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**PREVALENCE OF BACTERIAL VAGINOSIS IN WOMEN WITH VAGINAL SYMPTOMS IN SOUTH PROVINCE, RWANDA**

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**Running title: Bacterial vaginosis and women with vaginal symptoms****Abstract**

This is a prospective study of 297 Consecutive High Vaginal Swab (HVS) specimen from patients with vaginal symptoms at the laboratory of Butare University Teaching Hospital, South Province, Rwanda. The aim of the study was to evaluate the prevalence of bacterial vaginosis and the role of some micro-organisms and laboratory indices associated with it. The age range was 16-57 years with a mean of 30.8 years. The overall prevalence of bacterial vaginosis was 17.8% and the highest percentage of 52.8 % (28) found in the age group of 21-30 years compared with the lowest percentage of 1.9% (1) in the age group less than 20 years. Almost half of patients with trichomoniasis were found to have bacterial vaginosis ( $P < 0.05$ ). The demonstration Clue cells in wet mount was found in significantly higher numbers (90.5%) in women with bacterial vaginosis ( $P < 0.001$ , positive predictive value 90.4%) while low sensitivity and positive predictive value were seen for vaginal discharge for detecting infection with bacterial vaginosis ( $p > 0.05$ , positive predictive value 26.0%). Bacterial vaginosis is common among women with vaginal symptoms in Rwanda as showed by gram stain examination. Further research into this pathology in other Rwandan women populations is needed.

Keywords: Bacterial vaginosis, laboratory based study, prevalence, Rwanda

**Introduction**

Vaginal symptoms are among the most common reasons of visits in clinical medicine, and occur frequently in women during their reproductive health, resulting very often in consulting an obstetrician or gynecologist or not (1). Bacterial vaginosis (BV) is the most common cause of vaginal discharge among women in reproductive age with a prevalence of 9-37%, depending on the population studied (2, 3). The

prevalence of vaginal infections, particularly BV, is high in many countries in Sub-Saharan Africa. For example, 20% to 50% of women of reproductive age are affected in Zimbabwe (4). It's characterized by a disorder of the vaginal ecosystem characterized by a change in the vaginal flora from the normally predominant lactobacillus to one dominated by sialidase-enzyme-producing organisms including *Gardnerella vaginalis*, *Mobiluncus spp.*, *Prevotella*

*bivia*, *bacteroides spp.*, *Peptostreptococcus spp.*, *Ureaplasma urealyticum*, and *Mycoplasma hominis* (5). All these organisms may have a synergistic role in producing the symptoms of BV. The condition is although common especially in low settings but under diagnosed. This may be due to confusion over its complex polymicrobial nature (6).

The two most widely accepted methods for the diagnosis of bacterial vaginosis, Amsel's composite criteria (7) and Nugent's Gram stain evaluation of bacterial morphotypes (8), are not used sufficiently in routine practice (9), mostly in low income countries. Although the diagnosis of BV by Amsel criteria is simple, it is relatively insensitive and not easily subjected to quality control, and the apparent complexity of the latter may have limited its routine application by clinical laboratories. As a consequence, surveillance studies on BV are mostly based on specialist clinic setting. Its prevalence in developed communities has been well documented as leading cause of vaginal discharge (10), whilst reports on the prevalence of BV from developing communities are scarce. Authors are not aware of other studies on this topic undertaken in Rwanda. The aim of our study was to evaluate the prevalence of BV among women who presented with vaginal symptoms at the Butare University Teaching Hospital, a tertiary health facility in South province, Rwanda, and to discuss the role of some micro-organisms and laboratory indices associated with BV.

## **Materials and methods**

The study was conducted at the unit of microbiology (department of medical biology), Butare University Teaching Hospital, South Province, Rwanda, from March to December 2007. A total of 296 Consecutive High Vaginal Swab (HVS) specimen from patients (aged 16 to 57 years) with vaginal symptoms, who were referred to our laboratory, were included in the study. Almost all the patients were symptomatic and complained of one or more of the following symptoms: vaginal discharge, pruritus, and lower abdominal pain. Of 296 high vaginal swabs, clinical data on symptoms were available for 117 patients. All specimens were taken in patients who were already undergoing examination and the study was approved by the Butare University Teaching Hospital. The study was classified as human harm free since it is a laboratory-based study and all samples were analyzed anonymously to assure the patient confidentiality. A sterile cotton tipped swab was inserted in the posterior vaginal fornix at the time of speculum examination, then two swabs were taken, the first swab was rolled on a clean slide then a drop of isotonic saline was added and the slide was examined microscopically (X 400) for the presence of clue cells and *Trichomonas vaginalis*. A second swab of secretions was fixed by flame and Gram staining of the slide was performed for microscopic examination. The slide was examined under oil immersion microscopy (X 1000). Diagnosis of bacterial vaginosis was determined according to

a morphological scoring system(8), based on the proportions of lactobacilli relative to gram-negative anaerobes. Each slide was read by 2 independent technicians and was evaluated by another when discrepancies arose. The presence of yeast was done by slide smear examination of gram stain.

