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Detection of Aerobic Vaginitis and Antibiogram of its Implicating Bacteria among Women with Suspected Cases of Vaginitis in Obstetrics and Gynecology Clinics, Ahmadu Bello University Teaching Hospital, Shika, Zaria-Nigeria

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Abstract

Aerobic vaginitis (AV) is a condition caused by aerobic bacteria, posing significant risks to women's health, particularly during pregnancy. Misdiagnosis and treatment challenges stem from widespread multidrug-resistant bacteria. This study aimed to diagnose aerobic vaginitis (AV) and assess antibiotic susceptibility patterns of the implicated bacteria in vaginitis among women attending Ahmadu Bello University Teaching Hospital's Obstetrics and Gynecology Clinics in Zaria, Nigeria. A total of 100 high vaginal swab (HVS) samples were collected and subjected to bacterial isolation, identification, and antibiotic susceptibility testing using cultural and biochemical methods, and the agar disc diffusion method, respectively. Results indicated 23% positivity for AV, with the highest prevalence observed in the 41-50 age group (50.0%) and the lowest in the 21-30 age group (7.3%), revealing a significant association between age and AV ($p<0.05$). While third-trimester pregnant women displayed a higher AV rate (32.0%) than those in their second trimester (0%), no significant association was found between gestational periods and AV ($p>0.05$). Symptomatically, painful intercourse correlated with a 28.0% AV rate, while vaginal itching showed an 18.5% rate, though lacking a symptom-AV relationship ($p>0.05$). Notably, condom use during sexual intercourse exhibited a higher AV rate (63.6%) than non-users (18.0%). AV prevalence was notably higher among women with a history of miscarriage (62.5%) compared to those without (15.5%), showing a significant association between risk factors and AV ($p<0.05$). Klebsiella species (47.8%) and Escherichia coli (30.4%) were the primary AV-associated bacteria, with Klebsiella spp. showing high resistance to Ceftriaxone and Ampicillin (100%). These findings underscore the importance of accurate AV diagnosis to avert adverse outcomes like miscarriage and postpartum complications and highlight the need to reconsider Ceftriaxone and Ampicillin usage in AV treatment.

Keywords: Aerobic vaginitis; Aerobic bacteria; Antibiotic Susceptibility; MDR

INTRODUCTION

Vaginitis has been a global public health challenge which is common to women of reproductive ages. Vaginitis includes aerobic vaginitis, bacterial vaginosis, trichomoniasis and vulvovaginal candidiasis, these have led to gynaecological and obstetric complications (Oparaugo *et al.*, 2022). The most common cause of abnormal vaginal discharge peculiar to women of reproductive age is bacterial vaginosis (BV) (Hacer *et al.*, 2012). Its symptoms include increase in vaginal P^H, greyish or milky white discharge without inflammation. This is due to the replacement of the vaginal flora (Lactobacilli) by a mixed flora of anaerobic organisms such as *Prevotella* spp., *Mycoplasma hominis*, and *Mobiluncus* spp. (Lamichanne *et al.*, 2014; Prospero, 2014).

The common pathological conditions causing vaginitis are well defined, however 7-72% of vaginitis victim (women) remain undiagnosed due to some organisms consisting of aerobic bacteria called intermediate flora (Mumtaz *et al.*, 2008).

Aerobic vaginitis caused by aerobic bacteria has posed a negative threat to women especially of pregnancy outcomes (Donders *et al.*, 2017). The clinical symptoms include increase in vulva itching, inflammation (edematous), stinging and burning sensations due to ulcerations, sticky yellow vaginal discharge and dyspareunia (Donders *et al.*, 2017; Kaambo *et al.*, 2018). The common bacteria believed to cause aerobic vaginitis are commensals of the intestine and skin which include *Escherichia coli*, *Klebsiella pneumonia* and *Staphylococcus aureus* respectively. These pathogenic bacteria can illicit toxin which suppress the host immunity leading to disease occurrence (Max *et al.*, 2022).

The global emergence of aerobic vaginitis can be paired antimicrobial resistance increase which has affected diagnosis and failure of proper antibiotics treatment can lead to adverse effects in reproductive women (Kaambo *et al.*, 2018) which can be miscarriage, infertility, preterm labour other complications such as activation of cervical cancer, amniotic fluid infection and PROM (Premature rupture of membrane) and STD (Sexually Transmitted Disease) can set in (Han *et al.*, 2015).

