

# High Prevalence of Bacterial Vaginosis Due to *Gardnerella* Species and Intra Genital Hygiene Impact Practices among Rural and Urban Women in Yaoundé, Cameroon

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## Abstract

**Background:** Bacterial vaginosis represents a public health problem due to its high frequency in our various health facilities. Vaginal douching used by women as a means to achieve hygienic measures could be potentially dangerous. The objective of the study is to aim at bringing forth epidemiological data on intra-genital hygiene practices, determine the prevalence of bacterial vaginosis and the association between these vaginal practices and this genital infection. **Methods:** A cross-sectional study was conducted on March 2022 on patients received in Human Biology Laboratory of Institute of Medical Research and Medicinal Plants Studies, in Yaoundé. Data were collected by questionnaire after an oral and written consent obtained from the patients. Vaginal swabs were collected and inoculated on to Blood Agar, Chocolate with polyvitex. Identification was done using morphologically appearance, Gram staining and biochemical tests. Statistical analysis was done using SPSS 20 software. **Results:** A total of 120 patients were enrolled during the study. The most represented age group of participants was 25 to 35 years with 62.5%. The overall prevalence of bacterial vaginosis was 29.16%. The prevalence of bacterial vaginosis varied according to the number of lifetime male sexual partners, women who reported having only one sexual partner in their life had a prevalence rate of 23.32%. The prevalence of bacterial vaginosis was higher in patients living in urban areas (23.33%). No significant correlation

was observed between bacterial vaginosis and regularly vaginal douching and practice of intimate vaginal cleansing ( $p = 0.980$ ). **Conclusion:** Our findings indicated that sexual behaviour traits may have an impact on the relatively high prevalence of bacterial vaginosis. This suggests that comprehensive health education programmes may be necessary to lower the incidence of bacterial vaginosis, which indicate the need for comprehensive and programmed health education programs aimed at reducing the prevalence of bacterial vaginosis.

## Keywords

Women, Prevalence, Bacterial Vaginosis, Intra-Genital Hygiene, Yaoundé

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## 1. Introduction

Bacterial vaginosis (BV) is the most common lower reproductive tract syndrome in women. It occurs when the normal lactobacilli-dominated flora in the vaginal environment is altered to include different bacterial species, such as *Gardnerella* species, *Mycoplasma hominis*, and several anaerobic species [1]. Female genital mutilation (FGM) and associated female reproductive tract practises including vaginal douching and traditional intra-vaginal self-treatment (to treat vaginal symptoms and tightens the vagina) have been documented in certain African traditions [2]. Vaginal douching, also known as intravaginal cleaning or intra-genital hygiene, is a method of achieving hygienic measures that is often employed by women [2], and it normally involves the insertion of a liquid solution into the vagina. However, quantitative and qualitative data on the prevalence of vaginal douching and these traditional intra-vaginal self-treatments are scarce [3] compared to FGM.

Globally, it seems that BV prevalence varies, particularly affecting Africans and there have been reports of bacterial vaginosis prevalence among Australians, women in North America, and women in East and Southern Africa ranging from 12% to 29% and 50%, respectively [4]. The impact of Bacterial vaginosis on the lower and upper female reproductive system has been deduced. BV has been associated to endometritis after childbirth or abortion [5] and adverse pregnancy outcomes as vaginitis-related organisms (*Gardnerella species* and *Prevotella*) and their toxins can cross the placenta [5]. The effect of lower reproductive tract bacteria that ascend to the female upper reproductive particularly that of vaginosis has not been fully elucidated in Cameroon. Most studies have been conducted on few samples of women group and few of these studies have examined the role of intravaginal practices in the pathogenesis of bacterial vaginosis. We therefore aimed at bringing forth epidemiological data on intra genital hygiene practices (vaginal douching and intromission of traditional product in the vagina) and determine the prevalence of bacterial vaginosis and the association between these vaginal practices and this genital infection.

## 2. Materials and Methods

### 2.1. Study Design and Setting

This study was a cross-sectional study conducted on patients received for a blood sugar check during the open house organized on International Women's Day on March 8, 2022 in Human Biology Laboratory of the Center of Research on Health and Priority Pathology located at the Ministry of Scientific Research and Innovation of Cameroon.

