

## ORIGINAL RESEARCH



# Bacterial vaginosis: Prevalence and associated risk factors among non-pregnant women of reproductive age attending a Nigerian tertiary hospital

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## Abstract

### Aim

To determine the prevalence and risk factors associated with bacterial vaginosis (BV) among non-pregnant women of reproductive age group.

### Methods

A cross-sectional study among non-pregnant asymptomatic women aged 19 to 45 years, attending the gynaecological clinic at University of Ilorin Teaching Hospital, Ilorin, Nigeria. Participants were counselled and an informed consent was obtained. This was followed by vaginal swabs for microscopy, culture and sensitivity. Diagnosis of BV was by Nugent's criteria. Data analysis was by Statistical Package for Social Sciences (SPSS) version 20.0. Chi-square and Yates corrected chi-square were calculated, and p value <0.05 was significant.

### Results

Among the 212 participants, prevalence of BV was 40.1%; it was common among women aged 25-34 years (50; 58.8%), the married (77; 90.6%) and those with tertiary education (39; 45.9%). The risk factors for BV were common among women with laboratory evidence of the infection, however statistically significant risk factors were the use of intrauterine device (OR 1.61, 95%CI 0.543-4.759; p0.020) and previous voluntary termination of pregnancy (OR 1.04, 95%CI 0.600-1.808; p0.047).

### Conclusion

There was high prevalence of bacterial vaginosis in the study population. Universal screening and treatment of cases may assist in lowering the associated morbidity.

## Introduction

Bacterial vaginosis (BV), formerly called non-specific vaginitis, is a polymicrobial disease characterized by reduction in lactobacilli and hydrogen peroxide production, a rise in vaginal pH and overgrowth of BV associated organisms<sup>1</sup>. These BV associated pathogens are *Gardnerella vaginalis*, *Ureaplasma urealyticum* and anaerobes of the genera *Peptostreptococcus*, *Bacteroides*, *Mobiluncus*, *Prevotella*, *Fusobacterium*, *Veillonella* and *Eubacterium*.

BV affects 10.0% of females<sup>2</sup> and its prevalence varies from 12.0 – 30.0%<sup>3-7</sup>. It is the commonest cause of abnormal vaginal discharge in women of childbearing age<sup>8</sup> although majority of cases are asymptomatic and remain unreported<sup>8</sup>.

BV is associated with an increased risk of pelvic inflammatory disease, postoperative infections, cervicitis, HIV infection and probably cervical intraepithelial neoplasia<sup>1-4</sup>. Premature rupture of membranes, preterm labour and delivery, chorioamnionitis and post-partum endometritis are some of the obstetric complications<sup>1-8</sup>. Diagnostic tests for BV such as Amsel's, Nugent's or Spiegel's criteria, gas-liquid chromatography with succinate:lactate ratio >4 and Fem Exam card test kit are available. BV has several adverse reproductive health outcomes and treatment of the condition in women of childbearing age will reduce these adverse outcomes. This study aimed at determining the prevalence and risk factors for BV among non-pregnant women of reproductive age in Ilorin, Nigeria and generate an otherwise dearth of data for this group of women.

## Methods

The study was a cross-sectional study involving non-pregnant women aged 19 to 45 years attending the gynaecological clinic of the University of Ilorin Teaching Hospital, Ilorin Nigeria conducted between November, 2011 and March, 2012. Consenting eligible participants were recruited and participated in the study. Pregnancy, menstruation, abnormal vaginal bleeding, urinary or faecal incontinence and antibiotics use within 72 hours prior to presentation were the exclusion criteria.

Using previously documented prevalence of BV in non-pregnant women of 14.0%<sup>6</sup> and the Fisher's formula<sup>9</sup>, the sample size of 212 participants including 10% attrition rate was calculated. The participants were selected by a systematic random sampling technique in which one out of every two patients at the clinic who satisfied the inclusion criteria was recruited until the sample size was attained. An interviewer-administered questionnaire purposely designed for the study was used to collect relevant information including socio-demography, douching, smoking, contraception, sexual history, history of previous preterm deliveries and sex with a high risk partner. A high-risk partner was defined as one who practices unprotected sex, has multiple sexual partners, has sex with a partner who has multiple other partners or has sex with intravenous drug users.

Vaginal swabs were collected by the researchers during speculum examination by passing sterile cotton wool swab into the fornix and gently rotated against the vaginal wall to obtain vaginal secretion specimens taking precaution to

avoid collecting cervical secretion. Swab specimens were placed inside Amines's transport medium for transportation to the medical microbiology laboratory for processing.

