



Original article

Bacteriological Profile of Genital Infections in Virgin Women Seen at the Medical Biology Laboratory of the Abass Ndao Hospital Center in Dakar

Profil bactériologique des infections génitales chez des femmes vierges reçues au laboratoire de biologie médicale du centre hospitalier Abass Ndao à Dakar

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Résumé

Introduction : La flore vaginale normale joue un rôle crucial dans le maintien de la santé des femmes, grâce à la présence de lactobacilles qui maintiennent un environnement acide protecteur. Toute perturbation de cet équilibre pourrait entraîner des infections génitales, notamment la vaginose bactérienne. Cette étude visait à déterminer le profil bactériologique des infections génitales chez des femmes vierges reçues au laboratoire du CHAN.

Méthodologie : Il s'agissait d'une étude rétrospective menée au laboratoire de l'ANHC d'avril 2023 à octobre 2024, portant sur des femmes vierges reçues pour examen de prélèvement vaginal. Les données ont été collectées à partir des registres du laboratoire, saisies dans Microsoft Excel version 2016 et analysées à l'aide du logiciel JASP (Version 0.96).

Résultats : Trente-sept (37) patientes ont été incluses,

avec un âge moyen de $22,65 \pm 8,22$ ans. La tranche d'âge [15-30] ans était la plus représentée avec 70,3 % (n = 26). Sur le plan clinique, les pertes vaginales (leucorrhées) constituaient le motif de consultation le plus fréquent avec 29,7 % (n = 11). L'examen bactériologique des prélèvements vaginaux a montré un taux de positivité de 27 % (n = 10). Parmi les patientes positives, *Gardnerella vaginalis* et *Staphylococcus aureus* représentaient respectivement 18,9 % et 5,4 %. La numération leucocytaire a révélé que 18,9 % (n = 7) des patientes présentaient un état inflammatoire. Le test de Kruskal-Wallis a montré que les patientes présentant des leucorrhées avaient une numération leucocytaire moyenne significativement plus élevée que les autres ($p < 0,001$). Le test du Chi-deux appliqué entre les tranches d'âge et les germes isolés a démontré une association statistiquement significative ($p = 0,039$).

Conclusion : Notre étude sur les germes isolés chez des femmes vierges confirme que la vaginose bactérienne peut survenir en l'absence de toute activité sexuelle, soulignant l'importance de la considérer comme une dysbiose du microbiote vaginal plutôt que comme une infection strictement sexuellement transmissible.

Mots-clés : vaginose bactérienne ; femmes vierges ; inflammation.

Abstract

Introduction: The normal vaginal flora plays a crucial role in maintaining women's health, owing to the presence of lactobacilli that sustain a protective acidic environment. Any disruption of this balance may lead to genital infections, including bacterial vaginosis. This study aimed to determine the bacteriological profile of genital infections in virgin women seen at the medical biology laboratory of the Abass Ndao Hospital Center.

Methodology: This was a retrospective study conducted at the ANHC laboratory from April 2023 to October 2024, involving virgin women referred for vaginal swab examination. Data were collected from laboratory records, entered into Microsoft Excel version 2016, and analyzed using JASP software (Version 0.96).

Results: Thirty-seven (37) patients were included, with a mean age of 22.65 ± 8.22 years. The age group [15-30] was the most represented at 70.3% (n = 26). Clinically, vaginal discharge (leukorrhea) was the most frequent presenting symptom at 29.7% (n = 11). Bacteriological examination of vaginal swabs yielded a positivity rate of 27% (n = 10). Among positive patients, *Gardnerella vaginalis* and *Staphylococcus aureus* accounted for 18.9% and 5.4%, respectively. Leukocyte counts revealed that 18.9% (n = 7) of patients presented an inflammatory state. The Kruskal-Wallis test showed that patients with leukorrhea had a significantly higher mean leukocyte count than others ($p < 0.001$). The Chi-square test applied between age groups and isolated organisms demonstrated a statistically significant association ($p = 0.039$).

Conclusion: Our study on organisms isolated from virginal women confirms that bacterial vaginosis

can occur in the absence of any sexual activity, underscoring the importance of viewing it as a dysbiosis of the vaginal microbiota rather than a strictly sexually transmitted infection.