### 2.2. Data Collection Methods

Data were collected by questionnaires that had four main parts: Sociodemographic information (age, profession, region of origin, religion, level of education, marital status), intravaginal practices, sexual life, clinical and medical antecedent. The questionnaire was created after a literature review [6], and it was pretested for fluency and comprehension on regular patients who came to the lab on a daily basis for analysis.

**Inclusion criteria:** women who consented to participate and older than fifteen (15) years. Women who came to the human biology laboratory for blood checking and correctly completed the questionnaire.

**Non inclusion criteria:** women that were bleeding, postmenopausal and pregnant women; women who did not give consent for participation and those receiving antibiotics, who did vaginal cleansing on the day of sampling.

### 2.3. Vaginal Sample Collection

Secretions from the vaginal orifice and posterior vaginal vault were collected by swabbing in a standardized manner. The collected swabs were sent to the bacteriology unit of the human biology laboratory immediately for analysis.

### 2.4. Isolation and Characterization of Isolated Germs

For the diagnosis of bacterial vaginosis, we made a flame-fixed slide smear and then stained by Gram's method. Then we made a microscope observation at the 100 objective with immersion oil. This observation allowed us to classify the vaginal flora into 4 types according to Thomason (1998) [7] and to make the diagnosis of bacterial vaginosis:

Type I flora: predominance of the Doderlein flora.

Type II flora: majority Doderlein flora, but existence of a substitution flora without dominant morphology.

Type III flora; flora of bacterial vaginosis with rarefaction of the Doderlein flora with appearance of a substitution flora with dominant morphology.

Type IV flora; flora of bacterial vaginosis with complete disappearance of Doderlein flora with appearance of abundant substitution flora and presence of clues-cells. *Gardnerella* species was identified as gram variable or gram negative coccus bacilli.

Then the potash test was carried out: we mixed a drop of leucorrhoea with a

drop of 10% potassium hydroxide on a slide. A rotten fish-like amino odor indicates a positive reaction. Collected swabs were inoculated on to, blood agar, chocolate with polyvitex (Bio Rad, France) in respect of the standard streak plate technique. In case of growth in the first 24 hours, more than 10 colonies observed testified to a bacterial infection. Identification was done using morphologically appearance, gram staining and biochemical tests (Bio Rad, France).

## 2.5. Statistical Analyses

Data were entered into Epi info version 7, cleaned, and exported to SPSS version 20 for analysis. Categorical variables were tested for statistical significance of distributions using the chi square test.  $P < 0.05$  was considered significant.

## 2.6. Ethical consideration

All participants had provided informed and written consent. Administrative authorizations were also obtained from the Director General of the Institute of Medical Research and Medicinal Plants Studies and the laboratory head too. An ethical Clearance (N° 2020/03/658/CNERSH/SP) was obtained from the National Research Ethic Committee for Human Health.

## 3. Results

### 3.1. Characteristic of the Study Population

A total of 120 participants were recruited in this study base the inclusion criteria. The mean age of the participants was 31.08 (95% CI = 29.12, 32.82). The most represented age group of participants was 25 to 35 years with a proportion of 61.2%. The majority of our participants were single (68.1%), lived in urban areas (76.2%) and had a higher education level (75%).

### 3.2. Traditional Intra-Vaginal Self-Treatment

76% of participants in this study declared that they regularly practiced vaginal douching. Of those who regularly practiced this intimate cleansing, 71.6% used plain water, 10.2% used sanitary products and 18.2% used other products than the two listed lemon, vinegar. For the utility of the traditional products, 19.0% of women who participated in the study said they introduced traditional products into their vaginas. 21.9% of these enrolled participants justified this practice as a way to fight against sexually transmitted infections, 19.3% to eliminate vaginal odor, 7.9% to eliminate odor and excess secretion, and 5.3% thought it was only to eliminate excess vaginal secretion, and finally 3.6% to avoid dry itchy vagina and eliminate sexual transmitted disease.

