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# Prevalence and Risk Factors of Bacterial Vaginosis Among Women with Pelvic Inflammatory Disease Attending General Hospital Gusau, Zamfara State, Nigeria (2025-2026)

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## Abstract

Bacterial vaginosis (BV) is one of the commonest vaginal infections among women with pelvic inflammatory disease (PID). Early diagnosis is important because untreated BV may result in infertility, chronic pelvic pain, ectopic pregnancy, and recurrent reproductive infections, the prevalence of bacterial vaginosis, identify associated risk factors, and characterize bacterial isolates among women diagnosed with pelvic inflammatory disease attending General Hospital Gusau, Zamfara State. A hospital-based cross-sectional study was conducted among 125 women diagnosed with PID. Vaginal swab specimens were collected and examined using vaginal pH determination, wet mount microscopy, Gram staining with Nugent scoring, and bacterial culture. Demographic and behavioral data were collected using structured questionnaires and analyzed using SPSS version 25. Chi-square analysis was used to determine associations, with statistical significance set at $p < 0.05$. The prevalence of bacterial vaginosis was 62.4% (78/125). Age was not significantly associated with BV ($\chi^2 = 6.085$, $p = 0.077$).

However, multiple sexual partners ($\chi^2 = 7.20$, $p = 0.007$) and vaginal douching ($\chi^2 = 8.50$, $p = 0.004$) were significantly associated with BV. Gardnerella vaginalis was the predominant bacterial isolate (64%), followed by Mobiluncus spp. (16%), Mycoplasma hominis (8%), and mixed bacterial flora (12%). Behavioral practices, particularly multiple sexual partners and vaginal douching, significantly increase the risk of infection. Routine laboratory diagnosis and health education should be integrated into reproductive healthcare services to reduce BV-related complications.

**Keywords:** Bacterial vaginosis, Pelvic inflammatory disease, Gardnerella vaginalis, Vaginal douching, Nigeria, Women's reproductive health.

## 1. Introduction

Bacterial vaginosis is the most prevalent vaginal disorder among women of reproductive age and is characterized by disruption of the normal Lactobacillus-dominated vaginal microbiota, leading to overgrowth of anaerobic bacteria, particularly Gardnerella vaginalis (Wiesenfeld *et al*., 2012; Taylor *et al.*, 2013). BV has been increasingly recognized as an important contributor to pelvic inflammatory disease and adverse reproductive outcomes (Taylor *et al.*, 2013). Despite its high burden in sub-Saharan Africa, laboratory diagnosis remains limited in many healthcare facilities due to reliance on syndromic management (Wiesenfeld *et al*., 2012). Consequently, epidemiological data from northern Nigeria remain scarce, emphasizing the need for localized studies to guide evidence-based interventions (Wiesenfeld *et al*., 2012; Taylor *et al.*, 2013). Bacterial vaginosis is a polymicrobial disorder characterized by disruption of the normal vaginal microbiota, with depletion of Lactobacillus species and overgrowth of anaerobic bacteria, particularly Gardnerella vaginalis (Ravel *et al.*, 2011). It remains the most common cause of vaginal discharge among women of reproductive age and is associated with infertility, adverse pregnancy outcomes, sexually transmitted infections, and pelvic inflammatory disease (Ravel *et al.*, 2011). Pelvic inflammatory disease is an inflammatory disorder of the upper female genital tract that contributes significantly to infertility, chronic pelvic pain, and ectopic pregnancy (Kenyon *et al.*, 2013). Recent evidence indicates that BV-associated organisms facilitate ascending genital tract infections through biofilm formation and disruption of the normal vaginal ecosystem (Kenyon *et al.*, 2013). Although bacterial vaginosis is highly prevalent in sub-Saharan Africa, laboratory diagnosis remains inadequate in many Nigerian hospitals where syndromic management is still commonly practiced (Afolabi *et al.*, 2016). Consequently, accurate epidemiological data remain limited in Zamfara State. This study investigated the associated and microbiological profile with pelvic inflammatory disease attending General Hospital Gusau.

## 2. Materials and Methods

A hospital-based cross-sectional study among women aged 15–49 years diagnosed with pelvic inflammatory disease attending General Hospital Gusau, Zamfara State. Ethical approval was obtained before the commencement of the study, written informed consent was obtained from all participants. Two high vaginal swabs were collected from each participant under aseptic conditions (Alao *et al.*, 2009). One swab was examined by wet mount microscopy and Gram staining using the Nugent scoring

system, while the second swab was cultured on Blood agar, Nutrient agar, and MacConkey agar for bacterial isolation and identification using standard microbiological techniques (Alao *et al.*, 2009). Statistical analysis was performed using SPSS version 25. Frequencies, percentages, and Chi-square tests were used to evaluate associations between variables, with regarded as statistically significant. Ethical approval was obtained before commencement of study.

