



Bacterial vaginosis and risk factors: A cross-sectional study among women at Soa District Hospital, Cameroon

Marie Chantal Ngonde Essome^{1,2*} Mohamadou Mansour¹, Grace Yimga¹, Paule Anthea Gwet-Mbem³, Angeline Boula⁴.

¹Institute of Medical Research and Medicinal Plants Studies, Po box 13033 Yaoundé Cameroon

²Yaoundé University Teaching Hospital, Po Box 134 Yaoundé Cameroon

³Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, Po Box 3495 Yaoundé Cameroon

⁴Chantal Biya Fondation, Yaoundé Central Hospital, Po Box 37 Yaoundé Cameroon

Corresponding mail: ngondechan@yahoo.fr Ph. +237677655602

Abstract:

Bacterial vaginosis is the most prevalent genital infection, characterized by malodorous vaginal discharge, and has arisen as a public health concern due to its link to sexually transmitted illnesses. The purpose of this cross-sectional study was to determine the prevalence rate of bacterial vaginosis due to *Gardnerella* species and the risk factors related to this infection in childbearing women at the Hospital of District of Soa. A questionnaire was administered before each vaginal swab sample was obtained. Bacterial vaginosis was classified as a Nugent score of 7 to 10, and the presence of clue cells. The findings were as follows: 210 women were enrolled in this study. The average age was 29.42 ± 5.15 years, with extremes ranging from 18 to 48 years. The age group with the highest representation (38.67%) was 26-33 years. The prevalence of bacterial vaginosis was 42.85% (90/210), with *Gardnerella species* present at 90% (81/90) and *Mobiluncus species* present at 3.33%. The 18-25 age group was more susceptible to bacterial vaginosis due to *Gardnerella species* (35.80%), although the student group was the most affected (32.09%), and the difference was not statistically significant. With a prevalence of 44.44%, the single group was statistically significantly more exposed to this vaginal infection than the other groups. University-level women had a higher prevalence rate of bacterial vaginosis due to *Gardnerella species* infection (54.32%), followed by secondary-level women (37.03%). *Gardnerella species* vaginosis was found in both pregnant and non-pregnant women (38.27% and 61.72%, respectively). To avoid future obstetric difficulties, this infection must be effectively managed therapeutically.

Keywords:

Bacterial vaginosis, *Gardnerella species*, women, District Hospital of Soa, Cameroon



Introduction

Bacterial vaginosis (BV) is the most common cause of abnormal vaginal discharge among women of childbearing age which is associated with sexually transmitted disease and adverse birth outcomes (Nzomo *et al.*, 2013). It is characterized by an increase in vaginal pH, decreased lactobacilli and overgrowth of facultative and anaerobic bacteria (*Gardnerellavaginalis Gardnerellaleopoldii*, *Gardnerellapiotii*, *Gardnerellaswidsinskii*, *Mobiluncus* species, *Bacteroidesfragilis*, *Atopobium*, *Prevotella*) either isolated or in combination. The prevalence is in general higher in part of Africa, but in other parts of the world, it has been shown to vary with race and ethnic group (Kenyon *et al.*, 2013). It is manifested by abundant leucorrhoea with the smell of rotten fish and can cause pain, itching and redness in the vagina (Alcentore *et al.*, 2013). The vaginal cavity is naturally colonized by many bacteria. Lactobacilli or Doderlein flora are the predominant bacteria in the so-called normal vaginal flora (Bohbot, 2001). The disappearance of this flora exposes to bacterial vaginosis. However *Gardnerella* species are isolated with a greater frequency (83 to 98%) in the flora of bacterial vaginosis (Goffinete *et al.*, 2013). Estimates of the prevalence of bacterial vaginosis worldwide range from 12% in Australian women to 29% in North America, and over 50% in women in the Middle East and South Africa (Livengood, 2009). Payne *et al.*, (2020) reported a prevalence of bacterial vaginosis of 17.08% in Dschang and Diagne *et al.*, (2019) found a prevalence of 21% in Senegal. The prevalence of bacterial vaginosis was 3.13% higher in African American women than in white women (Livengood, 2009). The existence of bacterial vaginosis facilitates the acquisition of certain sexually transmitted infections such as *Neisseria gonorrhoea* infection, *Chlamydia trachomatis*, *Herpes simplex* type 2 and Human Immunodeficiency Virus infection (AIDS) (Anane *et al.*, 2000). Many studies have suggested that bacterial vaginosis may have a role in the development of gynecological disorders such as pelvic inflammation, cervicitis, AIDS, and cervical cancer. Premature birth, abortions, chorioamnionitis, and postpartum endometritis are all obstetrical concerns related with bacterial vaginosis (Leitich *et al.*, 2003; Guerra *et al.*, 2006; Guaschinio *et al.*, 2006). The purpose of this study was to determine the prevalence rate of bacterial vaginosis due to *Gardnerella* species and the risk factors associated with this infection in women of reproductive age at Soa District Hospital.