Data processing and statistical analysis were performed using SPSS software (version 15.0). The results were expressed as percentage, with significance at 5%

## Results

A prospective study of consecutive 297 high vaginal swabs from women with vaginal symptoms was studied over the 10-month period for bacterial vaginosis; the age range was 16-57 years with a mean of 30.8 years. The overall prevalence of bacterial vaginosis was 17.8% and the highest percentage of 52.8 % (28) found in the age group of 21-30 years compared with the lowest percentage of 1.9% (1) in the age group less than 20 years (Table 1). Yeasts were present in samples from 83 (28%) patients and *T. vaginalis* was detected in samples from 11 (3.7%) patients.

Table 2 shows the distribution of *T. vaginalis* infection and the presence of yeast on gram stain over the categories of patients with and without

bacterial vaginosis. Almost half of patients with vaginal trichomoniasis were found to have bacterial vaginosis ( $P<0.05$ ) while only few cases with yeasts were associated with bacterial vaginosis.

Of 296 high vaginal swabs, clinical data on symptoms reported were available and accurate for 117 patients, and only these data were analysed further. Most common symptoms identified was vaginal discharge (39.3%) followed by pruritus (31.6%), combination of vaginal discharge and pruritis (22.2%) and lower abdominal pain (6.8%). Table 3 shows a non-significant trend of a lower rate of symptoms in women with negative result compared to women with an infectious vaginal agent. A high rate of vaginal discharge was found in women with *Trichomonas vaginalis* than in bacterial vaginosis or in the absence of pathogen, although not to a significant extent. The demonstration Clue cells in wet mount was found in significantly higher numbers (90.5%) in women with bacterial vaginosis ( $P<0.001$ , positive predictive value 90.4%) while low sensitivity and positive predictive value were seen for vaginal discharge for detecting infection with bacterial vaginosis ( $p> 0.05$ , positive predictive value 26.0%).

TABLE 1: AGE DISTRIBUTION OF PATIENTS WITH BACTERIAL VAGINOSIS

AGE GROUP (YEARS)	BV (%)	I (%)	N (%)
16-20	1 (1.9)	4 (4.9)	9 (5.6)
21-30	28 (52.8)	38 (46.3)	94 (58.4)
31-40	18 (34)	28 (34.1)	36 (22.4)
> 40	6 (11.3)	12 (14.6)	22 (13.7)
Total	53 (100)	82 (100)	161 (100)

BV, bacterial vaginosis: score of 7-10; I, intermediate: score of 4-6; N, normal: score of 0-3

TABLE 2: ASSOCIATIONS BETWEEN BACTERIAL VAGINOSIS AND PRESENCE OF OTHER MICRO-ORGANISMS

CHARACTERISTIC		n (%)	VAGINAL FLORA MORPHOLOGY		
			BV (%)	I (%)	N (%)
Trichomonas vaginalis*	Positive	11 (3.7)	5 (45.5)	4 (36.4)	2 (18.2)
	Negative	285 (96.3)	48 (16.8)	78 (27.4)	159 (55.8)
Yeasts	Positive	83 (28)	10 (12)	20 (24.1)	53 (63.9)
	Negative	213 (72)	43 (20.2)	62 (29)	108 (50.7)

BV, bacterial vaginosis: score of 7-10; I, intermediate: score of 4-6; N, normal: score of 0-3.

\*  $P < 0.05$ ; \*\*  $P < 0.01$ ; \*\*\*  $P < 0.001$  BV vs. I+N

TABLE 3: CORRELATIONS OF SYMPTOMS WITH LABORATORY DIAGNOSIS, NUMBERS IN PARENTHESES ARE PERCENTAGE OF CASES IN THE SAME ROW

LABORATORY DIAGNOSIS	SYMPTOM N (%)				
	Vaginal discharge	Pruritis	Vaginal discharge and pruritis	lower abdominal pain	Total
Normal flora	20 (33.3)	22 (36.7)	13 (21.7)	5 (8.3)	60
Bacterial vaginosis	6 (42.9)	2 (14.3)	5 (35.7)	1 (7.1)	14
Yeasts	12 (36.4)	12 (36.4)	7 (21.2)	2 (6.1)	33
Trichomona vaginalis	2 (66.7)	1 (33.3)	–	–	3
Mixed infection	6 (85.7)	–	1 (14.3)	–	7
Total	46 (39.3)	37 (31.6)	26 (22.2)	8 (6.8)	117

TABLE 4: SENSITIVITY, SPECIFICITY AND POSITIVE PREDICTIVE VALUE OF SYMPTOMS AND SIGNS ASSOCIATED WITH BACTERIAL VAGINOSIS BY NUGENT SCORE.