Keywords: bacterial vaginosis; virgin women; inflammation.

Introduction

The normal vaginal flora plays a crucial role in maintaining women's health, thanks to the presence of lactobacilli that maintain a protective acidic environment ($\text{pH} < 4.5$) (1,2). Indeed, the production of hydrogen peroxide (H_2O_2), lactic acid, and bacteriocins by lactobacilli helps combat the proliferation of pathogenic bacteria (3). Any disruption of this balance may lead to the occurrence of genital infections, among which bacterial vaginosis and vulvovaginal candidiasis are indeed the most frequent in women (4).

Bacterial vaginosis (BV) is a condition characterized by a decrease in vaginal lactobacillary flora and polymicrobial anaerobic proliferation of the vaginal mucosa (5). Although often asymptomatic, BV remains, along with vulvovaginal candidiasis, the most frequent cause of vaginitis and, consequently, one of the most common reasons for consultation among women (6). Clinically, it is characterized by various inflammatory symptoms of the mucosa, such as generally fluid, grayish, or milky vaginal discharge, itching and a burning sensation, as well as the absence of leukocytic exudate, perineal redness, and edema (7,8). An odor often described as "fishy" is the principal sign of bacterial vaginosis. The anaerobic bacteria responsible for this odor produce amines such as trimethylamine, putrescine, and cadaverine, which give it this characteristic smell (9).

Several factors may influence the occurrence of bacterial vaginosis, such as cultural differences, sexual behaviors, and hygiene practices. A study comparing African-American women to women of European origin, with or without BV, highlighted significant differences at the level of the vaginal microbiota.

Indeed, women of European origin without bacterial vaginosis (BV) more frequently presented a vaginal flora with predominance of lactobacilli, while African-American women more often had a vaginal microbiota composed of various strict anaerobic bacteria, notably *Anaerococcus* (10). Nutritional factors have also been implicated in the development of bacterial vaginosis; a study highlighted a significant correlation between dietary lipid intake and bacterial vaginosis, as well as an inverse correlation between bacterial vaginosis and intakes of folate, vitamin E, and calcium (11).

It is important to recall that BV is associated with increased medical risks, notably susceptibility to sexually transmitted infections. Bacterial vaginosis is also associated with a risk of pregnancy complications, including miscarriages during the second trimester, spontaneous preterm deliveries, and post-cesarean endometritis (12).

From an epidemiological standpoint, the global prevalence of BV is estimated at 26%, with variations according to populations, their socioeconomic characteristics, and their geographical situation (13). In Senegal, a study conducted in Dakar had shown that among genital infections, bacterial vaginosis accounted for 39.6%, followed by candidiasis (14).

Although bacterial vaginosis is classically associated with sexual activity, studies comparing the prevalence of bacterial vaginosis or the prevalence of *Gardnerella vaginalis* isolation between two groups of women, the first consisting of sexually active women and another composed of virgin women, showed that there was no statistically significant difference (15). Moreover, in the scientific literature, there are cases of infection linked to *Gardnerella vaginalis* in virgin women, showing that bacterial vaginosis (BV) should not be considered as an exclusively sexually transmitted infection (16).

However, in our African countries, few studies have been interested in the occurrence of this bacterial vaginosis in virgin women. It is within this context that this study is situated, aiming to determine the bacteriological profile of genital infections in virgin women seen at the laboratory of the Abass Ndao Hospital Center (CHAN).

Methodology

• Type, Population, Duration, and Study Setting

This was a retrospective study conducted at the medical biology laboratory of the Abass Ndao Hospital Center during the period from April 2023 to October 2024, involving virgin women seen at the said facility.

- *Inclusion and Exclusion Criteria*

- All virgin women seen at the CHAN laboratory during the study period and having a vaginal swab examination (PV) with properly completed analysis reports were included in the study. Those with a PV examination with missing information were not included in the study.

- *Data Collection and Analysis*

From the laboratory registers, we collected data related to the patients (age, sex...), clinical indications, and biological examination results. All these data were entered into Microsoft Excel version 2016 and analyzed using JASP software (Version 0.95).

