

Original Article

A study to Determine the Antibiotic Sensitivity of Microbes Causing Cervical Infections in Women in Zawia Western Libya

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ABSTRACT:

Purpose: Bacterial vaginosis (BV) infections in women are typically caused by living organisms, making it one of the most significant health issues related to the vagina. Bacterial vaginitis occurs when the normal bacteria in the vagina decrease in number. Aim: This study aimed to determine the prevalence of vaginal infections and the antibiotic susceptibility of different types of bacteria among women attending Al-Zawia Medical Hospital.

Methods: The study was conducted at Al-Zawia Medical Hospital from January to March 2024. Vaginal smear samples were collected from women and tested for sensitivity to antibiotics. All isolated vaginal samples were cultured using standard methods in the analytical sciences laboratory. Microbial sensitivity to antibiotics was determined using the disk diffusion technique based on the Kirby-Bauer method.

Results: were analyzed descriptively. Results: Between January and March 2024, 36 vaginal swabs were collected at Al-Zawia Medical Hospital, Libya. These samples were tested at the Al-Zawia Medical Analysis Laboratory for antibiotic sensitivity. Approximately 200 women aged 10 to 54 participated in the study. Overall, 18% of women had a vaginal infection, with higher rates seen in women aged 25 to 39. Streptococcus bacteria showed 100% susceptibility to ciprofloxacin, indicating its effectiveness in inhibiting the bacteria, including Staphylococcus aureus. E. coli bacteria had a lower sensitivity in this study, with an inhibition rate of 50%.

Conclusion: Bacterial vaginal infections are common among women and should be monitored regularly. Women should undergo periodic examinations for vaginal infections, and antibiotic treatment should be followed accordingly.

Keywords: Vaginal, Bacteria, Antibiotic Sensitivity, Bacterial culture, and vaginal swab

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INTRODUCTION

Vaginal (BV) infections are one of the most important health problems in both developing and developed countries ¹. The bacteria that infect the vagina in women were identified 150 years ago with the discovery of the microscope and the cultivation and isolation of bacteria ². 30% of women are affected worldwide.³ Vaginitis is usually an imbalance that occurs in the vaginal microflora and is more common in women of reproductive age.⁴ Numerous studies have indicated that approximately one million women between the ages of 15 and 44 suffer from these infections, with the percentage of women in the United States reaching 19.3%.⁵ Vaginitis in women is accompanied by vaginal discharge, itching, unpleasant odor and irritation. It is an imbalance of organisms present inside the vagina.⁶ Infections that affect the vagina due to different types of bacteria lead to complications that affect women, including infertility, pelvic infections (PID), and ectopic pregnancy, as well as miscarriages and premature deliveries.⁶ The changes that occur in the female reproductive system indicate an abnormal increase in certain types of bacteria that naturally inhabit this area. Therefore, the lactic bacteria that inhabit this place must be preserved and thus maintain the pH of the vagina, which produces lactic acid. and creates an environment that is not suitable for pathogenic bacteria.⁷

Infections that affect the female reproductive organs are caused by microbes and various causes, as they affect the health of the woman in all aspects, such as pregnancy, childbirth, etc., and therefore infection with different types of bacteria leads to serious complications such as ectopic pregnancy. Premature birth can also lead to infertility. Therefore, preventive measures must be understood to achieve complete health maintenance ⁸. The problem of transmission of infection between women is considered a serious problem and is negatively related to family life. It is a common problem in both developing and developed countries, where about one million women worldwide suffer from infections in general, especially bacterial vaginosis. (BV), where it amounts to 8% - 75%. Due to the proximity of the urethra, vagina, and anus to the vagina and female genitals, the infection increases and is transmitted from one place to another ⁸. With frequent use of antibiotics, antibiotic susceptibility patterns change over time, and with regular and increased use of antibiotics, fear and anxiety about antibiotic resistance increase, leading to fewer cures and increased rates of bacterial infections in women.⁷

Aim of the study:

This study aims to identify bacterial isolates and their antibiotic susceptibility in women with vaginal discharge visiting the gynecology clinic of Al-Zawia Medical Hospital.