### 3.3. Prevalence of Bacterial Vaginosis According to Sociodemographic Factors, Sex Behavior and Relationship with Intravaginal Practices

From this study, the prevalence of subgroups of bacterial vaginosis showed that women aged [25 - 35] had a prevalence of (24.16%) of bacterial vaginosis due to

*Gardnerella* species and the difference was significant with the others groups ( $P = 0.0002$ ) (Table 1). The prevalence of bacterial vaginosis variation appears to be related to education and marital status. Women with higher education were more likely to be positive for bacterial vaginosis due to *Gardnerella* species (18.33%) than those with secondary education (9.16%). The prevalence of bacterial vaginosis caused by *Gardnerella* species was higher among married subjects (16.66%) compared to the other groups and the difference was significant ( $P = 0.00004$ ).

**Table 1.** Prevalence of bacterial vaginosis according to sociodemographic characteristics, sexual behavior and setting place.

	Participants having Bacterial vaginosis due to <i>Gardnerella</i> species		P value
	YES No (%)	NO No (%)	
<b>Number of participants</b>	35 (29.16)	85 (70.83)	
<b>Age group of participants</b>			
[15 - 25]	0 (0)	32 (26.66)	
[25 - 35]	29 (21.16)	46 (38.33)	
[35 - 45]	6 (5)	6 (5)	<b>P = 0.0002</b>
≥45	0 (0)	1 (0.83)	
<b>Total</b>	<b>35 (29.15)</b>	<b>85 (70.85)</b>	
<b>Level of education</b>			
Primary	2 (1.66)	1 (0.85)	
Secondary	11 (9.16)	15 (12.5)	
Higher education	22 (18.33)	69 (57.5)	<b>P = 0.12</b>
<b>Total</b>	<b>35 (29.15)</b>	<b>85 (70.85)</b>	
<b>Marital status</b>			
Single	10 (8.33)	69 (57.5)	
Concubinage	2 (1.66)	3 (2.5)	
Divorced	3 (2.49)	2 (1.66)	
Married	20 (16.66)	8 (6.66)	<b>P = 0.00004</b>
Widow	0 (0)	3 (2.5)	
<b>Total</b>	<b>35 (29.15)</b>	<b>85 (70.85)</b>	
<b>Setting place</b>			
Urban area	28 (23.33)	65 (54.16)	
Rural area	7 (5.83)	20 (16.66)	<b>P = 0.691</b>
<b>Total</b>	<b>35 (29.15)</b>	<b>85 (70.85)</b>	
<b>Sexual partner within 6 months</b>			
None	03 (2.49)	8 (6.66)	
One	28 (23.32)	65 (54.16)	<b>P = 0.507</b>
At least two	4 (3.33)	12 (9.99)	
<b>Total</b>	<b>35 (29.15)</b>	<b>85 (70.85)</b>	

**Table 2.** Association between intravaginal practices and bacterial vaginosis.

Intravaginal practices	Bacterial vaginosis due to <i>Gardnerella</i> species		P value
	Yes	No	
<b>Regularly doing vaginal douching</b>	No (%)	No (%)	
YES	28 (23.32)	67 (55.83)	P = 0.955
NO	7 (5.83)	18 (15)	
<b>Traditional product practices</b>			
YES	5 (4.16)	12 (10)	P = 0.955
NO	30 (25)	73 (60.84)	

The prevalence of bacterial vaginosis varied according to the number of lifetime male sexual partners. Women who reported to having no sexual partner in the last 6 months had BV prevalence of 2.49% compared to BV prevalence of 23.3% and 4% respectively amongst the women were sexually active with single and multiple partners. The prevalence of bacterial vaginosis due to *Gardnerella* species was lower in patients living in rural areas (5.83%) than in those living in urban areas (23.33%). The statistical analysis did not show a significant correlation between bacterial vaginosis due to *Gardnerella* species and place of residence (P = 0.691).

