DOI: 10.51984/S447E145

مجلة جامعة سبها للعلوم الطبية
Sebha University Journal of Medical Sciences
Journal homepage: www.sebhau.edu.ly/journal/joms

# Bacterial Vaginosis in the Western Region of Tripoli, Libya: Prevalence and Associated Factors

Sleman A Aljared[a], *Mohamed. Abo Rokia[a], Nada. Al-Qadiri[b], Rahaf AL-Tayeb[b]

[a] Department of Basic Nursing, Faculty of Nursing, University of Tripoli
[b] Department of Anesthesia and Intensive care Faculty of Medical Technology , University of Tripoli

**Keywords:**
Bacterial vaginosis
Libya
Prevalence
Douching
reproductive health
Amsel's criteria

**ABSTRACT**

Bacterial vaginosis (BV) is a frequent vaginal infection affecting women of reproductive age, with known implications for reproductive and obstetric health. This study aimed to determine the prevalence and contributing risk factors of BV among women in the Western Region of Libya. Descriptive cross-sectional study was conducted between July and December 2024 in major hospitals and clinics in Tripoli. A total of 300 symptomatic women aged 21–55 years were assessed using Amsel's criteria. BV was confirmed in 140 (46.7%) participants. The highest infection rate was observed among women aged 28–37 years (50.7%). Married women represented the majority of positive cases (81.9%), and 61.4% were pregnant. The most common associated factors included vaginal douching (84.3%), intrauterine device usage (42.2%), and a history of abortion (12%). This study concluded that the incidence of bacterial vaginosis was notably prominent, indicating a distinct correlation between the occurrence of BV and various risk factors. Hence, it is imperative to comprehend and assess the multifaceted risk factors to enhance the efficacy of preventative and therapeutic approaches.

# التهاب المهبل البكتيري في المنطقة الغربية من طرابلس، ليبيا: الانتشاروالعوامل المرتبطة

سليمان علي الجرد[a]، *محمد ابورقية[a]، ندى حسن[b]، رهف الطيب[b].

[a] قسم اساسيات التمريض، كلية التمريض ، جامعة طرابلس
[b] قسم التخدير والعناية الفائقة، كلية التقنية الطبية ، جامعة طرابلس

**الكلمات المفتاحية:**
التهاب المهبل الجرثومي
ليبيا
معدل الانتشار
غسل المهبل
الصحة الإنجابية
معايير أمسيل

**الملخص**

التهاب المهبل الجرثومي *(BV)* عدوى مهبلية شائعة تصيب النساء في سن الإنجاب، ولها آثار معروفة على الصحة الإنجابية والتوليدية.تهدف هذه الدراسة الى تحديد انتشار التهاب المهبل الجرثومي وعوامل الخطر المساهمة فيه بين النساء في المنطقة الغربية من ليبيا. أُجريت هذه الدراسة الوصفية المقطعية بين يوليو وديسمبر 2024 في مستشفيات وعيادات رئيسية في طرابلس. تم تقييم ما مجموعه *300* امرأة مصابة بأعراض وتتراوح أعمارهن بين 21 و55 عامًا باستخدام معايير أمسيل. اظهرت النتائج تأكيد التهاب المهبل الجرثومي لدى 140 (46.7%) من المشاركات في الدراسة. كان أعلى معدل إصابة بين النساء في الفئة العمرية 28–37 سنة (50.7%). شكلت النساء المتزوجات غالبية الحالات الإيجابية (81.9%)، وكانت نسبة النساء الحوامل من بينهن 61.4%. أظهرت النتائج أهمية ارتباط بعض العوامل مثل الغسل المهبلي (84.3%)، واستخدام اللولب الرحمي (42.2%)، ووجود تاريخ للإجهاض (*12%*). ان حدوث التهاب المهبل الجرثومي بارزًا بشكل ملحوظ، مما يشير إلى وجود علاقة واضحة بين حدوثه وعوامل الخطر المختلفة. لذا، من الضروري فهم وتقييم هذه العوامل متعددة الأوجه لتعزيز فعالية الأساليب الوقائية والعلاجية.