The prevalence of aerobic vaginitis is 7-12% less than the prevalence of bacterial vaginosis (Donders *et al.*, 2017), Due to this feature, It can be mistaken for bacterial vaginosis (Bitew *et al.*, 2017). Aerobic vaginitis is not easy to treat due to the developing spread of multidrug-resistant bacterial strains. Therefore, proper awareness of aerobic vaginitis to clinicians is essential in order to avoid misdiagnosis with similar vaginitis as well as to aid proper treatment.

MATERIALS AND METHODS

Ethical Clearance and Study Population

The research was conducted after ethical approval was obtained from Health Research Ethics Committee of Ahmadu Bello Teaching Hospital (ABUTH), Shika, Zaria-Nigeria, with reference number NHREC/TR/ABUTH-NHREC/01/02/23. The study population involved females of reproductive age (13 years - ≥ 51 years) who attending the gynecology clinic of the hospital.

Administration of Questionnaire

Structural questionnaires were administered to the patients enquiring for socio-demographic data and risk factors associated with aerobic vaginitis (Geng *et al*, 2016; Shazadi *et al*, 2022; Yalew *et al*, 2022).

Sample Collection

100 High vagina swabs (HVS) samples were collected with a disposable swab stick and transported in a flask containing ice packs to Department of Microbiology Laboratory, Ahmadu Bello University for microbiological analysis.

Isolation and Identification of Aerobic Vaginitis Implicating Bacteria

Two milliliter of physiological saline was dispensed into each HVS container to resuscitate the organism. The samples were then inoculated on Eosine Methylene Blue (EMB) agar, MacConkey Agar and Mannitol Salt Agar (MSA) at 37^{0}C for 24 hours aerobically. Thereafter, the plates were examined for the presence of growth; colonies on EMB with greenish metallic sheen were suspected to be *Escherichia coli*, large pinkish mucoid colonies on MacConkey were suspected to be *Klebsiella* spp. and golden yellow with yellow zones on MSA were suspected to be *Staphylococcus aureus*.

A smear of the suspected isolates (*Klebsiella* species, *Escherichia coli* and *Staphylococcus aureus*) were made on a clean grease-free slide, air dried, heat fixed and Gram stained. Suspected *Escherichia* coli and *Klebsiella* spp. appeared as Gram negative, and *Staphylococcus aureus* appeared as Gram positive (Chessbrough, 2006).

Biochemical test such as IMViC, catalase, coagulase and DNase were carried out to confirm the isolates as *Escherichia coli*, *Klebsiella* species and *Staphylococcus aureus* respectively.

Antibiotic Susceptibility Test

The antibiogram of all the isolated bacteria was performed using Kirby-Bauer technique and the following antibiotic discs were used: CH (Chloramphenicol 30µg), AM (Ampicillin 30µg), LEV (Levofloxacin 5µg), CN (Gentamicin 30µg), CRO (Ceftriaxone 30µg) against each organism. (CLSI, 2021). The bacterial isolates that were resistant to two or more classes of antibiotics were considered to be multi-drug resistant (MDR).

RESULTS

Figure 1 shows that the prevalence of aerobic vaginitis (AV) among patients presenting with vaginitis which was 23%. Table 1 shows the prevalence of aerobic vaginitis based on Age. It was found to be higher (50%) among age group 41-50 years, while the least (7.3%) was observed in age group 21-30 years. Table 2 shows the prevalence of AV based on socio-demographic factors (Level of education and occupation), where women with primary education had a prevalence of 50% compared to women with other levels of education. House wives had the highest prevalence of 40.0%. The prevalence of AV based on risk factors which was highest in women that use condom during sexual intercourse (63.7%) and women that had miscarriage (62.5%) and least in pregnant women (Table 3). Table 4 shows the prevalence of aerobic vaginitis based on gestational period in which pregnant women in their third trimester had 32% rate. Table 5 shows the prevalence of aerobic vaginitis based on symptoms. Prevalence of aerobic vaginitis among women with symptoms of painful sex was 28.0%, while those with vagina itching had the 18.5% rate.

