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Bacterial Vaginosis Prevalence and Its Associated Risk Factors among Women at Kiambu Level-5 Hospital, Kenya

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Authors' contributions

This work was carried out in collaboration among all authors. Authors SAO and OMM designed the study and performed the statistical analysis and wrote the protocol and the first draft of the manuscript. Author AW managed the analyses of the study, while authors JNR and MM managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

Background: Bacterial vaginosis (BV) 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 require highly skilled microscopists. The objective of this study was to determine the prevalence of BV among women at Kiambu Level-5 Hospital and to establish the risk factors associated with it.

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Methodology: The Cross-sectional study was carried out at Kiambu Level-5 hospital, department of Pathology between April 2023 and June 2023. 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 (23.0%) while 150 (77.0%) were negative. Yeast cells (candidiasis) was found in 23 participants (11.7%) while 1 participant (0.5%) had gonococci. Out of the risk factors analyzed, only age had a significant association with BV (P=0.03)
Conclusion: The relatively high prevalence of bacterial vaginosis attained in this study shows that it is a health concern among women in Kiambu, Kenya particularly those aged between 41-45 years. There is need to educate women on how to avoid BV and to empower them to recognize the signs and symptoms, in order to seek treatment.

Keywords: Bacterial vaginosis; prevalence; risk factors.

1. INTRODUCTION

Bacterial vaginosis (BV) 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 *Atopobium vaginae Gardnerella vaginalis*, *Mycoplasma hominis* and *Ureaplasma urealyticum,* 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 between several studies. For instance, Muia et al. [7] conducted a study among HIV infected women in Machakos County that had a prevalence rate of 10.3%. Musyoki et al. [8] conducted a study in Nairobi amongst female commercial sex workers which had a prevalence of 15.1 %. Nzomo et al. [9] found a prevalence of 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; itching, 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 using 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, Gadnerella vaginalis*, *Bacteroides* and *Mobilincu*s 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 Mengistie et al. [14]; Bhujel et al. [15]. Screening of BV still remains complicated due to the fact that it is attributed to host, social, epidemiologic and biological influences [16,17,18].

2. MATERIALS AND METHODS

2.1 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.

Females aged between 18-55 years old attending Comprehensive Care Centre at Kiambu level-5 hospital who agreed to be involved in the research, and signed a consent form, were enrolled into the study. A questionnaire with both open and closed ends was used to capture the demographic details of the participants. Pregnant women and those on their periods were excluded.

2.2 Collection and Processing 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 2-8 degrees Celsius 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 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]. Yeast cells were seen as large Gram-positive cocci while the gonococci were seen as Gram negative intracellular diplococci.

All positive results were communicated to the nurse at the clinic for patient follow-up and treatment.

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.

2.3 Data Collection and Analysis

Demographic data from the questionnaire and the test results 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.

3. 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 (32.6%) followed by the age group 36-40 years (21.8%). It was noted that ages 51-55 years old had the lowest prevalence of BV (2.2%) and age had a statistical association with BV (P= 0.03).

The overall prevalence of BV in this study was 46/196 (23.0%) while 150/196 patients (77.0%) were negative for Bacterial Vaginosis with Nugent scores of 0-3 (Fig. 1).

The attained scores were added to get the total scores going from 0-10 as illustrated in Table 4.

This study revealed that BV was more prevalent among the married women at 56.5% and lowest among the widowed at 2.2% (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, and gonococci among the participants at 23/196 (11.7%) and 1/196 (0.5%) respectively.

4. DISCUSSION

Gram-stained smears were evaluated and Nugent-scored. Prevalence of Bacterial vaginosis was 23.0%. This is in agreement with a study done in Taiwan by Huang and colleagues [20] which had a prevalence of 22.8%. Ndiaye and colleagues in 2023 got a prevalence of 20.3% in their study, this was also very close to this study [21]. A study conducted in Ethiopia had a prevalence of 19.4% which is not very different [22]. Another research conducted by Ambike et al had a prevalence of 23%, which exactly agrees with this study, even though it was done