• Procedure for Vaginal Swab Examination in Virgin Women

- *Collection Conditions*

The collection should ideally be performed outside of menstruation, and the patient should not apply any vaginal toilet (ovule or antiseptic cream) before the examination. The taking of antibiotics or local antifungals within 48 to 72 hours before the collection is prohibited. Subsequently, a vulvar collection is performed by introducing a soft swab moistened with physiological serum if necessary, delicately at the entrance of the vagina (without crossing the hymen). The use of a speculum is formally prohibited in this specific case. After collection, the swabs must be properly closed and transported as quickly as possible to the laboratory. It is essential to explain the procedure to the patient (and to the parents if a minor), to respect her privacy, and to obtain informed consent. The examination must be performed gently, reassuring the patient at each step.

- *Laboratory Examination*

This examination includes fresh state examination and examination after Gram staining. For its realization, a suspension is prepared by soaking the swab in 0.5 ml

of distilled water. The fresh state examination allows the search for polymorphonuclear cells (search for possible inflammation), epithelial cells, and yeasts. The examination after staining allows visualization of the presence or absence of germs by describing their morphological and tinctorial characteristics. This is followed by culture on ordinary Miller Hinton and Sabouraud media for the search for yeasts. This culture is incubated at 37°C for 24 hours. In case of growth, germ identification is performed by mini-

gallery, and interpretation takes into account the inflammatory state of the patient.

Regarding the inflammatory state, generally, the number of leukocytes required to affirm an inflammatory state ranges between 11 and 12 per field (17). For the present study, we referred to the WHO, which defines an inflammatory state from 10 leukocytes per field.

Presence of inflammation: leukocytes ≥ 10 /field

Absence of inflammation: leukocytes < 10 /field

Results

A total of 37 patients were included in the study with a mean age of 22.65 ± 8.22 years. The age class [15-30[was the most represented at 70.3% (n=26). Clinically, 29.7% (n=11) of patients had leukorrhoea.

- Distribution of the Population According to Age Groups

Table I: Distribution of the population according to age groups (years)

Age groups (years)	Number	Percentage (%)
< 15	6	16.2
[15-30[26	70.3
≥ 30	5	13.5

- Distribution of the Population According to Clinical Indications

Table II: Distribution of the population according to clinical indications

Clinical Indications	Number	Percentage (%)
Infectious workup	4	10.8
LEUKORRHEA	11	29.7
Others	22	59.5

Others: vulvar pruritus, infection screening, pelvic pain.

- Bacteriological Examination Results

The bacteriological examination of vaginal swabs from our patients showed a positivity rate of 27%. Infections with *Gardnerella vaginalis* and *Staphylococcus aureus* represented respective frequencies of 18.9% and 5.4% (Table III). Leukocyte counting showed that 18.9% of patients had an inflammatory state (Table IV).

Table III: Culture results of our samples

Results	Number	Percentage (%)
Gardnerella vaginalis	7	18.9
Klebsiella pneumoniae	1	2.7
Staphylococcus aureus	2	5.4
Negative	27	73.0

Table IV: Leukocyte counting results

Inflammatory State	Number (N)	Percentage (%)
Absence of inflammation	30	81.1
Presence of inflammation	7	18.9

- Search for Association Between Different Parameters

The Kruskal-Wallis test applied between leukocyte count and the different clinical indications showed that there was an association between these two parameters. Indeed, patients who had leukorrhoea as an indication had a higher mean leukocyte count than other patients ($p < 0.001$) (Table V). The search for association between the different age classes and the isolated germs by the Chi-square test showed a statistically significant association ($p = 0.039$) (Table VI).

Table V: Kruskal-Wallis test between leukocyte count and different clinical indications

Indication	N	Mean (leukocytes)
Others	21	2.571
Infectious workup	4	1.250
LEUKORRHEA	11	11.182

Kruskal-Wallis Test

Factor	Statistics	df	p
INDICATION	14.57	2	< 0.001

Table VI: Chi-square test between age classes and results

Age Class	Gardnerella vaginalis	Klebsiella pneumoniae	Negative	Staphylococcus aureus
< 15	0.00%	16.67%	66.67%	16.67%
[15-30[19.23%	0.00%	80.77%	0.00%
≥30	40.00%	0.00%	40.00%	20.00%
	Value	df	p	
Chi-square test	13.26	6	0.039	
X ²				
N	37			

Discussion

A total of 37 patients were included in the study with a mean age of 22.65 ± 8.22 years. Another study conducted in Washington on virgin women and students at the university of said city showed similar results with a mean age of 20 ± 1.2 years (18). This relatively young age could be explained by the sociocultural realities of the area where the study was conducted. Indeed, in several areas in Africa, virginity is valued and often preserved until marriage.

