



Prevalence of Bacterial Vaginosis among HIV-Positive Women in Machakos County Hospital, Kenya

Mutuku Onesmus Muia^{1*}, Scholastica Gatwiri Mathenge¹,
Wachuka Gathigia Njoroge¹, Titus Kamau Karuga²
and Kyama Cleophas Mutinda³

¹Department of Medical Laboratory Sciences, School of Medicine, Kenyatta University, P.O.Box 43844-00100, Nairobi, Kenya.

²Machakos Cancer Care and Research Centre, Machakos Level 5 Hospital, P.O.Box 19-90100, Machakos, Kenya.

³Department of Medical Laboratory Sciences, School of Biomedical Sciences, College of Health Sciences, Jomo Kenyatta University of Agriculture and Technology, P.O.Box 62000-00200, Nairobi, Kenya.

Authors' contributions

This work was carried out in collaboration among all authors. Authors MOM and KCM designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors WGN and SGM managed the analyses of the study. Author TKK managed the literature searches and reporting of the slides. All authors read and approved the final manuscript.

Article Information

Editor(s):

(1) Dr. Rajbala Singh, Dehradun, Uttarakhand, India.

Reviewers:

(1) Olga Plisko, Riga Stradiņš University, Latvia.

(2) Aparna Darshan Palshetkar, Vivekanand Education Society's College of Pharmacy, India.
Complete Peer review History: <http://www.sdiarticle4.com/review-history/66112>

Original Research Article

Received 12 January 2021

Accepted 04 March 2021

Published 09 March 2021

ABSTRACT

Background: Bacterial vaginosis (BV) is a common infection in women during their reproductive age. However, the burden of BV among HIV-positive women in Kenya is not clear. This study aimed to determine the prevalence of BV in HIV-positive women visiting the comprehensive care center in Machakos county hospital, Kenya.

Study Design: Cross-sectional study.

*Corresponding author: E-mail: muia.onesmus@ku.ac.ke;

Place and Duration of Study: Machakos County Hospital Comprehensive Care Centre and Machakos Cancer Care and Research Centre, between August 2020 and December 2020.

Methodology: We conducted a cross-sectional study at Machakos county hospital in Kenya by enrolling 400 women who were HIV-positive and attending the comprehensive care center at the facility. Convenience sampling was used to select the study participants. Cytological samples obtained using a cytobrush were processed using manual liquid based cytology technique. All smears were stained using the Papanicolaou staining method and examined microscopically for the presence of clue cells. A Chi-square test was performed to evaluate the association between BV and the demographic variables.

Results: Out of the 400 participants enrolled in this study, 41 (10.3%) had BV. The age groups 30-39 years (n=14, 34.1%) and 40-49 years (n=14, 34.1%) had the highest BV burden. Based on marital status, married women had the highest cases of BV (n=18, 43.9%) while divorced women had the least cases of BV (n=4, 9.8%). Women who used condom as the method of family planning showed to have the highest cases of BV (n=18, 43.9%). Of all the variables studied, only age had a statistically significant association with BV ($P=0.002$).

Conclusion: The prevalence of BV among HIV-positive women in Machakos county hospital, Kenya in this study was 10.3%. Age and BV were significantly associated.

Keywords: Age; bacterial vaginosis; cervical cytology; HIV-positive women; pap smear.

1. INTRODUCTION

Bacterial vaginosis (BV) is a prevalent vaginal infection, particularly among women of childbearing age, and is associated with a myriad of health problems. The prevalence of BV varies across countries and regions. A recent systematic review reported a global burden of 23%-29% among the general population, with Europe and Central Asia and South Asia reporting the highest and lowest prevalence, respectively [1]. However, the burden of BV may also differ according to the population's characteristics such as race, hospitalization, number of sexual partners, pregnancy, and marital status [1,2]. It arises when there is a decline in the count of helpful bacteria such as lactobacilli and an overgrowth of harmful bacteria, including *Enterobacteriaceae*, *Streptococcus spp*, *Veillonella spp*, *Bacteroides fragilis*, *Ureaplasma urealyticum*, and *Gardnerella vaginalis* [3]. The harmful bacteria are opportunistic microbes that grow singly or in combination with other organisms.