Figure 2 shows the occurrence of bacteria in aerobic vaginitis, in which *Klebsiella* spp. (47.82%) was the most encountered followed by *Escherichia coli* (30.43%) and *Staphylococcus aureus* (21.74%).
Table 6, 7 and 8 shows antibiotic zones of inhibition against the aerobic vaginitis implicating bacteria. The percentages of susceptible, intermediate and resistant isolates are shown in Table 9. Table 10, 11 and 12 shows the phenotypic antibiotic susceptibility patterns of the isolates. The occurrence of Multi-Drug Resistant (MDR) isolates is shown in Figure 3.

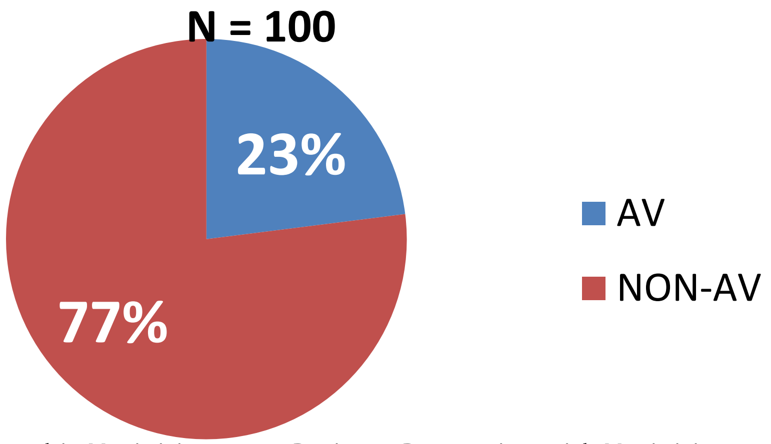

Figure 1: Prevalence of Aerobic Vaginitis among Patients Presenting with Vaginitis
Key: N: Number of Sample; AV = Aerobic Vaginitis

Table 1: Prevalence of Aerobic Vaginitis based on Age

Age	No. Examined	No. Positive (%)	No. Negative (%)
13-20	17	4(23.5)	13(76.5)
21-30	41	3(7.3)	38(92.7)
31-40	23	7(30.4)	16(69.6)
41-50	12	6 (50.0)	6 (50.0)
>/=51	7	3(42.9)	4(57.1)
Total	**100**	**23(23.0)**	**77(77.0)**

x^2=12.913; P-value= 0.012
Key: No=Number

Table 2: Prevalence of Aerobic Vaginitis based on Socio-Demographic Factors
Key: No=Number

Factors	No. Examined	No. Positive (%)	No. Negative (%)	x^2	*p*-value
Level of Education				3.093	0.378
Primary	2	1(50.0)	1(50.0)		
Secondary	17	6(35.3)	11(64.7)		
Tertiary	74	14(18.5)	60(81.0)		
Others	7	2(28.6)	5(71.4)		
Occupation				5.392	0.249
Civil servant	15	4(26.7)	11(73.3)		
House wife	15	6(40.0)	9(60.0)		
Business woman	25	7(28.0)	18(72.0)		
Student	24	6(13.6)	38(72.0)		
Others	1	0(0)	1(100)		

Table 3: Prevalence of Aerobic Vaginitis based on Risk Factors

Risk Factors	No. Examined	No. Positive	No. Negative	x^2	*p-value*
Diabetic				1.291	0.001
Yes	20	10(50.0)	10(50.0)		
No	80	13(16.0)	67(83.0)		
Use of condom				11.524	0.001
Yes	11	7(63.6)	4(36.4)		
No	89	16(18.0)	73(82.0)		
Properly kept toilet				0.007	0.931
Yes	82	19(23.2)	63(76.8)		
No	18	4(22.2)	14(77.8)		
Miscarriage				16.781	0.000
Yes	16	10(62.5)	6(37.5)		
No	84	13(15.5)	71(84.5)		
Infertility				10.368	0.001
Yes	7	3(42.9)	4(57.1)		
No	54	10(18.5)	44(81.5)		
Contraceptive				2.538	0.111
Yes	19	7(36.8)	12(63.2)		
No	81	16(19.8)	65(80.2)		
Douching				6.832	0.009
Yes	20	9(45.0)	11(55.0)		
No	80	14(18.5)	66(72.5)		
Pregnancy				0.538	0.463
Yes	37	10(27.0)	27(73.0)		
No	63	13(20.6)	50(79.4)		