## 3. Results

The study demonstrated a high burden diagnosed pelvic inflammatory disease. Women aged 20–39 years accounted for the highest proportion of positive cases, although age was not significantly associated with bacterial vaginosis. Behavioural factors significantly influenced infection. Participants reporting multiple sexual partners bacterial vaginosis with a single sexual partner ($p = 0.007$). Likewise, vaginal douching showed a significant association with bacterial vaginosis ($p = 0.004$). Microbiological culture identified Gardnerella vaginalis as the predominant bacterial isolate, followed by Mobiluncus species, Mycoplasma hominis, and mixed bacterial flora.

**Table 1. *Socio*-demographic characteristic and Age distribution of participants**

| **BV Detection ; Demographic Characteristics** | **frequency (n=125)** | **percentage (%)** |
|---|---|---|
| **Age** | | |
| 15-19 | 38 | 30.4% |
| 20-29 | 40 | 32 % |
| 30-39 | 35 | 28 %) |
| 40-49 | 12 | 9.6% |
| **Total** | **125 (100%)** | **100%** |

### 1. Socio-demographic Characteristics and Age Distribution of Participants

125 participants were enrolled in the study. The age distribution showed that the majority of participants were between 20–29 years, accounting for 40 (32 %) of the study population. This was followed by participants aged 15–19 years with 38 (30.4%), while those aged 30–39 years and 40–49 years constituted 35 (28%) and 12 (9.6 %), respectively. This finding indicates that young adults formed the largest proportion of the study population.

**Table 2 overall prevalence of BV among PID patients**

| BV Prevalence; BV status | Frequency | percentage |
|---|---|---|
| **Age range(years)** | | |
| Positive | 78 | 62.4 |
| Negative | 47 | 37.6 |
| **Total** | **125 (100%)** | **100%** |

## 2. Overall Prevalence of Bacterial Vaginosis (BV)

Out of the 125 participants examined, 78 (62.4%) tested positive for bacterial vaginosis, whereas 47 (37.6%) were negative. This indicates that more than one-third of the study participants were infected with BV, suggesting that bacterial vaginosis is relatively common among patients study area.

**Table 3 Association between Age and BV**

| Age range(years) | BV Positive | BV negative | Total |
|---|---|---|---|
| 15-19 | 31 | 7 | 38 |
| 20-29 | 10 | 30 | 40 |
| 30-39 | 25 | 10 | 35 |
| 40-49 | 12 | 0 | 12 |
| **Total** | **78** | **47** | **125** |

Chi-square ($\chi^2$)=6085,p=0.077(not statistically significance )

## 3. Associations between Age and Bacterial Vaginosis

The association between age and bacterial vaginosis was evaluated using the Chi-square test. Although differences in BV occurrence were observed across the age groups, the association ($\chi^2$ = 6.085, p = 0.077). This implies that age was not significantly associated with the occurrence of bacterial vaginosis among participants.

**Table 4 sexual partner and BV**

| Number of partner Total (%) | | BV Positive | BV negative |
|---|---|---|---|
| One | 31 | 5 | 36 (28.8) |
| Multiple | 47 | 42 | 89 (71.2) |
| **Total** | **78** | **47** | **125 (100%)** |

$\chi^2 = 7.20$, p=0.007 (statistically significance)

### 4. Association between Number of Sexual Partners and Bacterial Vaginosis

The relationship between the number of sexual partners and BV showed a statistically significant association ($\chi^2 = 7.20$, $p = 0.007$). Participants with multiple sexual partners had a higher frequency of bacterial vaginosis than those with only one sexual partner. This finding suggests that having multiple sexual partners may increase the risk of acquiring bacterial vaginosis.

**Table 5 vaginal Douching and BV**

| Douching practice | BV Positive | BV negative | Total (% |
|---|---|---|---|
| Yes | 25 | 25 | 50 (40%) |
| No | 53 | 22 | 75 (60%) |
| **Total** | **78** | **47** | **125 (100%)** |

$\chi^2 = 8.50$,p=0.004 (statistically significance )

### 5. Vaginal Douching and Bacterial Vaginosis

Between vaginal douching and bacterial vaginosis was statistically significant ($\chi^2 = 8.50$, $p = 0.004$). Participants who practiced vaginal douching were more likely to have bacterial vaginosis than those who did not. This finding suggests that vaginal douching may disrupt the normal vaginal flora, thereby increasing susceptibility to bacterial vaginosis.