**Table 1** presents the summary of sociodemographic data of participant having a bacterial vaginosis.

In this **Table 2**, we are presenting the regular practice of vaginal douching and the prevalence of bacterial vaginosis due to *Gardnerella* species. It's revealed higher percentage of bacterial vaginosis in the group of those who practiced than in those who did not (prevalence rate of 23.32% and 5.83% respectively). The prevalence of this infection was lower; 4.16% among women practicing vaginal intromission of traditional products. No significant correlation was observed between bacterial vaginosis due to *Gardnerella* species and the regular practice of vaginal douching (P = 0.955).

#### 4. Discussion

Bacterial vaginosis represents a public health problem due to its high frequency in our various health facilities. In order to improve the quality of care, the epidemiology of this pathology as well as its risk factors, particularly intra-vaginal practices, must be reevaluated and documented in the Cameroonian context. With this in mind we conducted a pilot study to bringing forth epidemiological data on intra-genital hygiene practices, determine the prevalence of bacterial vaginosis and the association between these vaginal practices and this genital infection, with a particular focus on intravaginal practices among women in Yaoundé. A prevalence of bacterial vaginosis of 29.16% was found in this study. This is similar to those found by Allsworth *et al.*, (2007) [8] and Yen *et al.*, (2007) [9] who conducted studies in the United States; these authors had a prevalence of bacterial vaginosis of 29% and 29.2% respectively. On the other hand,

lower prevalence rates of bacterial vaginosis than the present study have also been reported in Ethiopia (14.4%) [10], Iran (6.6%) [11]. These differences may be related, among other things, to study design, sample size, study population, methods used for identification of bacteria, also temporal and spatial variation as risk factors (intravaginal practices) for these genital infections. In our study, women aged [25 - 35] years were more likely to be risk of having bacterial vaginosis (24.16%) (P value = 0.0002). The same results were obtained by Koumans *et al.*, (2017) [12], Marx *et al.*, (2010) [13] in studies conducted in the United States of America and Kenya respectively. The latter reported in their study that women below the age of 40 years were at higher risk of contracting bacterial vaginosis. This could be explained by the fact that they are more likely to have multiple sexual partners and there are in period of maximum sexual activity. Frequent intercourse destroy vaginal flora and exposed to bacterial vaginosis. However, the low prevalence in women aged 45 years and above (0%) in our study is paradoxical. In fact at this age there is an increase in vaginal pH in these women, which has been identified as the cause of a decrease in estrogen levels, which in turn creates an optimal condition for the growth of bacteria other than lactobacilli [14]. Lack of education has been shown to be significantly associated with bacterial vaginosis [15]. However, our finding like other studies contradicts this conclusion [8] [9]. In the present study, bacterial vaginosis was higher in subjects with higher and secondary education (18.33% and 9.16% respectively) compared to primary level patients (1.66%). The geographical location of the testing laboratory of the Center for Research on Health and Priority Pathologies, who is close to schools and Universities area, would explain the high prevalence in this educational level. In our study, married women had a higher risk of having bacterial vaginosis (16.66%) compared to those with other marital status. Same results recorded with the existing literature on the subject [10] [11] [13]. This result found in the present study could be explained by the fact that they are more likely to have frequent sexual intercourse which destroy vaginal flora. In this series, contrary to all expectations, individuals living in urban areas were more often affected by bacterial vaginosis (23.33%) than those living in rural areas (5.83%). This could be explained by the size of our sample but also by the fact that the majority of the participants in our study lived in urban areas and have easy access to commercial antiseptic products used during douching; 10.2% of women in this study used sanitary product. Similar results were obtained by Mulu *et al.*, (2015) who in a cross-sectional hospital-based study in Ethiopia found a prevalence of bacterial vaginosis of 10.3% in women who live in urban areas [16]. In our study, there was a significant correlation between the number of lifetime sexual partners and the prevalence of bacterial vaginosis. One sexual partner was more likely have risk factors for bacterial vaginosis (23.32%) than none sexual partner within the six months. Some authors argue that bacterial vaginosis can be considered as a sexually enhanced disease rather than a sexually transmitted infection, with the frequency of sexual intercourse being a critical