Key: No=Number

Table 4: Prevalence of Aerobic Vaginitis based on Gestation Period

Gestation Period	No. Examined	No. Positive (%)	No. Negative (%)
First trimester	7	2(28.6)	5(71.4)
Second trimester	4	0	4(100)
Third trimester	25	8(32.0)	17(68.0)
No Response	64	13(20.3)	51(79.7)

x^2=2.722 *p-value* = 0.437

Key: No=Number

Table 5: Prevalence of Aerobic Vaginitis based on Symptoms

Symptoms	No. Examined	No. Positive (%)	No. Negative (%)
Painful Urination	7	3(42.9)	4(57.1)
Vaginal Itching	54	10(18.5)	44(81.5)
Vaginal Odour	15	4(26.7)	11(73.3)
Vulva Irritation	5	2 (40.0)	3 (60.0)
Painful Sex	4	3(75.0)	1(25.0)
No Response	15	1(6.67)	14(93.3)

x^2=3.186 *p-value* = 0.671

Key: No=Number

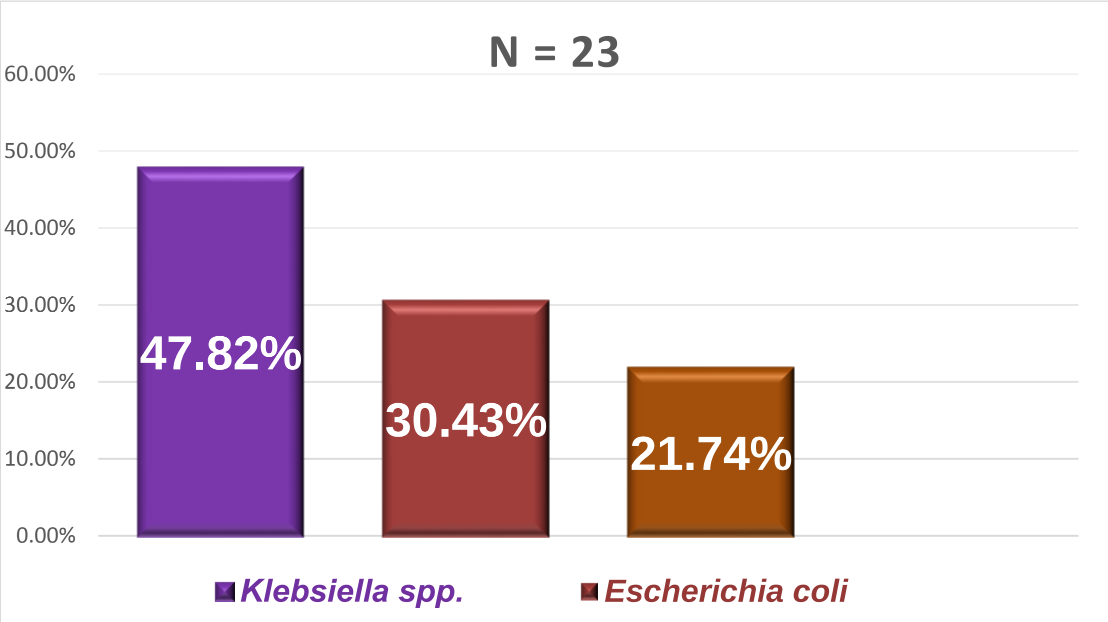

Figure 2: Occurrence of Bacteria in Aerobic Vaginitis
Key: N= Number of isolates

Table 6: Antibiotics Zone of Inhibitions against *Klebsiella* spp.

ID n=11	CRO(30µg)	CN(10µg)	LEV(5µg)	C(30µg)	AM(10µg)
	Zone of Inhibition (mm)				
K2	6R	21S	20I	6R	6R
K7	6R	20S	6R	20S	6R
K17	10R	19S	22S	6R	6R
K37	6R	13I	20I	20S	6R
K39	6R	25S	24S	11R	6R
K53	6R	12S	20I	19S	6R
K74	6R	19S	25S	21S	6R
K87	6R	12R	22S	20S	6R
K91	6R	24S	20S	6R	10R
K98	6R	20S	20I	6R	6R
K100	6R	25S	15R	25S	6R