**Table 6. Bacterial Isolate in BV Positive patients**

| Organism | Frequency ( n=125) | percentage (% |
|---|---|---|
| Gardnerella vaginalis | 80 | 64 % |
| Mobiluncus spp | 20 | 16 % |
| Mycoplasma hominis | 10 | 8.0 % |
| Mixed flora | 15 | 12.0 % |
| **Total** | **125** | **100%** |

**Table 6 Distributions of Bacterial Isolates among BV-Positive Patients**

Among the bacterial isolates identified in BV-positive patients, Gardnerella vaginalis was the most frequently isolated organism, accounting for 80 (64%) of all isolates. This was followed by Mobiluncus species with 20 (16%), while Mycoplasma hominis accounted for 10 (8.0%) and mixed bacterial flora accounted for 15 (12.0 %) each. The predominance of Gardnerella vaginalis is consistent with its established role as the principal organism associated with bacterial vaginosis.

## 4. Discussion

The study assessed the bacterial vaginosis (BV) diagnosed with pelvic inflammatory disease (PID) attending General Hospital Gusau, Zamfara State. The findings revealed that **62.4% (78/125)** of the participants were positive for bacterial vaginosis, indicating that among presenting with PID. Prevalence is comparable with previous studies conducted in Nigeria and other sub-Saharan African countries, where BV prevalence among women of reproductive age ranges from 25% to 60%. The high prevalence observed in this study further supports the assertion that BV is an important contributor to reproductive tract infections in developing countries. The age distribution showed that women aged **20–39 years** accounted for the majority of BV-positive cases. This finding is expected because women within this age group are sexually active and therefore have greater exposure to behavioural and reproductive factors associated with BV. Although age not statistically significant, occurrence of reproductive age emphasizes the need for targeted reproductive health education and routine screening in this population. The study also demonstrated multiple sexual partners' bacterial vaginosis**.** Women reporting multiple sexual partners had a higher prevalence of BV than those with a single partner. This finding agrees with previous studies that identified multiple sexual partners as an important behavioural risk factor for disruption of the normal vaginal microbiota, thereby increasing susceptibility to BV. Similarly, **vaginal douching** was significantly associated with BV ($p = 0.004$). Women who practiced vaginal douching were more likely to develop bacterial vaginosis than those who did not. Vaginal douching is known to disturb the normal Lactobacillus-dominated vaginal flora, increase vaginal pH, and promote the overgrowth of anaerobic organisms responsible for BV. This finding supports earlier reports that discourage the practice of vaginal douching because of its harmful effects on vaginal health. Microbiological analysis identified **Gardnerella vaginalis** as the predominant bacterial isolate among BV-positive patients, followed by **Mobiluncus species**,

**Mycoplasma hominis**, and mixed bacterial flora. The predominance of *Gardnerella vaginalis* is consistent with the established role of this organism in the pathogenesis formation, disruption the normal vaginal microbiome. The isolation of mixed anaerobic organisms further confirms polymicrobial infection rather than an infection caused by a single pathogen. Overall, the findings of this study confirm that bacterial vaginosis is common among women with pelvic inflammatory disease and that behavioural factors such as multiple sexual partners and vaginal douching significantly contribute to its occurrence. These findings highlight the importance of laboratory diagnosis and health education reducing the burden of BV and its associated reproductive complications.

### 4.1 Conclusion

The study concluded that among women attending General Hospital Gusau. The findings demonstrated that behavioural factors, particularly multiple sexual partners and vaginal douching, significantly increase the risk of developing bacterial vaginosis. *Gardnerella vaginalis* was identified as the predominant bacterial isolate, confirming its important role in the pathogenesis of the disease. Routine laboratory diagnosis using Amsel criteria, Gram staining, Nugent scoring, and appropriate microbiological culture remains essential for accurate diagnosis and effective management. Early identification and treatment of bacterial vaginosis among women with PID will help reduce infertility, pelvic infections.

i. Routine screening for bacterial vaginosis should be incorporated into the management of all women diagnosed with pelvic inflammatory disease.

ii. Healthcare workers should strengthen laboratory-based diagnosis using standard methods such as Amsel criteria, Gram stain, Nugent scoring, and bacterial culture instead of relying solely on syndromic diagnosis.

iii. Public health education should be intensified to discourage vaginal douching and promote healthy reproductive hygiene practices.

iv. Women should be educated on the reproductive health risks associated with multiple sexual partners and encouraged to practice safer sexual behaviours.

v. Government and healthcare institutions should improve laboratory facilities and ensure the availability of diagnostic reagents for accurate detection of bacterial vaginosis.

vi. Further studies involving larger populations and molecular diagnostic techniques should be complete microbiological profile in Zamfara State and parts of Nigeria.

vii. Continuous training of healthcare professionals on current diagnostic and treatment guidelines for bacterial vaginosis should be encouraged to improve patient outcomes.

- **Disclosure**

This article contain study with human participant and hospital base by the author

- **Conflict**

The authors declare that no conflict of interest.

- **Funding**

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- **Ethical Approval**

Ethical approval was obtained from the Ethics Committee of General Hospital Gusau, Zamfara State, and informed consent was obtained from all participants before enrolment.

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