Materials and methods:

1-Type and duration of the study

During April to July 2021, a three-month cross-sectional and descriptive study was carried out at the Soa District Hospital in Cameroon's Central Region.

2-Study population and size of the study

210 women between the ages of 18 and 49 who visited the Gynaecology Department at Soa District Hospital for consultations on pregnancies, prenuptial agreements, contraception, and infertility made up the study population. Those women who provided written informed consent to participate in the study and agreed to have cervico-vaginal swabs taken were included in the study. Women who were menopausal, menstruating, using vaginal ovules or antibiotics were excluded.

According to the prevalence of 17.08% of bacterial vaginosis reported by Payne *et al.*, (2020) in their study in Dschang (Cameroon), the size of our population study was determined using the Lorentz formula.

3-Sample collection

Participants were urged to refrain from vaginal washing before heading in for a consultation. Specula and sterile swabs were used to perform vaginal swabbing (at the cervix margins) after cleaning the vaginal margins with Dakin's solution. A sterile cotton wool-tipped swab (Henso Medical, Hangan,

Co., Ltd.) was used to collect secretions from the vaginal walls and was used to diagnose bacterial infections in the vagina.

Collected samples were processed immediately the same day in the Laboratory of Microbiology at the District Hospital of Soa. Each sample collected was preceded by a questionnaire. Participants were interviewed face to face by trained interviewers. The information collected using the survey included baseline information (age, marital status, education level, religion, region of origin), medical history (pregnancy, AIDS), history of self-medication and recent treatments.

4-Diagnosis of bacterial vaginosis

For bacterial vaginosis, vaginal smears were heat-fixed and Gram-stained then examined by light microscopy by a single reader and the results were interpreted by using a standardized method for diagnosing bacterial vaginosis, as described by Nugent et al., (1991). Bacterial vaginosis was defined as a Nugent score of 7 to 10. Small Gram negative or variable bacilli were assumed to be *Gardnerella* species morphotype associated with clues cells and curved Gram variable to be *Mobiluncus* on direct examination. Sniff test was performed with potassium hydroxide solution (10%). It was positive in case of bacterial vaginosis.

5-Ethical considerations

Participants were informed about the objectives of the study and the confidentiality and non-mandatory nature of participation in the study. Women were free to withdraw from the study at any time without affecting the quality of care they received. An authorization was obtained from the Director of Soa District Hospital to carry out the research. The study was submitted to the National Research Ethics Committee for Human Health (CNERSH) to obtain their approval and an ethical clearance was issued under the reference N° 2021/01/675/CE/CNERSH/SP. Moreover, informed and written consent was obtained from patients who agreed to participate in the study.

6-Statistical analysis of the data

Data was collected in Excel 2013 (Windows Excel, Microsoft, Redmond, WA, USA). The data collected was analysed statistically using SPSS version 21.0. Results were interpreted by the Chi square test with a degree of significance (p) at the 5% threshold.