Data related to clinical indications showed that 29.7% of patients presented with leukorrhea. This is in line with data from the scientific literature suggesting that vaginal discharge constitutes a major sign of bacterial vaginosis with a prevalence slightly higher than ours (19). This difference in prevalence may be linked to the number of patients. Indeed, bacterial vaginosis is the most frequent cause of vaginal discharge in the world, with an estimated annual cost of 4.8 billion dollars (20).

The anaerobic bacteria responsible for bacterial vaginosis produce substances such as proteases, sialidases, and mucinases that can degrade cervical and vaginal mucus, thereby causing liquefaction of secretions and an increase in the fluidity of discharge. This results in abundant, homogeneous, and fluid discharge. Moreover, certain bacteria produce biofilms that can stimulate vaginal secretion and increase discharge.

The bacteriological examination showed a frequency of 27% positivity concerning infections. This result is in line with that given by the WHO in 2025, estimating that bacterial vaginosis affects 23 to 29% of women (WHO, 2025). This study presents the particularity of being conducted in virgin women, thus showing that bacterial vaginosis is not transmitted exclusively by sexual route. Indeed, hormonal fluctuations at puberty age associated with estrogen variations can decrease vaginal glycogen, and consequently create a favorable ground for bacterial vaginosis (21).

To this is added the major factor, which is poor intimate hygiene practices. Certain alkaline soaps, antiseptics,

or even some products used for intimate wipes can lead to destruction of lactobacilli and increase vaginal pH. The bacteriological study also showed that *Gardnerella vaginalis* was the most frequently found bacterium (18.9%), i.e., 70% of positive patients. This result is superimposable with those found in the literature where this species is present in 95 to 100% of bacterial vaginoses and was initially considered as the unique etiological agent (22).

Gardnerella vaginalis possesses unique characteristics compared to the other bacteria associated with BV, which could allow it to colonize the vaginal epithelium early; it is also capable of effectively displacing lactobacilli and adhering to vaginal epithelial cells, which suggests that it could be necessary for the occurrence of this infection (23,24). We found 73% of patients with a negative bacteriological examination. This may be due to infections other than bacterial, such as vulvovaginal candidiasis, which are otherwise very frequent in women, or simply a hormonal imbalance. Leukocyte counting in these women showed that 81.1% of patients did not have inflammation. The absence of a marked increase in leukocytes allows distinguishing bacterial vaginosis from infectious vaginitis, characterized by significant inflammation. The germs *Klebsiella pneumoniae* and *Staphylococcus aureus* were found in 3 patients and are not typically linked to bacterial vaginosis. It could simply be cases of genital infections; moreover, these patients presented an elevated number of leukocytes, hence an inflammatory state.

Limitations

The reduced sample size ($n=37$) could limit the statistical power and the generalization of results to a broader population. The retrospective nature exposes to biases related to the quality and exhaustiveness of collected data, as not all data are mentioned in the registers. Furthermore, certain confounding factors such as hygiene, antibiotic treatments, or hormonal status may not be controlled.

Conclusion

This study on germs isolated in virgin women confirms that bacterial vaginosis can occur outside of any sexual activity, thus reflecting its multiple origins. The results showed a predominance of the species *Gardnerella vaginalis* (70% of infection cases), an anaerobic bacterium, probably associated with a decrease in lactobacilli. Moreover, the presence of certain bacteria of intestinal or cutaneous origin that are not typically associated with bacterial vaginosis (*Klebsiella pneumoniae*, *Staphylococcus aureus*) could reflect transient colonization or a non-specific imbalance different from classic bacterial vaginosis. These results underscore the full importance of taking into account several aspects when interpreting microbiological results and of viewing bacterial vaginosis as a dysbiosis of the vaginal microbiota rather than as a strictly sexually transmitted infection.

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