The vaginal swab was used for microscopy by making a thin smear on clean, dry and grease-free glass slides, air dried and gram stained. The stained slide was first examined under x40 then x100 objective of a compound light microscope. Three characteristic morphocytes i.e. Lactobacillus, Mobiluncus and Gardnerella, were sought during microscopic examination using their characteristics and scored appropriately using Nugent's Criteria<sup>10</sup>.

All data was entered into the database and analysed using Statistical Package for Social Sciences (SPSS) version 20.0. Results were presented in tables. Categorical variables were described by proportions and comparison of the study and control groups was done using chi-square or Yates corrected chi-square. Odds ratio and p<0.05 were termed significant. Institutional ethical approval was obtained before commencement of the study; participants were counselled and a written informed consent obtained at recruitment.

**Results**

A total of 212 non-pregnant women of reproductive age participated in the study, 85 were positive for BV giving a prevalence of 40.1%. It was commonest among the 25 to 34 years age range (50; 58.8%). Nugent scoring showed that 33(15.6%) had a score of 1-3, 94(44.3%) a score of 4-6 while 85(40.1%) had a score of 7 or more. From table 1, the modal age group of participants with BV was 30 to 34 years (28; 32.9%), 77(90.6%) were married while 39(45.9%) had tertiary education. However, there was no statistical significance in the occurrence of BV and the socio-demographic characteristics of the participants.

**Table 1: Relationship between demographic characteristics and bacterial vaginosis**

Variables	Bacterial Vaginosis		χ <sup>2</sup>	OR (95% CI)	p value
	Present n=85 (%)	Absent n=127 (%)			
Age group(years)					
< 20	1 (1.2)	0 (0)	0.049 <sup>Y</sup>	UD	0.826
20-24	7 (8.2)	9 (7.1)	0.174	1.27 (0.383 – 4.390)	0.677
25-29	22 (25.9)	40 (31.5)	0.037	0.92 (0.378 – 2.221)	0.847
30-34	28 (32.9)	36 (28.3)	0.343	1.30 (0.543 – 3.093)	0.558
35-39	15 (17.6)	22 (17.3)	0.067	1.14 (0.430 – 3.001)	0.796
≥ 40 <sup>REF</sup>	12 (14.1)	20 (15.7)			
Marital status					
Single	6 (7.1)	5 (3.9)	0.000 <sup>Y</sup>	1.20 (0.059 – 24.473)	1.000
Married	77 (90.6)	116 (91.3)	0.000 <sup>Y</sup>	0.66 (0.041 – 10.773)	1.000
Separated	1 (1.2)	5 (3.9)	0.000 <sup>Y</sup>	0.20 (0.006 – 6.664)	1.000
Widowed <sup>REF</sup>	1 (1.2)	1 (0.8)			
Education					
None	6 (7.1)	5 (3.9)	0.893	2.22 (0.6352 – 7.726)	0.345
Primary	13 (15.3)	17 (13.4)	0.682	1.41 (0.621 – 3.207)	0.409
Secondary	27 (31.8)	33 (26.0)	1.599	1.51 (0.796 – 2.867)	0.206
Tertiary <sup>REF</sup>	39 (45.9)	72 (56.7)			

χ<sup>2</sup>: Chi square; Y: Yates corrected chi-square; UD: Undefined

**Table 2: Relationship between risk factors and occurrence of Bacterial Vaginosis**

Variables	Bacterial Present n=85 (%)	Vaginosis Absent n=127(%)	χ <sup>2</sup>	OR (95% CI)	p value
Coitarche (years)					
<18	10 (11.8)	18 (14.2)	0.258	0.81 (0.353 – 1.846)	0.612
≥18	75 (88.2)	109 (85.8)			
Sexual partners					
0	1 (1.2)	1 (0.8)	0.000 <sup>Y</sup>	1.00 (0.020 – 50.400)	1.000
1	46 (54.1)	79 (62.2)	0.126 <sup>Y</sup>	0.58 (0.036 – 9.533)	0.723
2	31 (36.5)	40 (31.5)	0.296 <sup>Y</sup>	0.78 (0.047 – 12.889)	0.586
3	6 (7.1)	6 (4.7)	0.583 <sup>Y</sup>	1.00 (0.050 – 19.964)	0.445
4	1 (1.2)	1 (0.8)			
At risk partner					
Yes	24 (28.2)	30 (23.6)	0.336	1.27 (0.565 – 2.857)	0.562
No	44 (51.8)	70 (55.1)	0.000	0.99 (0.489 – 2.040)	0.996
Don't know	17 (20.0)	27 (21.3)			
Vaginal douching					
Yes	36 (42.4)	60 (47.2)	0.492	0.82 (0.472 – 1.427)	0.483
No	49 (57.6)	67 (52.8)			
Douching frequency(n=96)					
1-10	4 (11.1)	8 (13.3)	0.015	0.75 (0.208 – 2.700)	0.901
11-20	0 (0)	4 (6.7)	1.167 <sup>Y</sup>	0.000 (UD)	0.280
> 20	32 (88.9)	48 (80.0)			
Previous discharge					
Yes	45 (52.9)	72 (56.7)	0.290	0.86 (0.495 – 1.492)	0.590
No	40 (47.1)	55 (43.3)			
Malodorous discharge					
Yes	16 (18.8)	21 (16.5)	0.185	1.17 (0.571 – 2.399)	0.667
No	69 (81.2)	106 (83.5)			