## 1. Introduction

The vaginal environment in women of reproductive age is microbiologically dynamic and complex. Under healthy conditions, it is predominantly colonized by Gram-positive Lactobacillus species which play a crucial role in maintaining vaginal homeostasis [1]. A decline in these beneficial bacteria, particularly hydrogen peroxide-producing *Lactobacillus spp*) is strongly associated with the development of bacterial vaginosis (BV), the most common vaginal infection in women of childbearing age. Reported prevalence rates of

*Corresponding author:
E-mail addresses: m.aborokia@uot.edu.ly
*Article History : Received 10 February 2026 - Received in revised form 13 April 2026 - Accepted 18 April 2026*

BV vary widely across populations, ranging from 5% to 70% [2,3]. BV is a polymicrobial condition marked by the disruption of normal vaginal flora and the proliferation of facultative and anaerobic bacteria, this microbial shift alters the vaginal environment, leading to symptoms such as increased discharge, elevated pH, and a characteristic fishy odor due to the release of volatile amines [4]. The discharge is often thin, homogenous, and white-gray in appearance. Additional symptoms may include vaginal itching, burning, and dysuria, although some women may remain asymptomatic [5]. The condition is primarily driven by an imbalance in the vaginal microbiome, often initiated by Gardnerella vaginalis [6], a key pathogen capable of forming a biofilm that facilitates the adherence and growth of other opportunistic bacteria [6]. Other contributing organisms include *Mobiluncus* and *Mycoplasma species*. Interestingly, even beneficial bacteria like Lactobacillus may contribute to pathogenesis when their ecological balance is disturbed [7]. BV is associated with a number of adverse gynecological and obstetric outcomes, including spontaneous abortion, preterm delivery, stillbirth, low birth weight, chorioamnionitis, and postpartum endometritis [8,9]. It also increases susceptibility to pelvic inflammatory disease and enhances the transmission of sexually transmitted infections, including HIV, by 40% to 60% [10]. Globally, the prevalence of BV among women aged 14–49 has been estimated at approximately 29.2%, with significant variations linked to race, geographic location, socioeconomic status, and marital status [11,12]. Study has shown that married women are disproportionately affected, with reported rates as high as 68.4% compared to their unmarried counterparts [13]. This study aims to assess the prevalence and associated risk factors of bacterial vaginosis among women of reproductive age attending state hospitals and private clinics in Tripoli and Azzawya, Libya.

## 2. Materials & methods

### 2.1. Study design and study population

The cross-sectional study investigated the prevalence and risk factors of bacterial vaginosis among active reproductive women aged 18-49, the study was conducted in Tripoli University Hospital, Al Khadra General Hospital, and Alfordous's Clinic. This study was conducted between July and December 2024

### 2.2. Data collection

Data was collected through self-administered or interviewer-administered questionnaires, gathering information on demographics, sexual behavior, hygiene practices, and medical history. Additionally, a pelvic examination was conducted to collect vaginal discharge samples, aiding in the diagnosis and assessment of bacterial vaginosis.

### 2.3. Laboratory testing

#### 2.3.1. Amsel's clinical criteria

The Amsel criteria utilize clinical standards to diagnose bacterial vaginosis, requiring at least three of the following four criteria: typical vaginal discharge, elevated pH (> 4.5), positive Whiff test, and presence of clue cells [14].

#### 2.3.2. Data Analysis

Data analysis was carried out by descriptive statistics to summarize the study population and prevalence of bacterial vaginosis. Inferential statistics, specifically chi-square tests and p-value analysis, used to identify risk factors associated with bacterial vaginosis, providing insights into the relationships between various factors and the condition.

#### 2.3.3. Ethical Considerations

The study upheld ethical standards by obtaining written informed consent from all participants and maintaining confidentiality of their data. Ethical committee at faculty of nursing However, the study acknowledged potential limitations, including selection bias due to convenience sampling, which may have impacted the generalizability of the fin.