Key: R=Resistant; I=Intermediate; S=Susceptible; CRO= Ceftriaxone; CN=Gentamycin LEV=Levofloxacin; C=Chloramphenicol; AM=Ampicillin; n = Number of Isolates; ID = Isolate Code

Table 7: Antibiotics Zone of Inhibitions against *Escherichia coli*

ID n=7	CRO(30µg)	CN(10µg)	LEV(5µg)	C(30µg)	AM(10µg)
	Zone of Inhibition (mm)				
E13	10R	20I	25S	28S	6R
E22	6R	21I	30S	27S	6R
E30	6R	27S	20I	20S	10R
E46	6R	23S	21S	28S	10R
E61	10R	28S	20I	20S	6R
E82	6R	27S	30S	23S	6R
E90	6R	23S	25S	28S	6R

Key: R=Resistant; I=Intermediate; S=Susceptible; CRO=Ceftriaxone; CN=Gentamycin LEV=Levofloxacin; C=Chloramphenicol; AM=Ampicillin; n = Number of Isolates; ID = Isolate Code

Table 8: Antibiotics Zone of Inhibitions against *Staphylococcus aureus*

ID n = 5	Zone of Inhibition(mm)				
	CRO(30µg)	CN(10µg)	LEV(5µg)	C(30µg)	AM(10µg)
S8	6R	25S	25S	30S	6R
S16	6R	20S	23S	20S	6R
S21	6R	24S	30S	28S	6R
S32	6R	20S	20S	25S	10R
S60	6R	25S	24S	25S	6R

Key: R=Resistant; I=Intermediate; S=Susceptible; CRO=Ceftriaxone; CN=Gentamycin LEV=Levofloxacin; C=Chloramphenicol; AM=Ampicillin; n = Number of Isolates; ID = Isolate Code

Table 1: Percentage of Antibiotic Susceptible, Intermediate and Resistant Bacteria

Antibiotic	S (%)	I (%)	R (%)
***Klebsiella* spp. (n=11)**			
CRO	0(0)	0(0)	11(100)
CN	9(81.8)	1(9.1)	1(9.1)
LEV	5(45.6)	4(36.4)	2(18.2)
C	6(54.5)	0(0)	5(45.5)
AM	0(0)	0(0)	11(100)
***Escherichia coli* (n=7)**			
CRO	0(0)	0(0)	7(100)
CN	5(71.4)	2(28.6)	0(0)
LEV	5(71.4)	2(28.6)	0(0)
C	7(100)	0(0)	0(0)
AM	0(0)	0(0)	7(100)
***Staphylococcus aureus* (n=5)**			
CRO	0(0)	0(0)	5(100)
CN	5(100)	0(0)	0(0)
LEV	5(100)	0(0)	0(0)
C	5(100)	0(0)	0(0)
AM	0(0)	0(0)	5(100)

Key: R=Resistant; I=Intermediate; S=Susceptible; CRO=Ceftriaxone; CN=Gentamycin LEV=Levofloxacin; C=Chloramphenicol; AM=Ampicillin; n = Number of Isolates

Table 2: Phenotypic Antibiotic Susceptibility Patterns of *Klebsiella* spp.

ID n=11	Susceptible	Intermediate	Resistance	MDR
K2	CN	LEV	CRO,C,AM	+
K7	CN,C		CRO,LEV,AM	+
K17	CN,LEV		CRO,C,AM	+
K37	C	CN,LEV	CRO,AM	-
K39	C,LEV		CRO,C,AM	+
K53	CN,C	LEV	CRO,AM	-
K74	CN,LEV,C		CRO,AM	-
K87	LEV,C		CRO,CN,AM	+
K91	CN,LEV		CRO,C,AM	+
K98	CN	LEV	CRO,C,AM	+
K100	CN,C		CRO,LEV,AM	+

Key: R=Resistant; I=Intermediate; S=Susceptible; CRO=Ceftriaxone; CN=Gentamycin LEV=Levofloxacin; C=Chloramphenicol; AM=Ampicillin; MDR= Multi-Drug Resistant; n = Number of Isolates; ID = Isolate Code

