenatal care.

Methods

This retrospective study was conducted in Dr. Sulaiman Al Habib Hospital, Olaya Riyadh, a tertiary care hospital. Patients visiting our hospital are native Saudis as well as multiethnic expatriates. Total 217 healthy pregnant women were included in the study who visited the hospital from 1st January 2018 to 31st July 2019, all in the age group 18-45 years with a singleton <=36 weeks' gestation. These women underwent high vaginal swab based on presenting symptoms. Women with known obstetric complications, severe anemia, pregnancy induced hypertension, antepartum hemorrhage, fetal anomalies or those who lost follow up till delivery were excluded from the study.BV was diagnosed in these women by Nugent score, and obstetric details until delivery were noted for pregnancy outcomes. The variables were described in two groups; the case group included women with a positive diagnosis of BV and control group including those negative for BV.

Specimen collection

Sterile swab inserted into the upper part of vagina and rotated before withdrawing so that exudates are collected from the posterior vaginal vault or cervical orifice. The specimens were transported in Amie's transport medium immediately to the laboratory.

Nugent score

Smears prepared from the swab specimens on clean grease-free slides and Gram-stained. Gram stain uses Methyl violet as the primary stain, Lugol's iodine as the mordant, acetone as the decolouriser and safranin as counterstain. Each slide was studied under oil immersion and graded as per the standardized quantitative morphological classification method developed by Nugent et al[18]. Following morphotypes were given a score (0,1 to 4+), large gram-positive rods (Lactobacillus morphotypes), small gram-negative to gram-variable rods (Gardnerella and Bacteriodes morphotypes) and curved gram-variable rods (Mobiluncus morphotypes). Nugent score of 0-10

obtained by summing up individual score of all bacterial morphotypes. A score of 7 or higher diagnosed as BV, a score of 4 to 6 considered as intermediate and a score of 0 to 3 considered as normal (Table 1).

Data analysis

Subject related information was retrieved from hospital database and entered on an excel sheet, including the age, gravida, symptoms of discharge and nature of discharge including colour, consistency and odour, abdominal pain, vulval itching and dysuria, the gestational age at the time of testing also noted along with Nugent score. Treatment received for BV, gestational week at delivery and mode of delivery were also recorded. Antenatal complications and pregnancy outcomes studied were preterm labor, PROM, preterm delivery, miscarriage, LBW, birth asphyxia, Neonatal intensive care unit (NICU) admission. Statistical review was done using SPSS 20.0 version. For descriptive statistics qualitative data was expressed as frequency and percentage and numerical data as mean and SD. Inferential statistics were done using Chi-square test for comparison of various qualitative variables in two groups and unpaired t-test to match the mean maternal age, mean gestational age at testing and delivery amongst them. Risk ratios deduced to estimate association of BV with pregnancy outcomes, including preterm labor, preterm delivery, miscarriage, PROM, LBW, and NICU admissions. The limit of significance considered as p value <0.05.

Results

Total of 217 women were included in the study in the age range 22 to 44 years and mean age of 30.33$\pm$4.925. Forty-four women were diagnosed with BV by Nugent scoring criteria, giving an overall prevalence of 20.3%.

The mean age of positive cases was 29.863$\pm$5.24. The remaining 173 were considered negative for BV out of which 110(50.7%) had intermediate Nugent score, and 63(29%) had a negative score. Amongst the women in the case group, a majority (15 out of 44, 34.1%) were in the age tertile of 26-30 years, 11(25%) in the age tertile of 20-25 and 12(27.3%) in the age tertile of 31-35 years.28 out of 44 were multigravida (63.6%), 8(18.2%) presented in the first trimester,16(36.4%)presented in the second trimester and 20(45.5%) presented in the third trimester with mean gestational age at testing 23.477$\pm$9.036 weeks. 29 BV cases (61.4%) were treated by vaginal clindamycin,5(11.4%) by vaginal metronidazole,5(11.4%) by oral clindamycin, 2(4.5%) by oral metronidazole and 3(6.8%) did not take any treatment due to non-compliance. Mean gestational age at delivery was 36.0$\pm$ 4.534.29(65.9%) of the cases delivered as normal vaginal delivery,4(9.1%) as assisted vaginal delivery.10(22.7%) delivered by emergency caesarian and 1(2. 3%) by elective caesarian (Table 2).

Regarding symptoms 41(93.2%) of the total BV positive women had complaint of discharge out of which 11(25%) complained of malodor, 22(50%) had abdominal pain, 16(36.4%) had vulval itching 12(27.3%) had dysuria (Table 3).