factor [8] [9] [12]. As shown in several other studies [9] [12] [14] [16], douching was associated with a higher prevalence of bacterial vaginosis. In this study, 10.2% of women reported regular intimate vaginal cleansing with sanitary product. Some of these products may have antiseptic properties and others may greatly disrupt the vaginal environment, creating a disbiosis and therefore increasing the risk of endogenous or exogenous infection. In our study 76% of women practiced douching, 71.6% used plain water and 19% introduced traditional product in their vagina. McClelland *et al.*, (2006) found that 71% of women reported using soap or others products including detergent and only 1% women reported placing herbs or other substance in the vagina [17]. A study conducted on female sex worker in Nairobi found that 72% among them practiced intravaginal washing [18]. All this studies showed that douching is common at high frequency in sub Saharan Africa; this can be justified by our habits and customs.

Our study limitation was that: we could have had an even higher prevalence of bacterial vaginosis due to *Gardnerella* species, but we only had one open day in our laboratory, this limited the study population. In addition the women who were sent away for having done the intimate toilet this day did not return for the vaginal sampling the next day. Many pregnant women were not patient to answer the questionnaire. Finally, we do not have enough financial means to buy the reagents to identify the different species of *Candida* and *Gardnerella*.

## 5. Conclusion

The women came for a blood sugar check and many of them had bacterial vaginosis. It seems that many women with bacterial vaginosis are asymptomatic. Our study showed that the prevalence of bacterial vaginosis was relatively high and was affected by sociodemographic and behavioral characteristics including vaginal douching. Women aged 25 to 35 and with higher education were more exposed to bacterial vaginosis due to *Gardnerella* species. We have also found that the proportion of women with bacterial vaginosis living in urban areas was higher than that living in rural areas and married women had a higher risk of having bacterial vaginosis. This genital infection (bacterial vaginosis due to *Gardenerela* species) was not statistically linked to regularly doing vaginal douching even like the women who performed vaginal douching were more exposed to bacterial vaginosis in our study. Therefore, comprehensive health education aimed at reducing bacterial vaginosis is necessary; women need to be more educated concerning their vaginal hygiene.

## Author's Contributions

This work was carried out with the collaboration of all authors. The study was designed by Marie Chantal Ngonde Essome, Mansour Mohamadou and Adamou Velhima who are authors, conceptualised the protocol and also wrote the first draft of questionnaire.



Adamou Velhima Elie, Mansour Mohamadou, Clarisse Engowei Mbah, wrote the first draft of the manuscript.

Adamou Velhima Elie, Mansour Mohamadou, Clarisse Engowei Mbah, Lilian Akwah and Marie-Chantal Essome Ngonde managed the analysis of the study.

Clarisse Engowei Mbah, Valerie Emvoutou, Lilian Akwah, Milaine Toukap, Ngoutane Aicha, Franck Enama, Djoulde Ibrahima, Roger Ahouga were in charge of the literature and pretested the questionnaire.

Adamou Velhima Elie, Mansour Mohamadou, Franck Enama and Marie Chantal Ngonde performed the statistical analysis.

Finally, questionnaire was approved by all authors and all authors have read and approved.

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### Conflicts of Interest


The authors declare no conflicts of interest regarding the publication of this paper.

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## Appendix

<p>REPUBLIQUE DU CAMEROUN Paix-Travail-Patrie ----- MINISTERE DE LA RECHERCHE SCIENTIFIQUE ET DE L'INNOVATION ----- INSTITUT DE RECHERCHES MEDICALES ET D'ETUDES DES PLANTES MEDICINALES ----- CENTRE DE RECHERCHES EN SANTE ET SUR LES PATHOLOGIES PRIORITAIRES</p>		<p>REPUBLIC OF CAMEROON Peace-Work-Fatherland ----- MINISTRY OF SCIENTIFIC RESEARCH AND INNOVATION ----- INSTITUTE OF MEDICAL RESEARCH AND MEDICINAL PLANTS STUDIES ----- CENTRE FOR RESEARCH ON HEALTH AND PRIORITY PATHOLOGIES</p>
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### Consent Declaration

Mrs/Mr/Miss, IMPM researchers as part of their sovereign missions, are conducting a study entitled “**Research on Chlamydiae and on Gardnerella vaginalis**”, the main objective of the study is to determine the impact of Gardnerella and chlamydia co-infection on the health of women. For this, we will submit a questionnaire to you and then take a cervico-vaginal sample and a blood sample from you. All measures are taken to avoid the occurrence of risk and preserve the confidentiality of your results. Your results will be communicated to you shortly when they will be available.