χ<sup>2</sup>: Chi square; Y: Yates corrected chi-square; UD: Undefined

**Table 3: Relationship between family setting, contraception with previous**

Variables	Bacterial Vaginosis		χ <sup>2</sup>	OR (95% CI)	p value
	Present n (%)	Absent n (%)			
Family type (n=201)					
Monogamous	54 (69.2)	96 (78.1)	1.960	0.63 (0.333 – 1.204)	0.162
Polygamous	24 (30.8)	27 (21.9)			
Contraception					
Yes	22 (25.9)	42 (33.1)	1.249	0.71 (0.384 – 1.301)	0.264
No	63 (74.1)	85 (66.9)			
Type of contraception					
IUD	15 (68.2)	24 (57.1)	0.739	1.61 (0.543 – 4.759)	0.390
Other methods	7 (31.8)	18 (42.9)			
Previous VTOP					
Yes	39 (45.9)	57 (44.9)	0.021	1.04 (0.600 – 1.808)	0.886
No	46 (54.1)	70 (55.1)			
Number (VTOP = 96)					
1	24 (61.5)	33 (57.9)	0.000 <sup>Y</sup>	1.46 (0.125 – 16.981)	1.000
2	11 (28.9)	18 (31.6)	0.221 <sup>Y</sup>	1.22 (0.099 – 15.114)	0.638
3	3 (7.9)	4 (7.0)	0.179 <sup>Y</sup>	1.50 (0.089 – 25.393)	0.672
4	1 (2.6)	2 (3.5)			
Preterm delivery					
Yes	9 (10.6)	10 (7.9)	0.460	1.39 (0.538 – 3.567)	0.498
No	76 (89.4)	117 (92.1)			

χ<sup>2</sup>: Chi square; Y: Yates corrected chi-square; UD: Undefined

IUD: Intrauterine Device, VTOP: Voluntary Termination of Pregnancy

**Table 4: Multivariate analysis of risk factors for bacterial vaginosis**

Variable	B	p value	OR (95% CI)
Coitarche	-1.053	0.539	0.35 (0.012 – 10.066)
Sexual partners			
1	-21.816	1.000	0.00 (UD)
2	-20.875	1.000	0.00 (UD)
3	-41.953	0.999	0.00 (UD)
Malodorous vaginal discharge	-1.621	0.318	0.20 (0.008 – 4.759)
Family planning type	-0.320	0.799	0.73 (0.062 – 8.521)
Number of VTOP	-0.916	0.368	0.40 (0.054 – 2.939)
Preterm delivery	0.600	0.727	1.82 (0.063 – 52.867)

UD: Undefined; VTOP: Voluntary Termination of Pregnancy.

From table 2, BV was associated with coitarche after 18 years (75; 88.2%), primiparity (46; 54.1%), douching frequency >20 (32; 88.9%) and previous vaginal discharge (45; 52.9%). However, none of these was statistically significant.

Table 3 shows that the use of intrauterine device (IUD) (OR 1.61, 95%CI 0.543-4.759; p0.020) and previous voluntary termination of pregnancy (OR 1.04, 95%CI 0.600-1.808; p0.047) were statistically significant risk factors in BV.

Multivariate analysis (table 4) showed that none of the risk factors for BV was statistically significant in the development of the infection.

## Discussion

This study reported a high prevalence rate of 40.1% for bacterial vaginosis (BV) among asymptomatic women of reproductive age. The previously identified socio-demographic, obstetric, gynaecological and social risk factors were identified among participants with BV in this study but only the use of intrauterine contraception and previous unsafe abortion were statistically significant. This suggests that a universal approach combining both targeted and opportunistic screening of women in the reproductive age at contacts with the health care provider could be explored to prevent the associated morbidity of the infection.