Results

Distribution of participants according to baseline characteristic

In this study, 210 women were enrolled. The average age was 29.42 ± 5.15 years with extremes of 18 to 49 years. The most represented age group was that of 26-33 years (38.67%). 58.57% of women had a university level, followed by those with a secondary level (33.80%). Women in cohabitation were the majority (38.09%) followed by singles (29.52%) and married women (28.77%). According to professional status, 31.90% of women were civil servants, followed by women in liberal professions (25.5%), then the student group (24.5%) and housewives (17.61%). In this study, 44.76% of women were pregnant and 5.71% of women were AIDS positive. The prevalence of bacterial vaginosis was 42.85% (90/210) with the presence of *Gardnerella* species of 90% (81/90) and *Mobiluncus* species of 3.33% (3/90). (table 1)

Table 1: Distribution of bacterial vaginosis according to germs

Bacterial vaginosis	N	%
(<i>Gardnerellavaginalis</i>)	81	90
(<i>Mobiluncus</i>)	03	3.33
(others spp)	06	6.66
Total	90	100

Bacterial vaginosis caused by *Gardnerellas* pecies and risk factors

The 18-25 years old age group was more exposed to bacterial vaginosis due to *Gardnerella* species (35.80%) followed by the 26-33 years old age group with a prevalence rate of 30.86%. But the difference in prevalence between the groups age was not significant ($p= 0.121$). The different socio-professional groups were affected by bacterial vaginosis due to *Gardnerella* species, but the student group was the most infected with a rate of 32.09%, and the difference was not significant. The single group was more exposed to this vaginal infection with a prevalence rate of 44.44% and the difference with the others groups was statistically significant ($p=0.001$). (Table 2)

Table 2 : Distribution of bacterial vaginosis according to age, professional and marital status

	Bacterial vaginosis		P value
	No (%)	Yes (%)	
Age (ans)			0.121
	18-25	31 (23.66)	29 (35.80)
	26-33	57 (43.51)	25 (30.86)
	34-41	30 (22.90)	18 (22.22)
	42-49	11 (8.52)	09 (11.11)
Total		129 (100)	81 (100)
Professional status			0.247
	Civil servants	45 (34.35)	22 (27.16)
	Liberal profession	35 (26.71)	19 (23.45)
	Students	26 (19.84)	26 (32.09)
	Housewife	23 (17.82)	14 (17.22))
Total		129 (100)	81 (100)
Marital status			0.001
	Married	46 (35.11)	15 (18.51)
	Concubinage	56 (42.74)	24 (29.62)
	Single	26 (20.15)	36 (44.44)
	Widow	01 (0.76)	06 (7.40)
Total		129 (100)	81 (100)

University-level women were more exposed to bacterial vaginosis due to *Gardnerella* species with a prevalence rate of 54.32% followed by secondary-level women (37.03%). The difference between education levels was not significant. *Gardnerella* species infection in AIDS positive women was

12.34%. Women who were not pregnant suffered more from this infection (61.72%) than pregnant women (38.27%) and the difference was statistically significant (Table 3).

Tableau 3 : Distribution of bacterial vaginosis according to educational level, HIV status and among pregnant women

Level of instruction	Bacterial vaginosis due to <i>Gardnerella</i> species		P value	
	No (%)	Yes (%)		
Without instruction	01 (0.76)	00 (0.0)	0.636	
Primary	08 (6.20)	08 (9.87)		
Secondary	41 (31.29)	30 (37.03)		
University	79 (60.30)	44 (54.32)		
Total	129 (100)	81 (100)		
VIH status	Negative	127 (98.44)	71 (87.65)	0.151
	Positive	02 (1.52)	10 (12.34)	
Total	129 (100)	81 (100)		
Pregnant	Yes	63 (48.83)	31 (38.27)	0.032
	No	66 (50.38)	50 (61.72)	
Total	129 (100)	81 (100)		

Discussion

Bacterial vaginosis has emerged as a public health problem due to its association with sexually transmitted disease. It is a fairly common infection in women of childbearing age.