## 3. Results

The *lactobacilli* species that predominate in the normal vaginal flora are extremely complex and serve a crucial role in preserving women's health by suppressing other dangerous microbes. In the present work, vaginal swab from healthy women revealed the presence of gram-positive lactobacilli as shown in figure 1.

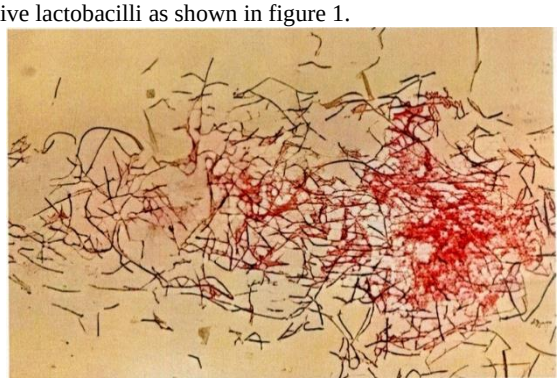

Figure 1: Gram-positive lactobacilli was isolated from vaginal negative cases of BV.

Out of 300 women enrolled in the study, 140 (46.7%) were diagnosed with bacterial vaginosis (BV) based on Amsel's criteria as shown in table (1).

**Table 1:** Shows Prevalence of BV positive cases among the suspected participants.

| | RESPONSES | COUNT | PERCENT (%) |
|---|---|---|---|
| VAGINAL BACTERIAL INFECTION | Positive | 140 | 46.7 |
| | Negative | 160 | 53.3 |
| | Total | 300 | 100.0 |

Figure (2) shows the prevalence of BV varied across age groups, with the highest rate observed among women aged 28–37 years (50.7%), and followed by the 18–27 (25.7%) and 38–47 (20.3%) age groups. Lower prevalence rates were noted among older age categories: 48–57 years (2.3%), 58–67 years (0.7%), and 68–77 years (0.3%).

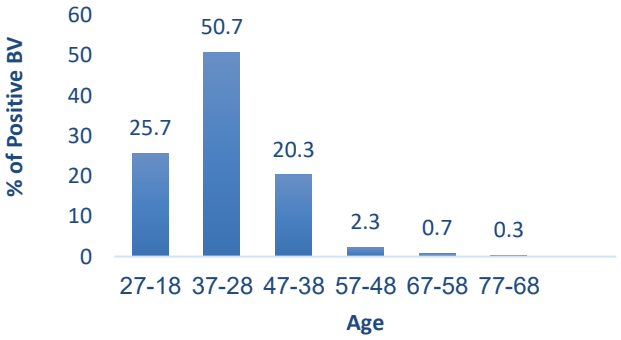


**Fig .2:** Displays the occurrence of suspected bacterial vaginosis cases by age group

Table (2) shows that the majority of participants were married (98%), while 1% were single, and a significant proportion of the study population (73.7%) were pregnant, 24.3% were non-pregnant as shown in table (3). Vaginal discharge was reported by 49.3% of participants, whereas 50.7% reported no discharge as shown in table (4). Among positive BV cases, 90% exhibited a vaginal pH above 4.5, 5% had a pH of 6, whereas vaginal discharge was not detected in 5% as shown in figure (3).