BV is a non-inflammatory condition and therefore in most cases lacks the typical symptoms such as vaginal discharge, odor, irritation, itching, erythema and dysuria [4]. According to the Centers for Disease Control and Prevention (CDC), about 84% of the patients with BV do not report any symptoms [5]; hence, the infection may be undetected, exposing the patients to health complications. Despite the absence of symptoms in most patients with BV, pregnant

women are exposed to a high risk of endometritis and low birth weight [6]. These complications adversely affect the wellbeing and safety of both the mother and the neonate. Besides, BV has been linked with a high risk of pelvic inflammatory disease that leads to chronic pelvic pain and infertility [6,7]. Patients with BV are also vulnerable to sexually transmitted diseases and Human Immunodeficiency Virus (HIV) [6]. Due to the absence and non-specificity of symptoms, many BV cases are undiagnosed, hindering the initiation of timely treatment and raising the risk of adverse health events.

Women who visit gynecologic clinics are likely to be tested for BV, especially when undergoing other examinations such as Pap smear to diagnose cervical cancer [8]. These patients may be undergoing routine screening or may have genital complaints. Notably, a recent systematic review and meta-analysis have found a significant positive association between BV and cervical cancer [8]. A disturbance in the vaginal flora has been linked to cervical cytological abnormalities [9]. Therefore, during cervical cancer screening, concurrent testing for BV is performed to inform the clinical decision-making of the healthcare provider. In Kenya, research on the diagnosis of BV during cervical cytological examination is limited. In this study, we aimed to determine the prevalence of BV among women undergoing cervical cancer screening using a liquid-based cytological technique.

2. MATERIALS AND METHODS

2.1 Study Population

We conducted a cross-sectional study at Machakos county hospital in Kenya and included HIV-positive women who were sexually active and attending the comprehensive care center at the facility. Convenience sampling was used to select the study participants. Women who were pregnant or declined to complete an informed consent form were excluded from the study.

2.2 Data Collection and Laboratory Procedures

A questionnaire was used to collect demographic data, including participants' sexual and reproductive history. A qualified clinician collected a cervical cytology sample using a cytobrush and the cytological material was transferred with brushes into a formulated liquid fixative. Samples were then taken to Machakos cancer care and research centre cytology laboratory and processed following manual liquid-based cytology technique [10].

All the smears were stained using the Papanicolaou method and examined microscopically for the presence of clue cells. All smears were examined by the principal investigator and reviewed by a qualified experienced clinical cytologist.

2.3 Statistical Analysis

All statistical analyses were performed using the statistical package for the social science system (SPSS version 18). We performed a Chi-square test to determine association between BV and the demographic variables studied. A P-value <0.05 was considered statistically significant.

3. RESULTS

A total of 400 participants were enrolled in the study. Of the 400 participants, 41 (10.3%) had BV as shown in Fig. 1. Table 1 presents a cross-tabulation of age vs BV. The age range of the participants was 21 – 74 years. The highest cases of BV were observed in the age groups (30-39) years (34.1%) and (40-49) years (34.1%) while among those aged 60 years and above there was no any case of BV. Age was statistically associated with BV ($P=0.002$).

Table 2 shows a cross-tabulation of marital status, Education, and Family planning methods

vs BV. Married women had the highest cases of BV (43.9%) while divorced women had the least cases (9.8%). There was no statistical significant association between marital status and BV ($P=0.53$). Those with secondary education as the maximum qualification had the highest cases of BV (61.0%) while those who had never gone to school had the least cases of BV (2.4%). Education level had no statistical association with BV cases ($P=0.12$). Based on the family planning method, women who used condoms had the highest cases of BV (43.9%) followed by injection (19.5%) with those using IUCD having zero cases of BV.

4. DISCUSSION

In this study, we have shown that the prevalence of BV among HIV-positive women in Machakos county hospital, Kenya was 10.3%. This prevalence is lower than that of India which was 20.9% in a study done in 2020 [11]. Another study conducted in the United States found a 17.3% prevalence of BV among HIV-positive women [12]. This variation between our research and other studies could be due to methodological differences since we relied on cervical specimens only, while the other two studies used both cervical and vaginal specimens. In our study, BV diagnosis was based on observation of clue cells only, but this approach is considered insufficient [13].

