

Original Research Article

Bacterial Vaginosis Prevalence and its associated risk factors among women at Kiambu level-5 Hospital, Kenya

ABSTRACT

Background: Bacterial vaginosis is a commonly experienced vaginal disorder in women. It occurs when the beneficial lactobacillus species are replaced by anaerobic and facultative bacteria, leading to a foul-smelling vaginal discharge. Its diagnosis remains a big challenge in developing countries such as Kenya. Gram stain and Nugent scoring of the bacterial morphotypes is the recommended method of diagnosis, but is tedious to undertake and requires highly skilled microscopists.

Objective: The study's objective was to determine the prevalence of BV among women at Kiambu Level-5 Hospital and to ascertain the risk factors associated with it.

Study Design: The Cross-sectional analytic study was carried out at Kiambu Level-5 hospital, department of Pathology between April 2023 and June 2023.

Methodology: We included 196 women between the ages 18-55 who were enrolled by convenience sampling and screened for bacterial vaginosis using gram staining and microscopy for bacterial morphotypes.

Results: Out of the 196 participants 46 were positive for BV (23%), 150 Negative (77%) by the gram stain method. 23 of them had yeast cells (candidiasis) 21 pus cells and 1 participant had gonococci. Out of the risk factors analysed, only age had a significant association with BV at a confidence interval of $P=0.03$.

Conclusion: Bacterial vaginosis was more prevalent in the age group of 41-45 years old. Age was found to have a statistically significant association with BV.

Key words: *Bacterial vaginosis, Nugent scoring, Vaginal discharge, anaerobic and facultative.*

INTRODUCTION

Bacterial vaginosis is the most common vaginal infection experienced by women all over the world. It is frequently encountered in Sexually Transmitted Diseases clinics, out-patient departments and reproductive health clinics with about 5-70 % of women affected [1]. It occurs when there is replacement of the beneficial lactobacillus that usually regulate the vaginal PH, making it acidic, by production of hydrogen peroxide that is vital in preventing anaerobic microbes in the vagina from growing extremely [2].

Absence of lactobacillus causes PH increase within the vagina. This leads to increased population of non-pathogenic bacteria such as *Atopobiumvaginae*, *Gardnerella vaginalis*, *Mycoplasma hominis* and *Ureaplasmaurealyticum*, among other bacteria, leading to a foul-smelling vaginal discharge. [3,4].

Burden of Bacterial vaginosis is greater in Sub-Saharan region at 38% prevalence according to Jespers *et al.*, [5], and at 55 % as found by Woodman, [6]. The prevalence in Kenya varies among various studies in diverse areas of the country. For instance, Mutuku *et al.*, [7] conducted a study among H.I.V infected women in Machakos county that had a prevalence rate of 10.3%, another by Musyoki *et al.*, [8] amongst female commercial sex workers in Nairobi had prevalence of 15.1 % while Nzomo *et al.*, [9] found 43 % in a study conducted in Thika. Regardless of the variation in prevalence rates across the country, BV remains a concern in public health and research. Several factors are linked to its occurrence such as contraceptive IUCD use, having many sex partners, new sex partner, intravaginal cleaning and unprotected sex. The symptoms of BV include; itchiness, sore and painful vagina, a discharge that is thin, white, grey or greenish in colour with a 'fishy' odour [10]. However, many women with bacterial vaginosis experience no symptoms, which further complicates the diagnosis and management of cases [11].

Centers for Disease Control (CDC) recommends that clinical bacterial vaginosis screening should be done through the Amsel's criteria. This involves checking the PH of the vaginal discharge which is usually more than 4.5 in the presence of BV, examining a wet preparation for clue cells and noticing an amine-like smell after adding 10% potassium hydroxide to the vaginal discharge. The other method is through gram staining the vaginal discharge, as the gold standard method and determining the population of lactobacilli, *Gardnerellavaginalis*, *bacteroides* and *mobilincus* species which are linked to BV [12]. Even though gram staining and Nugent scoring is the gold standard for screening BV, it takes a lot of time to accomplish and requires an expert in microscopy.