**Table 2:** Displays the occurrence of suspected bacterial vaginosis cases by marital status.

| MARITAL STATUS | COUNT | POSITIVE BV | % |
|---|---|---|---|
| SINGLE | **3** | **00** | **1.0** |
| MARRIED | **294** | **46.6** | **98** |
| ND | **3** | **00** | **1.0** |
| TOTAL | **300** | | **100.0** |

**Table 3:** Displays the occurrence of suspected bacterial vaginosis cases by pregnancy status.

| Pregnancy | Count | % |
|---|---|---|
| Yes | 221 | 73.7 |
| No | 73 | 24.3 |
| ND | 6 | 2 |
| Total | 300 | 100.0 |

Table 4: Displays the occurrence of vaginal discharge among suspected BV cases.

| | | | |
|---|---|---|---|
| Presence of discharge | Yes | 148 | 49.3 |
| | No | 152 | 50.7 |
| | Total | 300 | 100.0 |

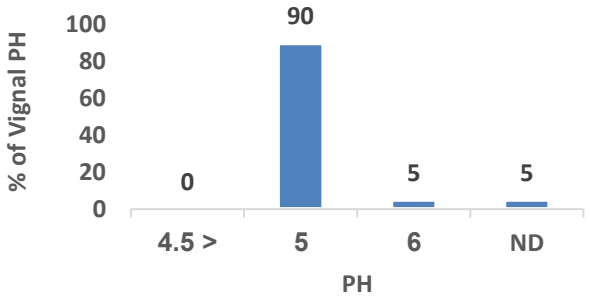


**Fig. 3:** Distribution of Vaginal pH levels among Study Participants.

Regarding the characteristics of vaginal discharge color, white discharge was the most frequently observed type, reported by 34% of participants, this was followed by yellow discharge in 12.7%, green discharge in 1.7%, and gray discharge in 0.7%. Notably, 51% of the participants reported the absence of any vaginal discharge color as shown in figure (4).

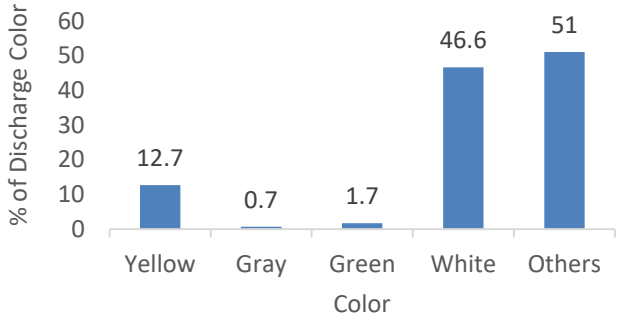


**Fig. 4:** Distribution of Vaginal Discharge Color among Study Participants.

The microscopic examination revealed the presence of clue cells in 47.7% of the positive samples, characterized by epithelial cells with irregular borders densely coated with adherent bacterial cells—indicative of bacterial vaginosis. Aberrant vaginal epithelial cells were observed in 2.3% of the cases (figure 5a & 5b).

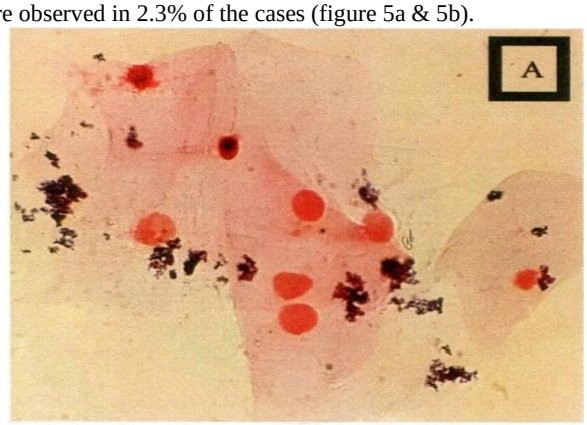


**Fig. 5a:** Vaginal epithelial cells (Clue cells) are with difficult-to-see borders due to the abundance of bacteria on their surface.

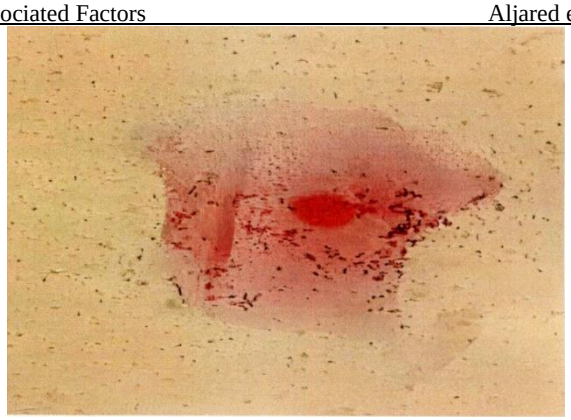

**Fig. 5b:** Vaginal epithelial cells (Clue cells) are with difficult-to-see borders due to the abundance of bacteria on their surface.