The prevalence and risks factors of bacterial vaginosis in the study population

The prevalence rate of bacterial vaginosis due to *Gardnerella species* in this study was 90% (81/90). This rate proves that bacterial vaginosis is a frequent infection in our environment. It poses a real problem for maternal and child health because of its potential role in the occurrence of gynecological and obstetrical complications. These findings are higher than those obtained by Payne et al., (2020) in Dschang (17.08%) and Diagne et al., (2019) in Senegal (21%). Moreover, they are also higher than those obtained by Esber et al., (2016) in Malawi; 51%. The differences in reported prevalence in different countries could be due to environmental, behavioral, socio-economic status and the screening techniques used were different between studies. Women aged 18 to 33 were more exposed to bacterial vaginosis; 66.66%. These results corroborate those of Faye-Kette et al., (1992) in Abidjan concerning the same age group with a rate of bacterial vaginosis of 63.84% and those of Tamboura et al., (2004) in Burkina who reported a prevalence rate of 64.3% among women of the same age group. This high rate can be justified by the fact that at this age group, women are in full genital activity which could destroy the flora of Doderlein and expose to bacterial vaginosis. The youngest (18-25 years old) have multiple sexual partners and are sometimes adept at oral contraception and intravaginal practices. Aziz et al., (2019) in Yemen reported that people under 25 were twice as likely to have bacterial vaginosis. Regarding women infected with *Gardnerella* species, 91.35% had the minimum level of secondary education. The results of Tamboura et al., (2004) corroborate our results, they find that 64.3% of women with bacterial vaginosis had a minimum high school education. On the other hand, Bradshaw et al., (2015) reported that bacterial vaginosis was associated with an education

level of less than 13 years of study. Our result seems paradoxical, because the women in our study were educated and would certainly not apply good hygiene practices to their vaginal cavity and sometimes they informed themselves in a biased way in social networks (Aziz *et al.*, 2019).

Distribution of bacterial vaginosis according to professional status, marital status, pregnancy and AIDS status

The prevalence rate of Bacterial vaginosis due to *Gardnerella* species was higher among students (32.09%). Faye-Kette *et al.*, (1992) reported a similar rate in Abidjan among students; (32%), as well as Tambura *et al.*, (2004) (28.6%) in Ouagadougou. The exposure of this group to bacterial vaginosis would be due to frequent sexual intercourse and poor knowledge of hygiene of the vaginal cavity. Single people had the highest rate of bacterial vaginosis due to *Gardnerella* species (44.44%) followed by women in concubinage (29.62%). The results of the study conducted by Anagounou *et al.*, (1994) reported a prevalence of 40% among unmarried people. This finding corroborates that of this study. The result can be justified by the fact that single people have multiple sexual partners and multiple sexual relations which could damage their vaginal flora and would therefore be exposed to bacterial vaginosis.

87.65% of women with Bacterial vaginosis due to *Gardnerella* species were AIDS-negative while 12.34% of women with this same vaginal infection were AIDS-positive. This result is similar to those of Keita *et al.*, (2009) in Mali which reported that 90% of seronegative women were infected with bacterial vaginosis. However, some recent research suggests that bacterial vaginosis is associated with the risk of AIDS transmission by weakening the vaginal mucosa, it potentiates AIDS infection (Alcaide *et al.*, 2017). There was no significant association between bacterial vaginosis due to *Gardnerella* species and AIDS infection ($p=0.151$). In this study, 38.27% of pregnant women suffer from *Gardnerella* species infection against 61.72% of non-pregnant women and the difference was statistically significant ($p= 0.032$). This lower prevalence rate of bacterial vaginosis due to *Gardnerella* species in pregnant women can be justified by the fact that during pregnancy the woman's vaginal cavity becomes more acidic through the secretion of many hormones and the presence of a high concentration of glycogen, a nutrient substrate for lactobacilli which prevent vaginal infections. Tchelougou *et al.*, (2013) in his study reported a prevalence rate of bacterial vaginosis due to *Gardnerella* of 55.31%. This high prevalence of bacterial vaginosis due to *Gardnerella* species in pregnant women in their study can be justified by the fact that the screening methods (culture of the samples) were different from that used in this study.