TEST	N OF THE RESULT WITH THE FOLLOWING RESULT (N=117)				SENSITIVITY	SPECIFICITY	PPV	P VALUE
	TP	FP	TN	FN	(%)	(%)	(%)	
Vaginal discharge	19	34	62	9	57.1	65.2	26	NS
Clue cells > 20%	12	2	94	2	90.4	97.7	90.4	< 0.001

TP, true positive; FP, false positive; TN, true negative; FN, false negative; PPV, positive predictive value; NS, not significant

### Discussion

Bacterial vaginosis is not a new syndrome but rather an infection that is being increasingly recognized in most of developed countries but still under-recognized condition in many low settings. There have been no reports of the prevalence of bacterial vaginosis in Rwanda. The present study, which is a cross-sectional laboratory-based study to define the presence of vaginal infections, provided unique information on the prevalence of bacterial vaginosis in the symptomatic women in the developing community.

In the present study our finding, with the overall prevalence of bacterial vaginosis of 17.8%, is in agreement with most of the studies that showed different rates ranging from 17% to 37% (11-13). However, higher rates of bacterial vaginosis have been reported in some studies carried out in developing countries. In a study from Haryana, India, bacterial vaginosis was diagnosed in a high percentage (48.5%) of rural women (14). These variations in the rate could be related to geographical distribution or systematic differences in the various population

samples. The contrasting prevalence figures may be because of various reasons such as differences in socio-economic status, educational level and method used for diagnosis of bacterial vaginosis.

Previous studies have found that bacterial vaginosis prevalence increased with age (15-17). In these studies, bacterial vaginosis prevalence was higher in women aged 25 years and older compared to women aged 14-24 years.

However, another study showed no association between bacterial vaginosis and age > 25 years (11). Although our findings showed that the prevalence of bacterial vaginosis is lower among women 16-20 years of age, there is no evidence to support this assertion as number of women in this group of age was very few.

In the present study, there were significant association of bacterial vaginosis with the presence of *Trichomonas vaginalis* in wet mount whereas no association was found with the presence of yeast on gram stain. The association of trichomoniasis with abnormal vaginal

ecology has been described by other authors (18, 19). The prevalence of this organism rise gradually with a decrease in the normal bacterial flora. This can be explained in 2 different ways: a normal vaginal ecology (score 0-3) may inhibit infection with *T. vaginalis* or trichomoniasis may change the vaginal ecology, causing it to resemble bacterial vaginosis. As found in a study (19) the presence of yeast on gram stain was inversely related to the level of ecological disturbance. This support the view that the bacterial vaginosis environment is not conducive to yeast multiplication, and yeast vaginitis therefore does not occur in the presence of bacterial vaginosis.

Out of 117 women with documented clinical information, the common symptom found was vaginal discharge in 39.3% followed by pruritus 31.6% and lower abdominal pain 6.8%. Clinical assessment is traditionally used for diagnosis. However, in the present study, none of the symptoms could significantly be attributed to a given infectious agent. A number of studies explored the association of vaginal discharge with vaginal infections (20, 21). With regard to clinical manifestations of vaginal infections among symptomatic women, all these studies found a variable degree of association between complaint of vaginal discharge and vaginal infections. Although these symptoms are not reliable, they are described in textbooks, as aids for the clinician to make a diagnosis of vaginal infection and to help choosing the proper medication. Even in our study, in more than

33.3% of cases with a laboratory diagnosis of normal flora, vaginal discharge was present.

Clue cells in wet mount were found to be significantly associated with bacterial vaginosis as shown by its sensitivity and positive predictive value. Our findings for positive clue cells also support previous studies that found it to have the highest sensitivity and specificity of the individual clinical criteria for diagnosing bacterial vaginosis (7, 22).

In conclusion, bacterial vaginosis is common among women with vaginal symptoms in Rwanda as showed by its diagnosis using gram stain. In fact, the prevalence of women with bacterial vaginosis in our study compared favourably with a lot of studies, but is different from some of the reports mostly from developing country where high rates prevail (12, 14). Clue cells in wet mount are valuable aid in bacterial vaginosis diagnosis. Although we did not evaluate the association of symptoms with vaginal infection in this study directly, our data suggest that the current approach to the diagnosis of vaginal infection should be reconsidered. Further research with larger sample size targeting both symptomatic and asymptomatic women in Rwanda is needed to study vaginal infections.

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