Figure (6) shows that 29.7% of the participants reported an unpleasant smell, regarding vaginal odor, vaginal irritation and itching were reported by 28% of participants , and a total of 77 participants (25.7%) experienced burning during urination, in contrast, clue cells were absent in 50% of the examined specimens. Also figure (6) shows that the analysis of clinical symptoms revealed that pelvic discomfort was the most frequently reported symptom (59.7%).

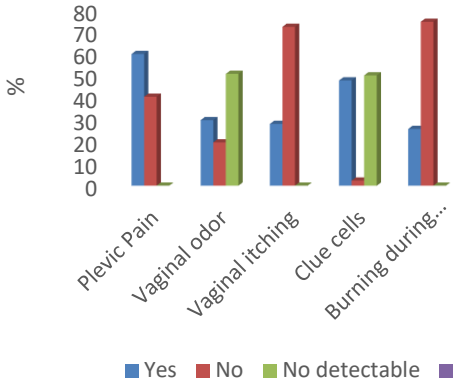


**Fig. 6:** Displays the occurrence of pelvic pain, Vaginal Odor, Vaginal itching, clue cells, and Burning during urination symptom among Study Participants.

Statistical analysis demonstrated significant associations between the prevalence of bacterial vaginosis (BV) and specific behavioural and clinical risk factors. Vaginal douching (p = 0.003), a positive family history of BV (p = 0.001), and the habitual use of tight-fitting, non-absorbent nylon garments (p = 0.001) were all significantly correlated with increased BV occurrence. In contrast, other factors—such as a prior history of *Trichomonas* infection, frequent antibiotic use, regular use of scented soaps, frequent application of perfumes in the genital area, and the use of intrauterine contraceptive devices—did not show statistically significant associations, though they were commonly reported among BV-positive individuals (Table 5).

Table 5: Prevalence of Bacterial vaginosis (BV) was associated with several potential risk factors.

| | **Responses** | **Count** | **(%)** |
|---|---|---|---|
| **Use of an intrauterine device** | Yes | 19 | 6.3 |
| | No | 278 | 92.7 |
| | No response | 3 | 1.0 |
| | Total | 300 | 100.0 |
| **Frequent use of scented soap** | Yes | 128 | 42.7 |
| | No | 172 | 57.3 |
| | Total | 300 | 100.0 |
| **Vaginal douching** | Yes | 160 | 53.3 |

| | | | |
|---|---|---|---|
| | No | 136 | 45.3 |
| | No response | 4 | 1.3 |
| | Total | 300 | 100.0 |
| **History of prior infection** | Yes | 238 | 79.3 |
| | No | 59 | 19.7 |
| | No response | 3 | 1.0 |
| | Total | 300 | 100.0 |
| **Frequent use of Antibiotic** | Yes | 173 | 57.7 |
| | No | 119 | 39.7 |
| | No response | 8 | 2.7 |
| | Total | 300 | 100.0 |
| **Frequent use of perfumes** | Yes | 90 | 30.0 |
| | No | 209 | 69.7 |
| | No response | 1 | 0.3 |
| | Total | 300 | 100.0 |
| **Use tight-nylon, non-absorbent clothing** | Yes | 142 | 47.3 |
| | No | 150 | 50.0 |
| | No response | 8 | 2.7 |
| | Total | 300 | 100.0 |