MATERIALS AND METHODS:

Sample collection:

The study was conducted at Al-Zawia Medical Hospital in Al-Zawia city, Libya where 200 swabs were taken from women.(Vaginal Swabs). Those who suffer from infections and vaginal problems within three months use it (cotton swabs). Taking into account that the patient did not take any type of antibiotic before taking the smear for a period exceeding several days, reaching five days, the samples were transferred to Al-Zawia Medical Laboratory, and these cases (200) of different ages (10-54) of women suffering from vaginal problems who visit the hospital during the period from January to March 2024.

Swab culture:

The swabs were cultured on agricultural media (blood agar medium, MacConkey agar medium) according to the method (streaking method). The plates were incubated at 37°C for 24 hours. The growing bacterial colonies were diagnosed using cultural and phenotypic characteristics and biochemical tests for different types of bacteria to diagnose different types of bacteria using Gram staining. Bacterial isolates were diagnosed based on morphological and cultural characteristics and biochemical tests.⁹

Antibiotic sensitivity testing:

The method was adopted (Kirby Bauer). In order to test the sensitivity to antibiotics, some parts of pure cultures were transferred from the nutrient medium used to another agricultural medium, Mueller Hinton agar. Using a culture needle, the medium is then allowed to dry for a period of (2 to 5) minutes. Then, antibiotic tablets are placed on the surface of the medium on which the culture has taken place and they are gently pressed. The plates are incubated at 37°C for 24 hours. After which, the zone of inhibition is divided into three sensitive categories. (Sensitive(S)) ,(Intermediate) , Resistant (R)) They were compared to standard values^{10 ,11} The following antimicrobial agents were employed: ampicillin (AK). - Amoxicillin (AML)- Amikacin (AMP) -Azithromycin (AMZ)-Aztreonam (AZT)-Tazo+ Piperacillin-Ceftriaxone (CRO)-Cefotaxime (CTX)-Cefixime (CFM)-Ceftazidime (CAZ)-Cefoxitin (FOX)-Ciprofloxacin (CIP)-Clindamycin (DA)-Chloramphenicol (LEV)-Doxycycline (DO)-Erythromycin (ERT)-Fusidic acid (FA) - Gentamicin (CN) - Imipenem (IMP) - Kanamycin (K)-Levofloxacin (LEV)-Meropenem (MEM)-Nalidixic acid (NA)-Nitrofurantoin (F)-Norfloxacin (NOR)-Tetracycline (TE)-Trimethoprim (TMP)-Tobramycin (TOB)-Vancomycin (VA) Antimicrobial susceptibility testing was performed by the disc diffusion method.

RESULT:

200 women patients who conducted vaginal swab cultures and adapted antibiotic sensitivity testing. There were 5 tables showed different distribution growth positive cases by different age groups, types of organisms isolated from the vagina, also to the age group, and sensitivity of species of bacteria to some type of antibiotics.

Table (1) showed the distribution of cases included in the study. The study included 200 women, and the incidence of bacterial vaginosis was 18% (36/200).

Table (1): Distribution of the growth of positive cases

Vaginal Swab	Growth	No growth
Growth	36	18%
No growth	164	82%
Total	200	100%

Table (2) showed the distribution of positive growth cases by age group: the relationship between bacterial vaginosis (BV) and age. The prevalence of bacterial vaginosis was relatively high in women in the 25-39 age group, reaching 50% (18/36). In the 40-54 age group (n = 10), the incidence of bacterial vaginosis decreased slightly to 28%.

Table (2): Distribution of the growth of positive cases by age group

Age	Frequency	Percentage %
10 – 24	8	22%
25 – 39	18	50%
40 – 54	10	28%
Total	36	100%

Table (3): showed the distribution of bacterial species isolated from HVS. The most frequently isolated species were Gram-negative and Gram-positive organisms. Where it was formed, *E. coli* 36% (13/36) followed by *Staph.aureus* In the same report 36% (13/36) and *Streptococcus sp* By 28%(10/36).

Table (3): Types of Organisms isolated from the vagina

Types of bacteria	Frequency	Percentage %
<i>E. coli</i>	13	36%
<i>Staph.aureus</i>	13	
<i>Streptococcus sp</i>	10	28%
Total	36	

prevalence of bacterial infections in table (4) in the age groups of women: Formed *Staph. Aureus*. It plays an important role in the etiology of vaginitis in patients in this study (36%). Vaginitis, in the present study, was relatively higher in the age groups of 25-39 years, followed by *E. coli* with the same percentage compared to others. (36%) in the same age group.