The modified Amsel's criteria rely on two features only to screen for bacterial vaginosis with a couple of studies proving this to be sensitive, less cumbersome and relatively fast [13]. Presence of clue cells on a wet preparation of the discharge and PH more than 4.5 have been shown to have a good match with Nugent score as found in studies by [14,15]. Screening of BV still remains complicated due to the fact that it is attributed to host, social, epidemiologic and biological influences [16,17]

MATERIALS AND METHODS

Study Design

We conducted a cross-sectional study at Kiambu level-5 hospital comprehensive care centre between April and June 2023. High Vaginal Swab specimen were collected from 196 participants and analysed for BV.

Inclusion Criteria

Females aged between 18-55 years old attending CCC clinic at Kiambu level-5 hospital who agreed to be involved in the research, and signed a consent form, were enrolled into the study.

Exclusion Criteria

Pregnant women and those on their periods as well as those who declined to give a signed consent did not take part in the research.

Laboratory Methods

Collection of High Vaginal Swabs

With the patient lying on a couch, legs apart, a speculum examination was done by the nurse and the vagina scrutinised for discharge, abrasions and erythema. A sterile high vaginal swab was labelled and used to obtain specimen from the posterior fornix of the vagina. This was transported at an appropriate temperature to the laboratory where it was smeared onto a clean- labelled slide, by rolling the swab over a drop of normal saline and allowing to air dry. The smear was then heat-fixed by passing the slide three times over a burner flame. This was followed by staining with the Gram 's technique after which it was examined microscopically using X100 magnification for clue cells, Lactobacillus species and coccobacilli that are gram-variable. These were scored as per the Nugent score. [19].

All positive BV results and any other infections detected were communicated to the nurse at the clinic for patient follow-up and treatment.

Quality Control

All procedures were performed by strictly adhering to the Standard Operating Procedures. Positive and negative control smears were stained together with the patient samples to validate the quality of the stains.

Data Collection, Analysis and Presentation

A questionnaire with both open and closed ends was used to capture the demographic details of the participants. This data together with the obtained results were entered into excel spreadsheet.

The data was imported from Excel into the SPSS version 26 and analysis for the dependent and independent variables done. Nominal and categorical variables were also analysed and presented as tables and charts. The results were expressed as percentages. P-value less than 0.05 was considered statistically significant at a confidence interval of 95%. Chi-square test was also used in the comparison of categorical and nominal data.

RESULTS

A total of 196 women were tested for Bacterial Vaginosis. The mean age was 40.18 and the Standard Deviation 8.59. Majority were from the age group 46-50 years old (28.6%), while the age group 18-20 years had only one participant tested (0.5%) (Table 1)

The highest prevalence of BV was recorded among the age group 41-45 years $n=15$ (32.6%) followed by the age group 36-40 years $n=10$ (21.7%). It was noted that those aged 51-55 years old had the lowest incidence of BV $n=1$ (2.2%) and age had a statistical association with BV ($P=.03$).

The overall prevalence of BV in this study was 46/196 (23%) while 150/196 patients (77%) were negative for Bacterial Vaginosis with Nugent scores of 0-3 (Pie chart 1)

This study revealed that BV was more prevalent among the married women at 56.5% and lowest among the widowed and divorced at 2.2% and 4.3% respectively. (Table 2)

Out of all the risk factors analysed, only age had a statistically significant association with BV. The others such as marital status, level of education and family planning method had no association statistically.

The study also detected candidiasis, pus cells and gonococci among the participants at 23/196 (51.1%), 21/196 (46.6%) and 1/196 (2.2%) respectively (Table 3).