Table 3: Phenotypic Antibiotic Susceptibility Patterns of *Escherichia coli*

ID	n=7	Susceptible	Intermediate	Resistance	MDR
E13		LEV,C	CN	CRO,AM	-
E22		LEV,C	CN	CRO,AM	-
E30		CN,C	LEV	CRO,AM	-
E46		CN,		CRO,C,AM	+
E61		CN,C	LEV	CRO,AM	-
E82		CN,LEV,C		CRO,AM	-
E90		CN,LEV,C		CRO,AM	-

Key: R=Resistant; I=Intermediate; S=Susceptible; CRO=Ceftriaxone; CN=Gentamycin LEV=Levofloxacin; C=Chloramphenicol; AM=Ampicillin; MDR= Multi-Drug Resistant; n = Number of Isolates; ID = Isolate Code

Table 4: Phenotypic Antibiotic Susceptibility Patterns of *Staphylococcus aureus*

ID	n=5	Susceptible	Intermediate	Resistance	MDR
S8		CN,LEV		CRO,AM	-
S16		CN,LEV,C		CRO,AM	-
S17		CN,LEV,C		CRO,AM	-
S32		CN,C	LEV	CRO,AM	-
S60		CN,LEV,C		CRO,AM	-

Key: R=Resistant; I=Intermediate; S=Susceptible; CRO=Ceftriaxone; CN=Gentamycin LEV=Levofloxacin; C=Chloramphenicol; AM=Ampicillin; MDR= Multi-Drug Resistant; n = Number of Isolates; ID = Isolate Code

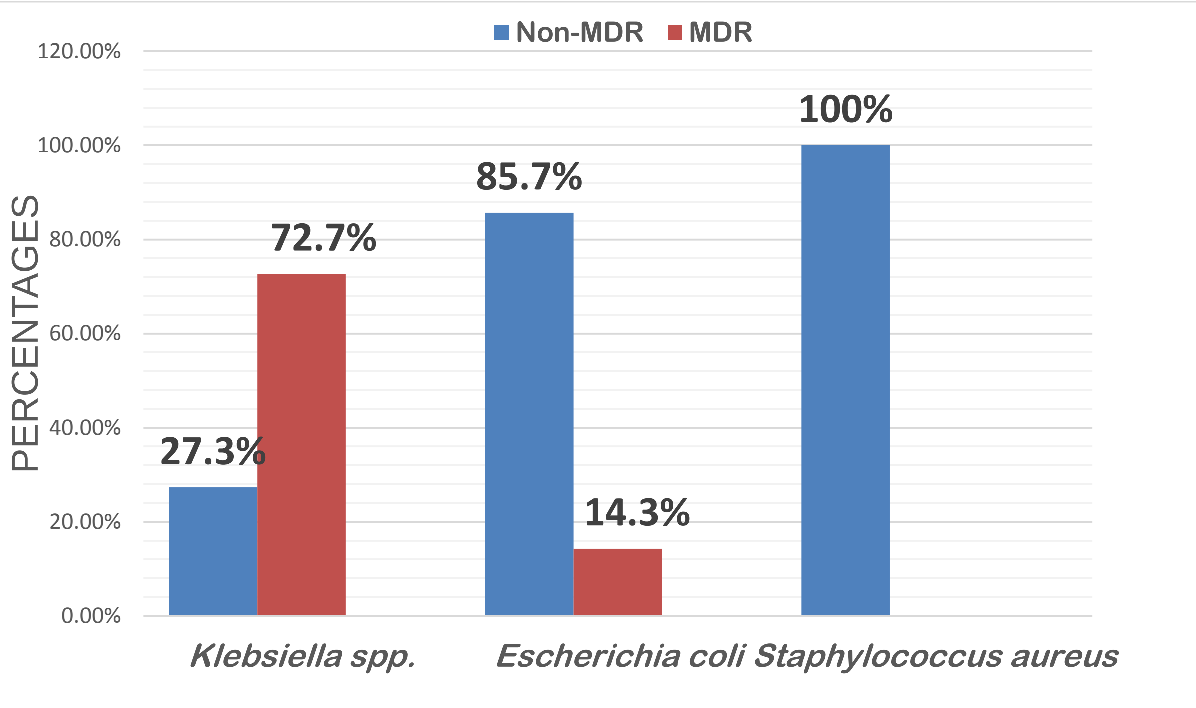

Figure 1: Occurrence of Multi-Drug Resistant Bacteria Isolated from Aerobic Vaginitis

DISCUSSION

In this study, the prevalence of AV was 23%, which was higher to the 17.4 % reported by Verma *et al*. (2017). However, it was lower to that of Asghar *et al*. (2021) which was 35%. This could be due to difference in methodology and poor personal hygiene.