I freely Agree to participate in the study    yes     no

### I- SOCIO-DEMOGRAPHIC DATA

1- Anonymous number \_\_\_\_\_ Phone number \_\_\_\_\_

2- Region of origin \_\_\_\_\_

3- Gender    M     F

4- Are you pregnant    yes     no

5- If yes, give the age of pregnancy \_\_\_\_\_

6- Your date of birth please \_\_\_\_\_ Age (years) \_\_\_\_\_

7- Nationality \_\_\_\_\_

8- Occupation \_\_\_\_\_

9- Residence \_\_\_\_\_ (Urban, Semi-urban, Rural)

10- Marital status    (Single, Married, Divorced, Concubinage, Other specify)

11- If Married specify: Monogamous or Polygamous \_\_\_\_\_

12- Level of education: \_\_\_\_\_ (Primary, secondary, higher, un-schooled) \_\_\_\_\_

### II- Intra vaginal practices (IVP)

- 13- Do you regularly practice intimate vaginal hygiene? yes  no
- 14- Do you clean the inside of your vaginal cavity? yes  no
- 15- If yes, what type of IVP (**Intra vaginal practices**): Vaginal toilet by scraping the vaginal walls with the fingers: yes  no
- 16- Do you practice vaginal douching: yes  no
- 17- If yes with which product? Simple water  hygienic  Other specify
- 18- Do you insert traditional products into the vagina? yes  no
- 19- If yes, how long have you been applying this practice?
- 20- If yes, who recommended this product to you? \_\_\_\_\_
- 21- What is the main reason that motivates you to follow this practice? (Eliminate vaginal odor, Eliminate excess vaginal secretion, Fight against STIs, Avoid pregnancy, Dry the vagina) \_\_\_\_\_
- 22- If yes how many times per week do you apply the product \_\_\_\_\_

### III- Sex life

- 23- Can you tell us at what age you had your first sexual intercourse?
- \_\_\_\_\_
- 24- How many sexual partners have you had during the last three months?
- \_\_\_\_\_

- 25- Do you see your periods normally? yes  no
- 26- If not what is the reason? \_\_\_\_\_

### IV- Clinical/Surgical history

- 27- Vaginal pruritus: yes  no
- 28- Painful urination: yes  no
- 29- Type of leucorrhoea: abundant  scanty
- 30- Pain during sexual intercourse: yes  no
- 31- Do you have pelvic pain? yes  no
- 32- Have you ever been tested positive for chlamydia? yes  no
- 33- If so, when was it? \_\_\_\_\_
- 34- What type of treatment did you take and for how long? \_\_\_\_\_
- 35- Have you been trying to conceive and you have not been able to do so during the last twelve months?
- 36- Have you had surgery once? yes  no
- 37- If yes, what type of operation? \_\_\_\_\_
- 38- Have you ever suffered from a fistula? \_\_\_\_\_

### IV- Medical history/Immunological status

- 39- Did you take antibiotics at home? yes  no  If not go to Q40
- 40- If yes, what is the duration (days) of the treatment? \_\_\_\_\_
- 41- Can you tell us the name of the Antibiotic? \_\_\_\_\_
- 42- Where did it come from? Street vendor  Pharmacy  Public hospital  Pharmacy  Private  hospital  Officine  Other to be specified
- 43- Do you know your current HIV serological status? yes  no
- 44- If yes, specify: Positive  Negative

45- If positive specify; the date of screening \_\_\_\_\_

46- If not, do you accept that we carry out your screening?    yes     no

47- If yes, collect:

48- Screening result: Positive     Negative

49- Do you suffer from any of the following chronic pathologies? Diabetes

High blood pressure     Cancer ; Other(s) to be specified

50- Have you had a cervico-vaginal smear?    yes     no

Signature