Pie chart 1:Prevalence of Bacterial vaginosis

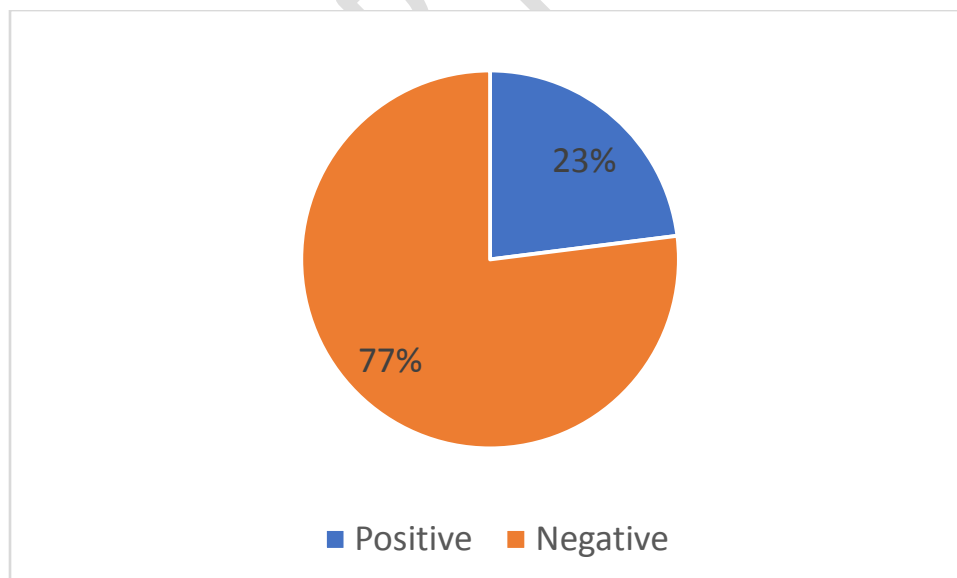


Table 1: Comparison of age and Bacterial vaginosis

Age (years)	Bacterial Vaginosis			P-value
	Total number (%)	Positive number (%)	Negative number (%)	
18-20	1(0.5)	0(0.0)	1 (0.7)	0.030
21-25	12 (6.1)	6 (13.0)	6(4.0)	
26-30	23(11.7)	5(10.9)	18 (12.0)	
31-35	20 (10.2)	2 (4.3)	18(12.0)	
36-40	38 (19.4)	10(21.8)	28(18.6)	
41-45	40(20.4)	15(32.6)	25(16.7)	
46-50	56(28.6)	7(15.2)	49(32.7)	
51-55	6(3.1)	1(2.2)	5(3.3)	
Total number	196(100)	46(100)	150(100)	

Table 2: Comparison of Marital status, Education, Family planning and Bacterial Vaginosis cases

Marital Status	Bacterial Vaginosis			P-value
	Total number (%)	Positive number (%)	Negative number (%)	
Single	75 (38.3)	17 (37.0)	58(38.7)	0.427
Married	112 (57.1)	26 (56.5)	86 (57.3)	
Divorced	3 (1.5)	2 (4.3)	1 (0.7)	
Widowed	6(3.1)	1(2.2)	5(3.3)	
Total number	196(100.0)	46 (100.0)	150 (100.0)	

Education	Bacterial Vaginosis			P-value
	Total number (%)	Positive number (%)	Negative number (%)	
None	4 (2.0)	1 (2.2)	3(2.0)	0.149
Primary	88 (44.9)	20(43.5)	68(45.3)	
secondary	74 (37.8)	16(34.7)	58(38.7)	
College	30 (15.3)	9(19.6)	21(14.0)	
Total number	196(100.0)	46 (100.0)	150(100.0)	

Family Planning Method	Bacterial Vaginosis			P-value
	Total number (%)	Positive number (%)	Negative number (%)	