The prevalence of AV was higher (50%) in the age group 41-50 years which could be due to thinning of the vagina epithelial making it to prone to entry of opportunistic pathogens. This is in contrast with the study of Krishnasamy *et al*. (2019) who recorded 35.8% prevalence against age group 41-50 years. In this study, 7.3% prevalence of AV was recorded among age group 21-30 years.

This agrees with the findings of Yalew *et al*. (2022) in northern Ethiopia who reported that 7.4% of aged group 21-29 years range had AV. However, it contradicted the findings of Asghar *et al*. (2021) where 31.4% rate was recorded against 21-25 years. Despite high rate of AV recorded among age group 41-50 years, there was no significant association between the disease and age group, as $p<0.05$. The prevalence of AV was higher (50.0%) among women with primary education compared to those with secondary education (35.3%). This may be due to lack of enlightenment and awareness among women with primary education on how vaginitis could be contracted. The prevalence of AV was higher (40.0%) among house wives compared to those with other occupations.

There was 40% prevalence of AV among diabetic patients; this was higher than those without history of diabetic. It was not surprising, as our finding recorded a significant association between diabetic and AV ($p<0.05$). However, the rate was lower to the one recorded in Oman against diabetic patients by Majeda *et al*., (2016) where the prevalence was 10.9%. This could be due to immune compromised system and high sugar level. The prevalence of AV was higher (63.6%) in women that used condom during sexual intercourse compared to those that do not. This may be due to improper use of condom as well as number patients recruited for this study in each group. Women with history of miscarriage had higher prevalence of AV (62.5%) than those without history of miscarriage. This may be due to disruption of vagina microflora as a result of the miscarriage and eventually lead to vaginal colonization by harmful bacteria. Women who practiced douching had higher prevalence of 45.0% than those that do not practice it. This may be due to imbalance of the vaginal microflora or inflammation caused by physical or chemical irritation which may be as a result of the use of herbal concoction, antiseptic or soap. In these findings, AV was significantly associated vaginal douching. The prevalence of AV among women with history of infertility was higher (42.9%) than those without history of infertility. The disease may be what accounted for their infertility. In this study, the prevalence of AV was higher (27.0%) among pregnant women than those that were not. This rate was higher to the finding of Sangeetha *et al*. (2015) who reported 20.8% among pregnant women. It was also higher to the one reported by Donders *et al*. (2005) in Belgium (7.9%). The disparity in the prevalence of AV in our study with other studies may be due to the differences in sample sizes. Prevalence of AV was higher among pregnant women in their 3rd trimester (32.0%) followed by those in their first trimester (28.0%) and least among those in their 2nd trimester (0%). The differences may be due to the fact that most of the pregnant women in the study area came for antenatal care during their third trimester, for this reason, higher numbers of samples were collected from them. According to this study, it was not significantly associated with AV.

A total number of 23 bacterial isolates were recovered from patients diagnosed of AV, out of which 47.82% were *Klebsiella* spp., 30.43% were *Escherichia coli* and 21.74% were *Staphylococcus aureus*. These findings were in contrast with the work of Yalew *et al*. (2022) who reported that *Staphylococcus aureus* (29.5%) was more implicated in AV than *Escherichia coli* (25.0%) and *Klebsiella* spp. (2.3%). Our findings also contradicted the work of Yasin *et al*. (2021) in Ethiopia, where *Staphylococcus aureus*, *Escherichia coli* and *Klebsiella* species were 22.0%, 20.0% and 6.8% encountered in AV respectively. Isolation of *Escherichia coli* and *Klebsiella* spp. in AV could be attributed to an increase in level of amino acid and lactose which encourages their growth. It could also be as a result of infection by fecal contamination of genital tract via intestinal flora.