An accurate diagnosis of BV should be based on a combination of tests, including clinical manifestation (Amsel Criteria); Gram stain (Nugent score); wet mount microscopy and polymerase chain reactions (PCR) [13]. According to Amsel criteria, BV should be considered present if the patient presents with three of the following conditions: white, thin, and homogenous vaginal discharge; vaginal fluid pH >4.5; fishy odor of the vaginal discharge; and clue cells [14,15]. The Nugent score is obtained by Gram staining the vaginal smear to evaluate the dominant bacteria based on morphology [13]. Following diagnostic advancement, PCR can identify and quantify different bacteria present in the vaginal samples [13]. In another study, when gram stain was taken as the standard diagnostic method, the sensitivity, specificity, positive predictive value, negative predictive value, and diagnostic value of Pap smear for BV diagnosis were 43.1%, 93.6%, 73.8%, 79.8%, and 78.8%, respectively [16]. Due to its low sensitivity, Pap smear may not be the ideal test for screening of BV.

In the present study, we have reported a statistically significant association between age and BV with the highest cases observed among women aged 30-49 years. Our findings are consistent with those of Ranjit et al., who found a higher prevalence of BV in women aged 30-40 years and lower prevalence in those aged 10-20 years and 50-60 years in Nepal [4]. However, in the study by Ranjit et al., the association between BV and age was not statistically significant [4]. Studies by Kamga et al. in Cameroon [17] and Ibrahim et al. in Nigeria [18] found a higher prevalence of BV in those aged 18-24 years. The age bracket 18-49 years corresponds to the reproductive age of women and is characterized by increased sexual activity.

The increased sexual activity, one of the transmission methods of BV, could also explain the high prevalence of BV among married women and the lower rate in divorced and widowed women in this study. Our findings are consistent with those of Gad et al., who also found a higher prevalence of BV among married women [19]. Frequent sexual intercourse disrupts the normal flora of the vagina and prevents its restoration [20]. Bacteria located in the perianal area are likely to be translocated to the vagina [20]. Cases of BV in sexually inactive women and virgin girls have been reported before [21,22]. Therefore, sexual activity is not the only cause of BV as other factors such as improper menstrual hygiene, tight clothing, food

habits, and lifestyle changes can alter the vaginal flora [21,22].

Moreover, the family planning method has been linked to the risk of BV. While condom use is considered protective against BV due to the physical barrier provided [23], the prevalence of BV was higher in women who used condoms than other contraceptive methods. However, the results for contraceptives use in our study were not statistically significant. Studies have shown that the effectiveness of condoms depends on consistent use [23]. In our study, we did not evaluate the consistency of condom use, and this affects the accuracy of our findings. Women who used pills, implants, and injections had the lowest prevalence of BV. Singh et al. [24] and Vodstrcil et al. [25] associate the low prevalence of BV among women who use the aforementioned contraceptives with the protective effects of hormones against bacterial overgrowth in the vagina.

Another factor that is likely to influence the occurrence of BV is literacy level. Low literacy is associated with a higher likelihood of getting BV due to poor knowledge about preventive measures [4]. In our study, the educational level had no significant association with BV, and those with secondary educational levels had the highest burden of BV. The effect of education could have been modified by other factors such as sexual activity, access to healthcare, and age.