None	137(69.9)	33(71.8)	104(69.3)	0.111
Pills	19 (9.7)	3(6.5)	16(10.8)	
Coil	2(1.0)	2(4.3)	0(0.0)	
Implant	11 (5.6)	4 (8.7)	7 (4.7)	
Condom	8(4.1)	0 (0.0)	8(5.3)	
Injection	10 (5.1)	2(4.3)	8 (5.3)	
TL	6(3.1)	1(2.2)	5(3.3)	
IUCD	3(1.5)	1(2.2)	2(1.3)	
Total number	196(100.0)	46 (100.0)	150(100.0)	

Table 3: Prevalence of other infections

Other infections	Count	Table Sum %
Yeast Cells	23	51.1%
Pus Cells	21	46.6%
Gonococci	1	2.2%
Total	45	100.0%

DISCUSSION

Bacterial vaginosis is a common cause of vaginitis that is encountered in many women of the reproductive age group. It has incidences varying between 10-35% among patients visiting obstetrics and gynecology clinics and 20-60% in patients visiting the outpatient department [20] Centers for Disease Control (CDC) recommends that clinical bacterial vaginosis screening should be done through the Amsel's criteria. This involves checking the PH of the vaginal discharge which is usually more than 4.5 in the presence of BV, examining a wet preparation for clue cells and noticing an amine-like smell after adding 10% potassium hydroxide to the vaginal discharge. The other method is through gram staining the vaginal discharge, as the gold standard method and determining the population of lactobacilli, *Gadnerellavaginalis*, *bacteroides* and *mobilincus* species which are linked to BV [12,19]. The results were obtained based on the table below.

Table 4: Nugent Scores

Lactobacillus species	Gardnerella species	Curved rods	Score
>30	0	0	0
5-30	<1	1-5	1
1-4	1-4	>5	2
<1	5-30		3
0	>30		4

The attained scores were added to get the total scores going from 0-10 as illustrated below

Table 5: Score Interpretation

Score	Interpretation
0-3	Bacterial vaginosis negative
4-6	Intermediate
7-10	Bacterial vaginosis positive

Source [19]

We evaluated and scored Gram-stained smears and prevalence of Bacterial vaginosis was 23%. This is in agreement with a study done in Taiwan by Huang and colleagues in 2023 [21] which had a prevalence of 22.8% and 20.3% by Ndiaye and colleagues in 2023 which was also very close to ours [22]. A study conducted in the year 2013 in Ethiopia had a prevalence of 19.4% and not very different from ours [20]. Another study conducted by Ambike and his colleagues had a prevalence of 23%, which exactly agrees with ours, even though it was done among pregnant women visiting ante-natal clinic [23]. Our prevalence however, differed considerably with that obtained by Lokken et al., in 2022 [24] which was 35%. However, their study had a sample size of 701 which was much larger compared to ours which was only 196, and this might have contributed to the difference. Our BV prevalence was also different from that registered by Majigo and colleagues in Tanzania which had a prevalence of 33.2% [25], even though they had a similar sample size as ours. This could have been due to interobserver variability from the microscopists. Our study revealed that BV was more prevalent among the married women at 56.5% and lowest among the widowed and divorced at 2.2% and 4.3% respectively, this can be explained by the fact that married women engage in sex frequently as opposed to divorced and widowed women and research has shown that sexual activity has a link with BV acquisition [26,27]. The high prevalence of BV among married women as opposed to widowed and divorced women was also registered by Mutuku and his colleagues in their study [7].

CONCLUSION

Bacterial vaginosis was more prevalent in the age group of 41-45 years old and age was significantly associated with BV.

CONSENT (WHERE APPLICABLE)

All procedures were clearly explained to the patients and those who agreed to take part in the study signed an informed consent form before their samples were obtained.

ETHICAL REVIEW (WHERE APPLICABLE)

This study was approved by the Kenyatta University Ethics Review Committee (PKU/2657/E1781), National Commission for Science and Innovation (NACOSTI/P/23/24582) and Kiambu Level-5 Hospital (KIAMBU/HRDU/23/04/04/RA)

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