Of the 44 BV positive cases, 9(20.5%) had preterm labor, 11(25%) had PROM, 9(20.5%) had preterm delivery, 2(4.5%) had miscarriage, 12 (27.3%) of cases had babies with birth asphyxia, 13(29.5%) were low birth weight, and 34(77.3%) underwent NICU treatment. They had 4.8 times the risk of preterm labor (95% Confidence Interval CI, 3.19-7.26), 5.23 times risk of PROM (95% CI, 3.54-7.72), 4.39 times the risk of preterm. delivery (95% CI, 2.81-6.85),5.12 times the risk of miscarriage (95% CI 3.90-6.71),3.7 times the risk for birth asphyxia (95% CI 2.29-5.96),3.2 times risk of LBW (95% CI,1.96-5.59) and 6.8 times the risk for NICU care (95% CI,3.59-13.06).BV was significantly associated with all these outcomes (Table 4).

Table 1: Nugent Scoring system for gram-stained vaginal smear

No. of organisms*	Lactobacillus Types	Gardnerella/Bacteriodes Types	Mobiluncus Types
None	4+	0	0
<1.0	3+	1+	1+
1-4	2+	2+	1+
5-30	1+	3+	2+
>30	0	4+	2+

*No of organisms per oil immersion field (Average of 10 fields counted), (Total score = Lactobacilli Gardnerella/Bacteriodes + Mobiluncus)

Table 2: Obstetric factors of women involved in the study

Characteristics	BV Present (N=44)	BV Absent (N=173)	p-value
Age in years	29.863 ± 5.241	30.791 ± 4.610	0.248
20-25 years	11(25%)	19(11.0%)	
26-30 years	15(34.1%)	68(39.3%)	
31-35 years	12(27.3%)	58(33.5%)	
36-40 years	4(9.1%)	21(12.1%)	
41-45 years	2(4.5%)	7(4.0%)	
Gravida			
Primi Gravida	16(36.4%)	43(24.9%)	0.126
Multi Gravida	28(63.6%)	130(75.1%)	
Gestational age at test (weeks)	23.477 ± 9.036	22.185 ± 8.569	0.378
First Trimester	8(18.2%)	33(19.1%)	
Second Trimester	16(36.4%)	80(46.2%)	
Third Trimester	20(45.5%)	60(34.7%)	
Gestational age at delivery	36.00 ± 4.534	38.208 ± 1.1167	<0.001*
Mode of Delivery			
NVD	29(65.9%)	124(71.7%)	
Assisted Vaginal	4(9.1%)	9(5.2%)	
Emergency CS	10(22.7%)	17(9.8%)	
Elective CS	1(2.3%)	23(13.3%)	
Treatment for BV (in BV Positive)			
Vaginal Clindamycin	29(65.9%)		
Vaginal metronidazole	05(11.4%)		
Oral Clindamycin	05(11.4%)		
Oral metronidazole	02(4.5%)		
No treatment	03(6.8%)		

(NVD: Normal Vaginal Delivery; CS: caesarian section). *Statistically significant.

Table 3: Presenting complaints and characteristics of discharge in women with BV

Presenting complaints^	BV Present (N=44)	BV Absent (N= 173)	p- value
Discharge	41(93.2 %)	130(75.1%)	0.009*
Vulval itching	16(36.4 %)	30(17.3 %)	0.006*
Dysuria	12(27.3%)	15(8.7%)	0.001*
Abdominal Pain	22(50 %)	77(44.5%)	0.514
Colour of Discharge			
White	19(43.2%	132(76.3%)	<0.001*
Yellow	24(54.5%)	29(16.8%)	<0.001*
Grey	1(2.3%)	12(6.9%)	<0.001*
Consistency of Discharge			
Watery	16(36.4%)	123(71.1%)	<0.001*
Thick	19(43.2%)	34(19.7%)	<0.001*
Frothy	9(20.5%)	16(9.2%)	<0.001*
Odour			
Normal	33(75.0%)	151(87.3%)	0.043*
Malodorous	11(25.0%)	22(12.7%)	

^ Some patients had more than one complaint *statistically significant

Table 4: Pregnancy outcomes

Pregnancy Outcome ^	BV Positive	BV Negative	p - value	RR (95% CI)
PROM	11(25%)	2(1.2%)	<0.001*	5.230 (3.545-7.717)
Preterm Labor	9(20.5%)	2(1.2%)	<0.001*	4.815 (3.193-7.261)
Preterm Delivery	9(20.5%)	3(1.7%)	<0.001*	4.392 (2.816-6.852)
Miscarriage	2(4.5%)	0(0.0%)	<0.001*	5.119 (3.902-6.714)
Birth Asphyxia	12(27.3%)	8(4.6%)	<0.001*	3.694 (2.290-5.958)
LBW	13(29.5%)	12(6.9%)	<0.001*	3.221 (1.962-5.287)
NICU admission	34(77.3%)	38(22.0%)	<0.001*	6.847 (3.589-13.063)