## 4. Discussion

This study revealed a notably high prevalence of bacterial vaginosis (BV) among women of reproductive age in Tripoli, with 46.7% of participants testing positive according to Amsel's criteria. This rate of prevalence was higher than those reported in China (32.2%) [15], Brazil (30.1%) [16], Nepal (24.4%) [17], and the United States (29.2%) [18]. It is comparable to findings from India, where 44.8% of women were diagnosed with BV based on smear analysis and Amsel's clinical criteria [19]. The prevalence of bacterial vaginosis (BV) was significantly elevated among pregnant women (73.7%) and married women (98%), underscoring the influence of demographic and physiological factors on BV incidence. Similarly, studies from Iraq [20], Nigeria, and Cameroon indicated high prevalence rates among married women, with Nigeria reporting a rate of 90.6% [21] and Cameroon showing 64.5% among women of reproductive age [22]. In contrast, data from a study carried out in Cameroon showed a significantly lower rate of BV prevalence (26.2%) among pregnant women [23]. Age-specific analysis in our study showed the highest BV prevalence (50.7%) in women aged 28–37, followed by those aged 18–27 (25.7%) and 38–47 (20.3%). Some research aligns with findings, showing a higher prevalence in the 20-30s age range [24]. Another study found BV to be most prevalent in women aged 25-29 (48.1%) and 30-34 years (44.4%) [25]. A study in Libya aligns with the finding revealed women between 25 and 44 years old had a higher prevalence of BV (48.2%), while in ages between 15 and 24 years, the prevalence was around 31.6% [26]. In contrast to the study finding, reported data indicate a higher prevalence of bacterial vaginosis (BV) in postmenopausal women, contrasting with the focus on reproductive-age women [27]. Symptomatically, pelvic discomfort due to BV was the most frequently reported complaint (59.7%), which aligns with existing literature linking BV to nonspecific pelvic pain and increased vaginal discharge [28]. Vaginal discharge was reported by nearly half of the participants (50-70%) prevalence of discharge [28]. In contrast to the finding in several studies show that the prevalence of BV among women of reproductive age ranges from 23% to 29% [28]. Other symptoms included unpleasant odor (29.7%), vaginal irritation (28%), and dysuria (25.7%), all of which are characteristic of BV and consistent with previous studies [29,30]. Notably, a significant proportion of BV-positive women were asymptomatic, highlighting the condition's silent nature and potential to go undetected without routine screening. Regarding discharge characteristics, white discharge was most commonly reported (34%), followed by yellow (12.7%), green (1.7%), and gray (0.7%). These findings are in consistence with previous studies, which identify white or gray discharge with a fishy odor as classic signs of BV [31,32]. Microscopically, clue cells were present in 47.7% of positive cases, underscoring their value as a diagnostic marker. This finding aligns with other studies reporting clue cells in approximately 40%–60% of BV cases [33]. Behavioral and environmental risk factors were also evaluated. A significant association was observed between BV and vaginal douching ($p = 0.003$), supporting earlier research that suggests douching disrupts the vaginal microbiota and increases susceptibility to infection [34]. Additional associations were found with a family history of BV ($p = 0.001$) and the use of tight, non-absorbent clothing ($p = 0.001$). Previous studies have indicated a potential genetic or shared environmental predisposition among women with a family history of BV [35,36].

## 5. Conclusion

This study highlights a significant prevalence of bacterial vaginosis (BV) among women of reproductive age in Tripoli, particularly among pregnant and married women. The findings indicate that demographic and physiological factors play a crucial role in the incidence of BV, with the highest prevalence observed in women aged 28–37. The symptoms associated with BV, such as pelvic discomfort and abnormal vaginal discharge, emphasize the need for awareness and screening, as many women remain asymptomatic.

## 6. Acknowledgment

We wish to express our sincere gratitude to the staff of the Department of Microbiology at the Libyan Center for Biotechnology Research for their invaluable support and assistance throughout this study. Their expertise and resources have significantly contributed to the success of this research. We are deeply appreciative of their commitment to advancing scientific knowledge within our community. Thank you for your guidance and encouragement.

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