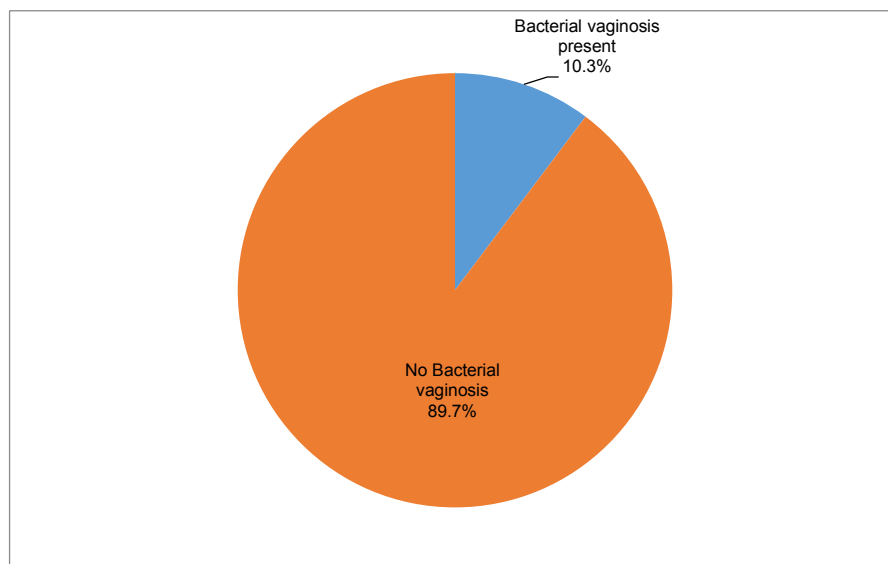


Fig. 1. Prevalence of bacterial vaginosis

Table 1. Comparison of age and cases of bacterial vaginosis

Age (years)	Bacterial Vaginosis			P-value
	Total number (%)	Positive number n=41 (%)	Negative number n=359(%)	
20-29	32(8)	9 (22.0)	23 (6.4)	0.002
30-39	111 (27.8)	14 (34.1)	97 (27.0)	
40-49	148 (37)	14 (34.1)	134 (37.3)	
50-59	98 (24.5)	4 (9.8)	94 (26.2)	
60 and above	11 (2.8)	0 (0)	11 (3.1)	
Total number	400 (100)	41 (100)	359 (100)	

Table 2. Comparison of marital status, education, family planning method and cases of bacterial vaginosis

Marital Status	Bacterial Vaginosis			P-value
	Total number (%)	Positive number n=41 (%)	Negative number n=359 (%)	
Single	100 (25.0)	14 (34.1)	86 (24.0)	0.531
Married	197 (49.3)	18 (43.9)	179 (49.9)	
Divorced	39 (9.8)	4 (9.8)	35 (9.7)	
Widowed	64 (16.0)	5 (12.2)	59 (16.4)	
Total number	400 (100.0)	41 (100.0)	359 (100.0)	
Education	Total number (%)	Positive number n=41 (%)	Negative number n=359 (%)	
Primary	158 (39.5)	9 (22.0)	149 (41.5)	0.116
Secondary	188 (47.0)	25 (61.0)	163 (45.4)	
College/University	47 (11.8)	6 (14.6)	41 (11.4)	
Never gone to school	7 (1.7)	1 (2.4)	6 (1.7)	
Total number	400 (100.0)	41 (100.0)	359 (100.0)	
Family Planning Method	Total number (%)	Positive number n=41 (%)	Negative number n=359 (%)	
Natural	68 (17.0)	6 (14.6)	62 (17.3)	0.784
Condom	179 (44.8)	18 (43.9)	161 (44.9)	
Injection	70 (17.5)	8 (19.5)	62 (17.3)	
Pill	30 (7.5)	4 (9.8)	26 (7.2)	
IUCD	14 (3.5)	0 (0)	14 (3.9)	
Implant	39 (9.7)	5 (12.2)	34 (9.5)	
Total number	400 (100.0)	41 (100.0)	359 (100.0)	

5. CONCLUSION

In this study, we have shown that the prevalence of BV among HIV-positive women visiting the comprehensive care center at Machakos county hospital was 10.3%. Age is the only factor that showed a significant association with the prevalence of BV. Our findings have demonstrated the diagnostic value of cervical cytological samples in detecting BV.

CONSENT

Written informed consent was sought from all patients who agreed to participate in this study before obtaining samples for screening. All procedures were explained to the patients and clarifications made in a language they could understand.

ETHICAL APPROVAL

The study was approved by the Kenyatta University Research and Ethical Review Committee (Protocol Number: PKU/2066/11213).

ACKNOWLEDGEMENTS

We are grateful to Machakos County Hospital CCC Staff led by Peter Mukenya and Andrew Mului for their support during the collection of Pap smear samples. We wish also to thank the medical laboratory officers at the Machakos cancer care and research center cytology laboratory; specifically Simon Gachau and Lawrence Kavivya for helping us in staining the cytological samples.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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