^More than one outcome for some patients. * Statistically significant PROM: premature rupture of membranes; LBW: Low birth weight; NICU: neonatal intensive care unit; RR: Risk ratio; CI: Confidence Interval)

Discussion

The overall prevalence of BV by Gram stain Nugent scoring criteria in this study was 20.3%. Similar studies have been done in various other countries and results are comparable with ours. A study in India indicated a prevalence of 20.5% and another in Denmark found it to be 17%[19,20]. However, higher prevalence rates were reported from some African countries like Botswana 38%, Kenya 37%, Zimbabwe 32.5%[21-23]. Lower prevalence was noted in other countries like Burkina Faso,6.4%; Sweden,9.3%; Boston, 11% and Washington,12%[24-27]. This variation could be attributed to differences in local territorial settings, behavioral patterns, education level of population and other socioeconomic differences. However, our results cannot be representative of a specific community as the study involved culturally diverse patients visiting our hospital. The highest prevalence was observed in the age tertile 26-30 years, similar to that by Mengistie et al[28], and Olusola et al[5] as women in this age group are most sexually active, also with the highest rate of pregnancies and therefore more prone to BV and sexually transmitted diseases[28]. Multiparous women constituted higher prevalence group in this study which was similar to reports from other studies[6,29]. This may be attributed to an increased frequency of sexual intercourse in these women which may subsequently result in disruption of the protective physical barrier of vaginal mucosa and change of microflora[30].

The symptoms of discharge, vulval itching and dysuria were found to be significantly associated with the presence of BV (p-value <0.05). Yellow, thick to frothy and malodorous discharge was significantly associated with BV. This is consistent with routine clinical assessment of a whitish, watery discharge without malodor as unlikely to be pathological. There are discrepant descriptions of the vaginal discharge in BV, some authors have reported the classical description of thin, grey, homogenous and frothy with or without malodor[31,32] and others have described white and yellow which substantiates our findings.

Forty five percent of women with BV presented with symptoms in their third trimester and 36.4% in the second trimester which is conflicting with the findings of Awoniyi *et al*. that prevalence decreased with advancement of pregnancy[33]. However, gestational age does not influence the chances of BV as per our study (p=0.378). It has been suggested that prevalence rate of BV may differ in different trimesters as studies have shown variable occurrence rates and presentation in different phases of the menstrual cycle. This indicates that there might be possible influence from endogenous sex hormones[34].

Our study showed a statistically significant association between BV and adverse outcomes considered in the present study which were miscarriage, preterm labor, preterm delivery, PROM, LBW, birth asphyxia and NICU admission validating the findings of previous studies[7,9,15,19,28]. Studies have shown that results are worse if BV is detected earlier in pregnancy as compared to that in late pregnancy[35]. Even though most of our women were sampled in second and third trimester, there was a significantly increased risk of all adverse outcomes. However, since our study was based on single sample collection, it is more likely that our patients were infected from early pregnancy as studies in past have reported that women are less likely to be infected in later pregnancy if not earlier[36]. This study also highlighted that

administration of antibiotics to cure BV does not surely reduce the peril of the dangerous outcomes. Majority of our women (93.2%) received treatment as either topical or systemic clindamycin or metronidazole. Only three positive cases (6.8%) did not take treatment due to non-compliance.

A significant limitation of our study was the retrospective analysis. However, the authors have tried to strictly abide by the exclusion criteria like previous obstetric complications, medical conditions which can interfere with study outcomes. Most of the confounding variables were reviewed while selection of cases in the study.

Conclusion

The prevalence of BV among pregnant women in our hospital is 20.3% and significant association has been found with several adverse outcomes affecting both mother and child. Education and awareness about this important health issue amongst women and treatment before pregnancy may help to reduce the associated adverse outcomes. More research is needed to assess if treatment of BV in the first trimester can prevent adverse outcomes and hence early screening and treatment may prove to be useful.

Ethical Approval

Ethics approval was obtained from the Institutional Review Board of Dr Sulaiman Al Habib Medical Group, Riyadh, Saudi Arabia (RC 19.11.61).

Limitations

Availability of Material

The data of the present study are available with the corresponding author.

Conflict of Interest

The authors declare no conflict of interest.

Contribution of Authors

Vidya Bhakta: Conception and design of the study, acquisition, analysis and interpretation of data, drafting and revising the article and final approval of the version to be published.

Sadia Askam: Acquisition of data, revising and final approval of the version to be published.

Aseel Aljaghwani: Statistics, revising the article and final approval of the version to be published.

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