among pregnant women visiting ante-natal clinic [23]. The prevalence obtained in this study was however, different from 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. The BV prevalence was also different from that registered by Majigo and colleagues in Tanzania which was 33.2% [25], even though they had a similar sample size. This could have been due to interobserver variability from the microscopists. This study revealed that BV was more prevalent among the married women and lowest among the widowed. The high prevalence of BV among married women as opposed to widowed women was also registered by Muia and his colleagues in their study [7]. However, this outcome contradicts a study by Oparaugo et al., in Nigeria who found that BV prevalence was higher among divorced and widowed women [26]. This can be explained by the fact that married women engage in sex frequently as opposed to widowed women. Research has also shown that sexual activity has a link with BV acquisition [27,28]. Despite this fact, cases of BV have been reported among virgin girls and sexually inactive women, proving that other factors such as poor menstrual hygiene, tight undergarments, diet and lifestyle changes can also alter the vaginal flora [29]. This study has demonstrated that age has a significant association with BV. The age group 41-45 years was the most affected by BV followed by age group 36-40. These findings correspond to those obtained by Muia et al., in their study in which BV prevalence was higher among women aged 30-49 years, and age was statistically associated with BV [7]. Other studies by Ibrahim et al., and Bitew et al., had similar findings [30,31]. This can be explained by the fact that the age group 18-45 years is the reproductive age for women and is characterized by heightened sexual activity. However, Yalew et al., did not find statistical significance of age and BV in their study, though the prevalence of BV was high in women 30 years and above, agreeing with the findings of our study [32]. Literacy level is associated with BV due to lack of knowledge about preventive measures [33]. This study established that women with lower level of education had the highest BV prevalence compared to those with college education, though this had no statistically significant association. This agrees with the findings of Bonneton and colleagues in their study and Bitew et al. [31,34]. The use of IUCD is a risk factor for BV [35]. In this study, women who did not use any family planning method had the highest prevalence of BV followed by those who used implants, while those who used condom had the lowest prevalence of BV. There was however no significant association between family planning and BV. Studies by Gallo et al., and Guedou et al. [36,37], have reported that condom use reduced BV acquisition by preventing alteration of vaginal flora as a result of seminal fluid exposure.

This study had limitations of time and resources and particularly the Nugent scoring of Gram-stained smears was quite tiresome and took long to achieve. Despite all this the study demonstrated that BV was more prevalent among women of reproductive age in Kiambu. However, there is need to conduct a larger study to realise the magnitude of BV in this population.

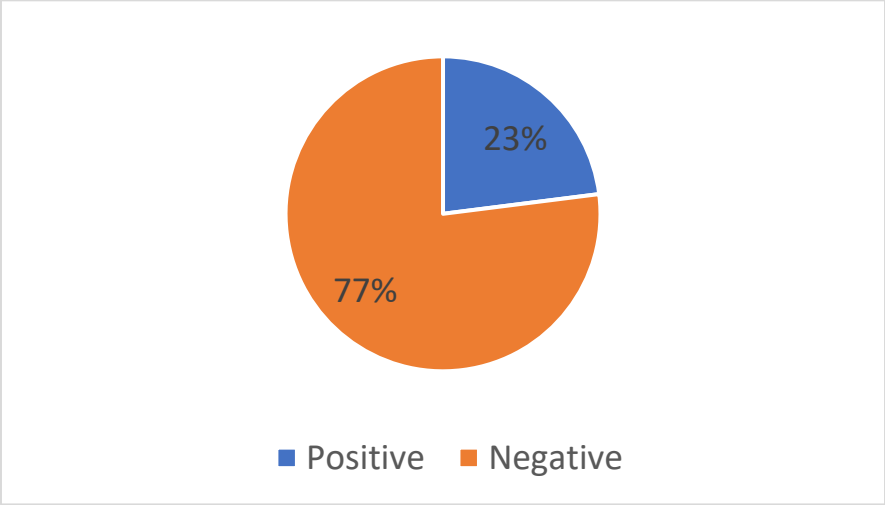

Fig. 1. Prevalence of bacterial vaginosis

Table 1. Age and bacterial vaginosis

		Bacterial Vaginosis		
Age (Years)	**Total**	**Positive**	**Negative**	***P-value***
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. Marital status, education and family planning in relation to bacterial vaginosis

		Bacterial Vaginosis		
Marital status	**Total**	**Positive**	**Negative**	***P-value***
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				0.149
None	4 (2.0)	1 (2.2)	3(2.0)	
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				
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. 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

Table 4. Score interpretation

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

Source [19]

5. CONCLUSION

The relatively high prevalence of bacterial vaginosis attained in this study shows that it is a health concern among women in Kiambu, Kenya particularly those aged between 41-45 years. There is need to educate women on how to avoid BV and to empower them to recognize the signs and symptoms, in order to seek treatment. A large study is recommended to give a broader magnitude of BV in this population since this prevalence may not be representative, considering that only women visiting the Comprehensive Care Centre of Kiambu Level-5 hospital were studied.

CONSENT

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 APPROVAL

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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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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