Table (4): Types of bacteria isolated according to the age group

Age of Patients (Years)	n (%)			Total	Range
Microorganisms	10-24	25-39	40-54		
<i>E. coli</i>	5	6	2	13	36%
<i>Staph. aureus</i>	2	8	3	13	36%
<i>Streptococcus sp</i>	1	4	5	10	28%
Total	5	21	10	36	100%

Table (5) clearly showed that there is a sensitivity of the types of bacteria to antibiotics, resistance, and sensitivity of the bacteria isolated from the farms in which they were grown: laboratory sensitivity tests for the most common isolates showed high levels of resistance to commonly used antibiotics. The results of the sensitivity of bacteria to different types of antibiotics showed that *Staphylococcus aureus* these bacteria, associated with vaginal problems in women, are very sensitive to certain antibiotics. Ceftriaxone (CRO), Cefixime (CFM), Cefoxitin (FOX), Imipenem (IMP), Kanamycin (K), Levofloxacin (LEV), Meropenem (MEM), Nitrofurantoin (FI n other words, most antibiotics have proven to be very effective against these bacteria, with rates reaching 100%. While both were taking antibiotics, Kanamycin (K) and Levofloxacin (LEV) High sensitivity to *Escherichia coli*, with rates reaching 100%. Antibiotic sensitivity for this type of bacteria was lower in comparison to *S. aureus*. Therefore, the antibiotic must be carefully chosen depending on the bacteria, their composition and properties The results indicated that *Streptococcus sp.* was susceptible to certain antibiotics. Amoxicillin (AML), Amikacin (AMP) And other antibodies at 100% in some of them

Note: Sensitive (S), Resistive (R)

Table 5: Sensitivity of species of Bactria to some type antibiotics

Antibiotics	Escherichia coli		Staphylococcus aureus		Streptococcus sp	
	S +	R	S +	R	S +	R
Drug						
Ampicillin (AK)	%12.5	%87.5	0	0	0	0
Amoxicillin (AML)	%25	%75	%33.33	%66.66	%100	0
Amikacin (AMP)	%66.66	%33.33	%83.33	%16.66	%100	0
Azithromycin (AMZ)	%50	%50	%100	0	%50	%50
Aztreonam (AZT)	%12.5	%87.5	0	0	%50	%50
Tazo+ Pipera	%33.33	%66.66	0	0	%66.66	%33.33
Ceftriaxone (CRO)	%50	%50	%100	0	%100	0
Cefotaxime (CTX)	%55.55	%44.44	%50	%50	%100	0
Cefixime (CFM)	%44.44	%55.55	%100	0	0	0
Ceftazidime (CAZ)	%37.5	%62.5	0	%100	%75	%25
Cefoxitin (FOX)	%16.66	%83.33	%100	0	%66.66	%33.33
Ciprofloxacin (CIP)	%70	%30	%83.33	%16.66	%100	0
Clindamycin (DA)	%25	%75	0	0	%100	0
Chloramphenicol (LEV)	%45.45	54.54	%80	%20	%83.33	%16.66
Doxycycline (DO)	%75	%25	%80	%20	%100	-
Erythromycin (ERT)	-	%100	%66.66	%33.33		
Fusidic acid (FA)	%12.5	%87.5	%40	%60	%50	%50
Gentamicin (CN)	%66.66	33.33	%83.33	%16.66	%85.71	%14.28
Imipenem (IMP)	%25	%75	%100	-	%50	%50
Kanamycin (K)	%100	-	%100	-		
Levofloxacin (LEV)	%77.77	%22.22	%100	-	%83.33	%16.66
Meropenem (MEM)	%55.55	%44.44	%100	-	%100	-
Nalidixic acid (NA)	%28.57	%71.42	%40	%60	%100	-
Nitrofurantoin (F)	%25	%75	%100	-	%100	-
Norfloxacin (NOR)	%50	%50	%100	-		
Tetracycline (TE)	%58.33	%41.66	%80	%20	%66.66	%33.33
Trimethoprim (TMP)	%66.66	%33.33	%100	-		
Tobramycin (TOB)	%33.33	%66.66			%100	-
Vancomycin (VA)	%20	%80	%87.5	%12.5	%100	-