Conclusion:

Women aged (18-33 years) were exposed to Bacterial vaginosis due to *Gardnerella* species, especially single women with a university level. This demonstrates the need to perform at least one gynecological test for bacterial vaginosis in women during their reproductive life. The effective therapeutic management of this infection must be undertaken to avoid future obstetrics complications. A polymerase chain reaction method should be performed to identify the different species of *Gardnerella* bacteria involved in bacterial vaginosis in further studies.

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References

- Alcaide, M., Chisembele M, Malupande, E., Rodriguez V, Fischl M, Arhearth K.(2017). Une intervention bio comportementale pour diminuer les pratiques intravaginales et la vaginose bactérienne chez les femmes zambiennes infectées par le VIH. *BMC Infect Dis*, 17, 338-42.<https://doi.org/10.1186/s12879-017-2436-3>.
- Alcentor, D.J.(2016).Evaluation of health disparity in bacterial vaginosis and the implication for HIV-1 acquisition in Africa american women. *Am J Reprod Immunol*, 76 (2),99-107.<https://doi.org/10.1111/aji.12497>
- Anagounou, S., Ndjoumessi, G., Makoutode, M.(1994).Vaginose bactérienne chez la femme enceinte à Cotonou (Benin). *Med Afri Noire*, 41, 239-42.
- Anane, S., kaouech, E., Zouari, B., Belhad, S., Kallel, K., Chaker, E.(2000).Les candidoses vulvo vaginales: facteurs de risques et particularités cliniques et mycologiques. *Journal de Mycologie Médicale*, 20,36-41.<https://doi.org/10.1016/j.mycmed.2010.01.001>.
- Aziz-abdul, M.,Mahdy, M., Abdul-Ghani, R.,Alhilahi, N.A., Al-Mujahed, L.K.A.,Alabsi, S.A., AL-Shawish, F.A., Alsarari, N.J.M., Bamashmos, W., Abdulwali, S.J.H., Karawani, M.A., Almikhlaif, A.(2019).Bacterial vaginosis, vulvo-vaginal candidiasis and trichomonal vaginitis among reproductive age women seeking primary health care in Sana'a city, Yemen. *BMC Infectious Diseases*,19(1),879.<https://doi.org/10.1186/s12879-019-4549-3>.
- Bamba, H.(2007). Etude de la prévalence et des facteurs de risques des IST/VIH/SIDA chez les gestantes vues en consultation prénatales au centre de santé de référence de la commune II de District de Bamako : A propos de 300 cas. *Thèse*, Université de Bamako.
- Bohbot, J.(2001). L'écosystème vaginal, ses variations physiologiques et pathologiques. *Réalités GynecolObstet*, 57,31-33.
- Bradshaw, C., Brotman, R.(2015). Making Inroads into improving treatment of bacterial vaginosis striving for long term cure. *BMC Infect Dis*, 15(1), 292-4.<https://doi.org/10.1186/s12879-015-1027-4>
- Diagne, R., Lo, S., Dia, M., Ndour, J., Ka, R., Ngom, B., Cobar, G., Saar, H., Niang, A.A., Sow, A.I. (2019) Genital infections with *gardenerellavaginalis* at Fann University Hospital dakar) and Saint Louis (Senegal). *Austin J Surg*, 6 (12), 1190.
- Esber, A., Turner-Norris, A., Mopiwa, G., Norris, A.H.(2016). Pratiques intravaginales et prevalence des infections des voies sexuelles et reproductive chez les femmes du Malawi rural. *SexHealth*, 43 (12), 750-55.<https://doi.org/10.1071/SH15139>
- Faye-Kette, A., Sylla-Koko, D., Cissé, A., Kacou-N'douba, A., Qkoua-Koffi, G., Acho, Y.(1992). Aspects épidémiologiques et cliniques de la vaginose bactérienne à Abidjan. *Médecine d'Afrique Noire*, 39,8-9.
- Goffinet, F., maillard, F., Mihoubi, N.,Kayem, G., Papiernik, E., Cabrol, D., Paul, G.(2013). Bacterial vaginosis: prevalence and predictive value for premature delivery and neonatal infections in women with preterm labour and intact membranes. *Eur J obstetReprodBiol*, 108,146-51. [https://doi.org/10.1016/s0301-2115\(02\)00423-2](https://doi.org/10.1016/s0301-2115(02)00423-2).

