

RESEARCH ARTICLE

AEROBIC VAGINITIS (AV): DISEASE BURDEN, BACTERIOLOGICAL PROFILE AND ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN WESTERN MAHARASHTRA.

Deepa Devhare¹

¹A-22 ChintaMani Residency, Chaitraban, laketown, Bibwewadi, Pune, Maharashtra

Received: 14 March, 2023/Revision: 20 March, 2023 /Accepted: 10 April, 2023

Abstract: Vaginitis is a very common and recurrent infection in reproductive age group especially worrisome in pregnant females. If it is misdiagnosed, left untreated or wrongly treated can lead to serious complications. With this background present study was conducted to determine the prevalence, bacteriological profile and antimicrobial susceptibility of the pathogens causing aerobic vaginitis. Study was conducted over a period of 1 year in which 241 vaginal swabs were processed for aerobic culture and gram stain. The organisms were identified and antimicrobial susceptibility was performed by Vitek 2 compact system. Out of 241 samples processed 37(15.4%) showed bacterial growth. *S. aureus* (40.5%), GBS (13.5%), *E. coli* (13.5%) and *K. pneumoniae* (13.5%) were the common pathogens isolated. Gram positive organisms showed highest sensitivity to Vancomycin and Linezolid. All gram-negative bacteria were sensitive to Imipenem and Meropenem. This study recommends the laboratory-based diagnosis of each clinically suspected case of vaginitis for appropriate management of patient. Addition of antibacterial agent in traditional empirical antifungal therapy for vaginitis is need of hour.

Keywords: Aerobic vaginitis, prevalence, bacterial pathogens, antibiotic susceptibility testing.

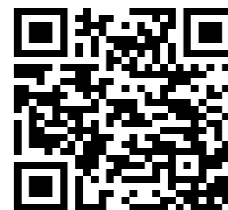
INTRODUCTION:

The Acidic Ph (<4.5) is maintained by lactobacilli by secreting lactic acid which are predominant normal flora of vagina [1]. There are different factors described like hormonal status, vascularity, alteration in pH, glycogen content which cause growth of pathogenic microorganisms in vagina [2]. One of the most common clinical conditions in females specially in reproductive age group is vaginitis [3]. Vaginitis is characterized by vaginal itching, irritation and vaginal discharge [4].

Vaginal discharge can be classified as infective, non-infective or physiological [5]. Whenever there is replacement of normal vaginal flora by aerobic bacteria which are pathogenic, it is termed as Aerobic vaginitis (AV) [2]. Bacteria associated frequently with aerobic vaginitis are *Group B Streptococci*, (GBS), *Staphylococcus aureus*, *E. coli*, *Enterococcus species*.

Corresponding Author:

Dr. Deepa Devhare,
A-22 ChintaMani Residency, Chaitraban, laketown, Bibwewadi, Pune,
Maharashtra
Email- deepadevhare@gmail.com



Aerobic vaginitis can give rise to various complications like pelvic inflammatory diseases, tubal infertility, ectopic pregnancy if they are untreated or misdiagnosed [6]. In pregnant females, Aerobic vaginitis (AV) can cause premature rupture of membrane, premature birth, chorioamnionitis, habitual miscarriage [7-9]. If neonate gets exposed to these bacteria during passage through birth canal it can lead to early neonatal sepsis or necrotizing enterocolitis in preterm infants [10]. As the etiological agents for vaginitis are very diverse, its treatment also significantly changes with etiology. This necessitates the microbial culture and laboratory-based diagnosis of every case of vaginitis to guide the appropriate and timely treatment. This will also avoid misdiagnosis, unnecessary antibiotic usage and emergence of drug resistance. Knowledge of local epidemiology, etiological agents and their antimicrobial susceptibility pattern based on lab data help the physician to decide rational empirical antimicrobial treatment for any infection [11]. So, with this background this retrospective study was conducted to identify the different etiological agents causing aerobic vaginitis (AV) and to study their antimicrobial susceptibility pattern.

MATERIAL AND METHODS:

A retrospective laboratory based observational study was conducted over a period of one year from January 2019 - December 2019 in Department of Microbiology of a clinical diagnostic center situated in Pune district, Maharashtra. Patient details like demographic data, laboratory findings and clinical details were obtained from electronic medical records for analysis. Vaginal swabs sent for microbial culture from female patients visiting Gynecology OPDs having symptoms of vaginitis and having vaginal discharge were included in the study. Vaginal discharge was collected by physician using sterile cotton swab and kept in a sterile container. Samples were immediately transported to the diagnostic Microbiology laboratory at 2-8 degree C for further processing. After receiving

samples (vaginal swab) in the laboratory they were immediately processed.