DISCUSSION:

Bacterial vaginosis (BV) is a condition that women suffer from as a result of a change or increase in pH and, therefore, a change in secretions, where the natural environment of the vagina becomes inappropriate and aerobic types of bacteria mix with anaerobic types of bacteria.³ In this study, the overall prevalence of bacterial vaginosis in women was 18%. Previous studies have reported varying rates of bacterial infection.¹²

These infections can lead to a range of symptoms, including unusual discharge, odour, and discomfort,

Coliform bacteria and *Staphylococcus aureus* bacteria were the most common, with a rate of 13%. This is evident in Table (4), where many studies have indicated that coliform bacteria are considered among the bacteria commonly found in the vagina due to the short distance. In the natural presence of these bacteria, many studies have been carried out that have proven their agreement with these bacteria. The result confirmed that the percentage of presence of these bacteria was 60%, which confirmed with other studies that coliform bacteria are

which may affect a woman's quality of life. It is essential for individuals experiencing these symptoms to seek medical advice for appropriate diagnosis and treatment options. Study reported.¹³ the prevalence rates of bacterial vaginosis were 47.5%, while the prevalence rates of bacterial vaginosis were lower than those found in the present study. They are therefore not in agreement with the study, which indicated that the infection rate was (30.1%).¹⁴

The treatment used in (BV) is antibiotics: amoxicillin (AML), ceftriaxone (CRO), and meropenem (MEM).

Other effective antibiotics given orally.¹⁵ Table (5) Ceftriaxone is an antibiotic that is very effective against many types of bacteria and fights infections by stopping the growth of the bacteria that cause them.¹⁶ Meropenem (MEM) is a highly effective antibiotic in the treatment of bacterial infections.¹⁷ Amoxicillin (AML) works on many bacterial infections because it stops the growth of pathogenic bacteria by inhibiting cell wall biosynthesis, resulting in the death of the bacteria.¹⁸

one of the most important causes of vaginal contamination.¹⁹

In addition, the percentage of *Staphylococcus aureus* bacteria among the positive samples was 13% in the vagina and causes bacterial contamination, as studies have indicated its prevalence, which reaches 25% in women, and this situation leads to various infections and complications.²⁰

This study is in agreement with .2 These staphylococcal bacteria were present at a rate of 23.8%. This type of bacteria is one of the most common vaginal pathogens, and its highest prevalence rate was observed between the ages of 31 and 40. In addition, some studies have indicated that *Staphylococcus aureus* is more prevalent than *E. coli* in vaginal swabs.²¹ While the current study indicates that both types of *coli* bacteria and *Staphylococcus aureus* bacteria are present at 13%.

and susceptibility testing, which is considered to be one of the reasons for the increase in antibiotic resistance.^{23; 24;25}

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The results of this study regarding antibiotic susceptibility of *Streptococcus* bacteria were 100% susceptible to the antibiotic ciprofloxacin, and this result is not consistent with .2This indicates the effectiveness of ciprofloxacin, which has also been shown to be effective in inhibiting the bacteria *Staphylococcus aureus*.²² In this study, the sensitivity of this anti-*coli* bacteria was lower; the inhibition rate was 50%.

Although norfloxacin is structurally related to nalidixic acid, it has a laboratory antibacterial spectrum, so it is more active in the present study; vaginal isolates of *E. coli* were 50% susceptible to this antibiotic. studies that indicated that low concentrations of norfloxacin (2 mg/L) inhibit coliform bacteria by 95% .²² However, the present study demonstrated the sensitivity of this antibiotic to *Staphylococcus aureus* bacteria and did not give any type of sensitivity to *Streptococcus* bacteria.

CONCLUSIO:

Staphylococcus aureus, *Escherichia coli*, and *Streptococcus* are the most common microorganisms in women. Ciprofloxacin was found to be highly effective against streptococci while the antibiotic Kanamycin (K) inhibited *Staphylococcus aureus* and *Escherichia coli* 100% with varying antibiotic sensitivities.

E. coli bacteria showed low susceptibility to ampicillin at a rate of 5.12%. While *Staphylococcus aureus* bacteria showed low susceptibility to amoxicillin at a rate of 33.33%. Many studies have determined that antibiotics acquire resistance as a result of inappropriate and indiscriminate use of antibiotics without medical advice

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