- Guaschimo, S., De Seta, F., Piccoli, M., Maso, G., Alberico, S. (2006). Aetiology of preterm labour: bacterial vaginosis. *BJOG*, 113(3):43-51. <http://doi.org/10.1111/j.1471-0528.2006.01122x>
- Guerra, B., Ghi, T., Quarta, S. (2006). Pregnancy outcome after early detection of bacterial vaginosis. *Eur J Obstet Gynecol Reprod Biol*, 128:40-5. <https://doi.org/10.1016/j.ejogrb.2005.12.024>
- Harmanli, O., Cheng, G., Nyirjesy, P., Chatwani, A., Gaughan, J. (2000). Urinary tract infections in women with bacterial vaginosis. *Obstet Gynecol*, 95 (5):710-2. [http://doi.org/10.1016/s0029-7844\(99\)00632-8](http://doi.org/10.1016/s0029-7844(99)00632-8)
- Kechia, F., Dohbit, J., Kouotou, E., Iwewe, S., Dzoyem, J., Mbopuwouo, C., Moyou, S.R., Less, B. (2015). Epidemiologic and mycological pattern of vulvo vaginal candidiasis in pregnancy in Yaoundé. *Health Sci Dis*, 16 (4), 32-35.
- Keita, A. (2009). Etude épidémiologique et Clinique de la vaginose au Centre Hospitalier Universitaire du point G. *Thèse*, Université de Bamako.
- Kenyon, C., Colebunders, R., Crucitti, T. (2013). The global epidemiology of bacterial vaginosis: a systematic review. *AM J Obstet Gynecol*, 209, 505-23. <https://doi.org/10.1016/j.ajog.2013.05.006>
- Leitich, H., Bonder-Adler, B., Brunbauer, M., Kaider, A., Egarter, C., Husslein, P. (2003). Bacterial vaginosis. *Am j Obstet Gynecol*, 189, 139-47. <https://doi.org/10.1067/mob.2003.339>
- Livengood, C. 2009. Bacterial Vaginosis: an overview for (2009). *Rev Obstet Gynecol*, 2(1), 28-37.
- Mogtomo, M., Ngo Njiki, A., Longang, A. (2016). Prévalence des germes impliqués dans les infections vaginales chez les femmes camerounaises et facteurs de risque. *International Journal of Biological and Chemical Sciences*, 10, 255-268. <https://www.ifg-dg.org>
- Nugent, R.P., Krohn, M.A., Hillier, S.L. (1991). Reliability of diagnosis bacterial vaginosis is improved by a standardized method of gram stain interpretation. *J Clin Microbiol*, 29, 297-301. <https://doi.org/10.1128/jcm.29.2.297-301.1991>
- Nzomo, J., Waiyaki, P., Waihenya, R. (2013). Bacterial vaginosis and correlates in women of reproductive age in Thika, Kenya. *Advances in Microbiology*, 3, 249-254. <https://doi.org/10.4236/aim.2013.33036>
- Payne, K., Tassongwa, T., Cecile, F., Ouaba, J. (2020). Facteurs de risque associés à la prévalence de candida albicans, Gardnerellavaginalis et trichomonas vaginalis chez les femmes de l'Hôpital de District de Dschang. *Int J Microbiol*, 1, 13-45. <https://doi.org/10.1155/2020/8841709>
- Tamboura, D. 2004. Aspects épidémiologiques, cliniques et bactériologiques de la vaginose bactérienne chez les femmes en période d'activité génitale au CHU-YO de Ouagadougou *Thèse*, Burkina Faso.
26. Tchelougou, D., Karou, D.S., Kpotsra, A., Balaka, A., Assih, M., Bamoke, G., Katawa, G., Anani, K., Simporé, J., De Souza, 2013. Infections vaginales chez les femmes enceintes au Centre Hospitalier Régional de Sokodé (Togo) entre 2010 et 2011. *Médecine et Santé Tropicale*, 23 (1) : 49-54. <https://doi.org/10.1684/mst.2013.0142>