Samples were inoculated on blood agar and MacConkey agar and incubated at 37 degree C for 24 hrs aerobically. From the vaginal swab a gram stain smear was also prepared. On gram stain presence of pus cells and microorganisms like gram positive cocci, gram negative bacilli or yeast cells was noted. The plates were examined for growth after 24hrs of incubation. Any growth obtained was correlated with gram stain findings. If there was no growth after 24hrs of incubation plates were further incubated for next 24 hrs before reporting them as no growth [12]. Growth obtained after culture was identified and antimicrobial susceptibility was performed by Vitek 2 compact system by Biomerieux, France. Drug resistance mechanisms like ESBL production in gram negative bacteria and Methicillin resistance in *Staphylococcus* species were detected by Vitek 2 compact system. Statistical analysis: Microsoft excel spreadsheets were used for data entry and analysis.

RESULTS:

Over a period of one year total 241 samples from patients with signs and symptoms of vaginitis were received and processed in the laboratory. Age range of patients included in the present study was 21 to 58 years. Maximum patients of aerobic vaginitis belonged to age group of 21-30 years, followed by 31-40 years as shown in **Figure 1**.

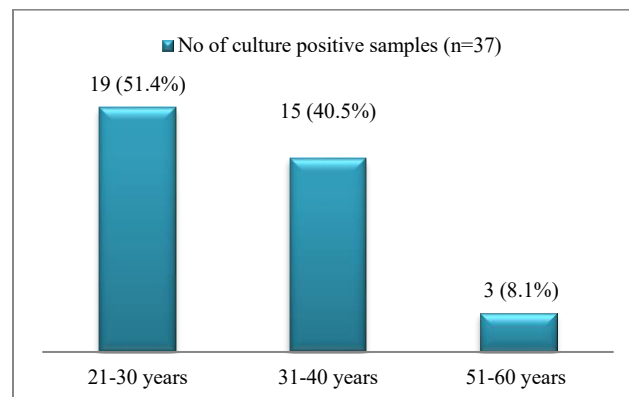


Figure 1: Age group wise distribution of cases of aerobic vaginitis

Out of 241 vaginal samples received for culture, 37 samples grew aerobic bacterial pathogens resulting in 15.4% prevalence of aerobic vaginitis in present study. *Candida* species was grown in 29 (12%) samples. In present study gram positive cocci (70.2%) were the most common aerobic pathogen followed by gram negative bacilli (29.7%) causing vaginitis. *S. aureus*, *Str. agalactiae* (GBS), *E. coli* and *K. pneumoniae* were the common pathogens isolated in present study. (Table 1) (Figure 2).

Table 1: Distribution of bacterial isolates from present study

Organisms	No of isolates(n-37)	Percentage
<i>Staphylococcus aureus</i>	15	40.5%
<i>Streptococcus agalactiae</i> (GBS)	5	13.5%
<i>Enterococcus species</i>	4	10.8%
<i>Coagulase negative Staphylococcus</i> (CONS)	2	5.4%
<i>E. coli</i>	5	13.5%
<i>Klebsiella pneumoniae</i>	5	13.5%
<i>Acinetobacter lwoffii</i>	1	2.7%

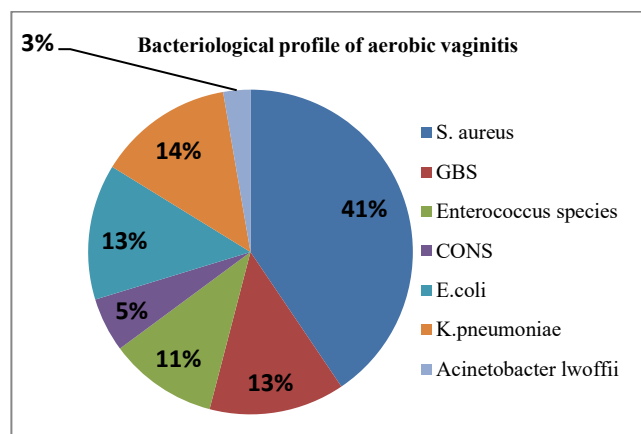


Figure 2: Distribution of aerobic bacteria causing vaginitis.

Gram positive organisms showed 100% sensitivity to Vancomycin, and Linezolid (Table 2) and all gram-negative bacteria were sensitive to Imipenem and Meropenem. (Table 3). In present study prevalence of MRSA in *Staphylococcus aureus* was 40% and

prevalence of ESBL in Enterobacterales was 60%. (Table 4)

Table 2: Antibiotic sensitivity pattern of gram-positive cocci isolated in present study.