Klebsiella species was 91.8%, 54.5% and 45.6% susceptible to Gentamicin, Chloramphenicol, Levofloxacin respectively and they were also 100% resistant to Ceftriaxone and Ampicillin. These findings were in contrast with study of Yalew *et al*. (2022) where Gram negative isolates were 100.0% susceptible to Chloramphenicol. However, our finding on susceptibility to Gentamicin was supported the study of Kareem *et al*. (2023) where it was reported that Gentamicin was among the most effective antibiotics against *Enterobacteriaceae*. The resistance *Klebsiella* spp to Ceftriaxone and Ampicillin could be as a result of its possession of penicillanase which rendered beta-lactam group of antibiotics ineffective.

This study revealed that *Escherichia coli* isolates were 100% susceptible to Chloramphenicol, 71.4% to Levofloxacin and Gentamicin respectively. The percentage susceptibility exhibited by *Escherichia coli* to Gentamicin was in agreement with the study of Yalew *et al*. (2022) who reported that all *Enterobacteriaceae* isolates showed 100.0% sensitivity towards chloramphenicol followed by gentamicin (92.9%). Also, a similar susceptibility profiles were reported from Admas *et al*. (2020) and Sangeetha *et al*. (2015).

Escherichia coli isolates in these findings were 100% resistance to Ceftriaxone and Ampicillin .The resistance to ampicillin was in agreement with the reports from India and Ethiopia by Beyene and Tsegaye (2011) and Tamboli *et al.* (2017) respectively. The isolated E. *coli* may possess resistant genes for beta-lactam agents in which Ceftriaxone and Ampicillin are included (Gebrehiwot *et al.*, 2012; Shehab *et al.*, 2015).

Staphylococcus aureus was 100% susceptible to Gentamicin, Levofloxacin and Chloramphenicol, as well as 100% resistant to Ampicillin and Ceftriaxone. These results were with the study of Yalew *et al.* (2022) who reported that 86.7% of *S. aureus* were susceptible to Levofloxacin followed by gentamicin 83.3%. However, S. *aureus* had a high resistance rate of (100.0%) for penicillin class of antibiotics (ampicillin).

These results confirmed that Gentamicin was among the most effective antibiotics against *Enterobacteriaceae* and also Levofloxacin can be used in treatment of AV in our region. As a result of their little effect on the normal microflora, fluoroquinolones such as ciprofloxacin /Levofloxacin are commonly used to treat AV because they allow rapid recovery from the condition (Kaambo *et al.*, 2018) *Klebsiella* spp. was 72.20% MDR compared to *Escherichia coli* (14.30) and *Staphylococcus aureus* this can due to the ESBL (Extended Spectrum beta-Lactamases) that *Klebsiella* spp. possess as an additional resistance mechanism hereby making it resistant to ampicillin and ceftriaxone respectively. This agrees with the study of Admas *et al.* (2020) which reported relatively high proportion of MDR among *Klebsiella* spp. This can be because it has chromosomal and plasmid encoded beta lactam enzymes (Themozhi *et al.*, 2014).

CONCLUSION

The prevalence of AV in this study was 23%. The aerobic bacteria isolated in the AV were *Klebsiella* spp., *Escherichia coli*, and *Staphylococcus* aureus with 47.82%, 30.43% and 21.74% occurrence respectively. Age group was significantly associated with AV, with 41-50 years age group having the highest rate (50.0%) of the disease. Patient with primary level of education had the highest prevalence (50.0%) of AV. Diabetic, use of condom, miscarriage, infertility and vaginal douching were risk factors with significant association with the disease. The prevalence of AV among pregnant patients was 27.0%. In this study, 82.61% of all the isolates were susceptible to Gentamicin followed by Levofloxacin 65.22%. *Klebsiella* spp., *Escherichia coli* and *Staphylococcus aureus* were 100% resistance to each of the Ampicillin and Ceftriaxone. *Klebsiella* spp. had the highest MDR (72.20%) followed by *Escherichia coli* (14.30%).

Patients who experience vaginitis must receive thorough investigation and appropriate treatment to prevent any negative effects on women's health, such as miscarriage, infertility, and post-partum complications. It is important to take proper measures towards sexual education, hygiene practices, and sexual risk behavior. Women should avoid douching with substances other than water, as the vagina is self-lubricating and cleansing. For treating vaginal infections caused by aerobic vaginitis, fluoroquinolones like Levofloxacin can be used. Further studies should be conducted to determine the antibiogram of aerobic bacteria causing vaginitis against other classes of antibiotics to ensure accurate prescription.

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