The high prevalence of BV in this study compares to 20.0% to 49.0% from other African countries<sup>11-13</sup>. Although BV is reported as commoner in black compared to white women,<sup>13</sup> there is no clear explanation for the racial difference although we suggest that socioeconomic factors may be contributory. Socio-demographic characteristics were not significantly associated with BV in this study similar to the report of Baisley et al<sup>14</sup>. Another study which reported higher BV among younger women with low level of formal education was not statistically significant<sup>15</sup>. However, Ness et al<sup>16</sup> and Ashraf-Ganjoei<sup>17</sup> both reported a significant association between low level of education and BV. This may be because low social class has been associated with high risky sexual behaviours that may increase acquisition of Reproductive Tract Infections (RTIs) including BV.<sup>16,17</sup> In our study, majority of women had tertiary education. This may be because our study is hospital-based where women of higher educational level come more since they are more likely to be able to afford the cost of care. This is a possible explanation for the different reports from different studies.

There was no statistical significant association between

number of life time sexual partners, marriage type and male partner high-risk behaviour relative to acquisition of BV in this study. However, some researchers reported a three-fold increase in probability for BV among women with multiple lifetime sexual partners<sup>18,19</sup> while another study<sup>20</sup> reported a lower prevalence of BV in monogamous relationships. A probable explanation for this study report may be that participants may have been unaware of the partners' high-risk sexual behaviour or unwilling to reveal them. The high rates of BV have been shown to be associated with other reproductive tract infections (RTIs). A concurrence rate of 68% was reported for BV and other RTIs in a multi-national study from Kenya, Rwanda and South Africa<sup>21</sup> while a comparative study reported higher prevalence of BV in HIV-positive women (46.0% vs. 20.5%, p<0.05) as well as higher prevalence for women with CD4 count <350cell/mm<sup>3</sup> (67% vs. 22%)<sup>22</sup>. A report from Malawi stated that the disturbance of vaginal flora by BV predisposes to increased HIV acquisition in pregnancy with an odd of 3.7 for antenatal and 2.3 for postnatal seroconversion<sup>23</sup>. If this association can be proved to be causal, it may explain the high prevalence of HIV infection in African countries where BV rate is correspondingly high. However, this study is limited in this regard as its design did not provide for a concurrent evaluation for other RTIs in the participants.

A statistically significant link has been established between BV and sexual contact with new and multiple partners thereby emphasizing the need for safe sex practices<sup>24</sup>. The required protection is not limited to unwanted pregnancy but also includes the risk for other RTIs. This study demonstrated higher occurrence of BV among IUD users corroborating a previous report of alteration of vagina flora in favour of the growth of BV-associated organisms by IUD in-situ<sup>17</sup>. However, progestin-only contraceptives were associated with lower likelihood of BV in another study<sup>21</sup>. Therefore, women with higher risk for BV should consider barrier or hormonal contraceptives before IUD in order to reduce risk for infection.

Although over 45.0% of participants in this study practiced douching, it has no significant association with BV. Other researchers also reported that despite being a common risk factor, douching was not statistically significant for BV infection<sup>12,15</sup>. Another study showed that women who douched were 1.2 to 5.1 times more likely to develop BV than those who did not depending on the frequency of vaginal douching<sup>22</sup>. Nonetheless, the different reports on the association between BV and douching may be related to the contents or agents used for douching by different individuals which, apparently, were not investigated in these studies.

Previous history of preterm delivery was found to be associated with BV occurrence in this study corroborating a previous report<sup>17</sup>. Therefore, women with prior history of preterm births should be screened for BV in early pregnancy and those found positive should be actively treated for the infection in the early second trimester to prevent a recurrence<sup>17</sup>.

The association between the frequency of voluntary termination of pregnancy (VTOP) and higher occurrence of BV in this study corroborates a previous report which attributed this to the alteration of vaginal flora in favour of the growth of BV associated organisms<sup>18</sup>. This becomes important especially in countries with restrictive abortion laws where VTOP is synonymous with unsafe abortion.

## Strengths and limitations of the study

The strength of this study is that it affords previously unavailable data on BV among non-pregnant women in North-Central Nigeria contributing to the pool of available data on the infection in this group of women. The design of the study as hospital-based is a limitation as women in the community who did not present at the health facility were excluded from the study.

## Conclusion

This study showed a high prevalence (40.1%) of BV among non-pregnant asymptomatic women of reproductive age attending a gynaecological clinic at University of Ilorin Teaching Hospital, Ilorin, Nigeria. However, most of the risk factors for BV were not statistically significant among the participants. Therefore, the study suggests that a universal approach combining targeted and opportunistic screening may be effective in preventing the attendant morbidities of BV among women.

## Declaration of conflicts of interest

The authors declare no conflict of interest in the conduct of the study.

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