Antibiotic	<i>S. aureus</i> (n=15)%	<i>Streptococcus agalactiae</i> (n=5)%	<i>Enterococcus species</i> (n=4)%	<i>Coagulase negative Staphylococcus</i> (n=2) %
Penicillin	0	5(100%)	3(75%)	1(50%)
Ampicillin	0	5(100%)	3(75%)	1(50%)
Amoxicillin clavulanic acid	1(6.6%)	5(100%)	3(75%)	1(50%)
Erythromycin	4(26.7%)	2(40%)	0	1(50%)
Clindamycin	4(26.7%)	2(40%)	NT	1(50%)
Gentamicin	4(26.7%)	NT	NT	1(50%)
Ciprofloxacin	1(6.6%)	1(20%)	1(25%)	1(50%)
Vancomycin	15(100%)	5(100%)	4(100%)	2(100%)
Teicoplanin	15(100%)	NT	4(100%)	2(100%)
Linezolid	15(100%)	5(100%)	4(100%)	2(100%)
Tetracycline	13(86.7%)	4(80%)	1(25%)	1(50%)
Cotrimoxazole	4(26.7%)	NT	NT	1(50%)
Oxacillin	9(60%)	NT	NT	1(50%)
High level gentamicin	NT	NT	2(50%)	NT

NT- NOT TESTED

Table 3: Antibiotic sensitivity pattern of gram-negative bacilli isolated in present study.

Antibiotic	<i>E. coli</i> (n=5)%	<i>Klebsiella pneumoniae</i> (n=5)%	<i>Acinetobacter lwoffii</i> (n=1)%
Ampicillin	1(20%)	0	NT
Amoxicillin clavulanic acid	1(20%)	2 (40%)	NT
Cefuroxime	1(20%)	3(60%)	NT
Ceftriaxone	1(20%)	3(60%)	1(100%)
Ceftazidime	1(20%)	3(60%)	1(100%)
Cefepime	1(20%)	4 (80%)	1(100%)
Cefoperazone sulbactam	4(80%)	5(100%)	NT
Ciprofloxacin	1(20%)	3(60%)	1(100%)
Amikacin	5 (100%)	5(100%)	1(100%)
Gentamicin	5(100%)	5(100%)	1(100%)
Cotrimoxazole	2 (40%)	3(60%)	1(100%)
Imipenem	5(100%)	5(100%)	1(100%)
Meropenem	5(100%)	5(100%)	1(100%)
Ertapenem	5(100%)	5(100%)	NT
Piperacillin tazobactam	3(60%)	4(80%)	1(100%)

NT- NOT TESTED

Table 4: Prevalence of MRSA and ESBL in present study

<i>Staphylococcus aureus</i> (n=15)		Enterobacterales (n=10)		
MRSA(n=6)	MSSA(n=9)	ESBL producers (n=6)	Non producers (n=4)	ESBL
40%	60%	60%	40%	

DISCUSSION:

In present study, age group commonly affected by aerobic vaginitis was 21-30 years (51.40%) followed by 31- 40 years (40.5%) which is in agreement with studies conducted by Krishnasamy *et al.*, Sopia *et al.* and Kahn *et al.* [2,12,13] Maximum prevalence of aerobic vaginitis (AV) in age group of 21-30years correlates with more sexual activity in this age group [12]. In present study prevalence of aerobic vaginitis was more (15.4%) as compared to vaginal candidiasis (12%) which is a similar finding shown in study conducted by Kumar *et al.* [5] This demonstrates the need for giving antibacterials in the empirical treatment of clinically suspected cases of vaginitis in addition to traditional practice of empirical antifungal therapy. The prevalence of aerobic vaginitis (15.4%) in present study is comparable with studies conducted by Sopia *et al.*, Cherian *et al.* and Sangeetha *et al.* who showed prevalence rate of 15.7%, 18% and 20.8% respectively [2,1,14]. Studies conducted by Shaikh *et al* and Sharan *et al.* showed higher prevalence of aerobic vaginitis 37% and 28.9% respectively [15,16]. There is lot of variation in prevalence rate of aerobic vaginitis affected by different factors like geographical area, personal hygiene, nutrition, associated co morbidities like diabetes, history of antibiotic usage causing overgrowth of pathogenic organisms [16].

In present study gram positive cocci (70.2%) were isolated predominantly which is well correlated with other studies conducted by Krishnasamy *et al.*, Sharan *et al.* and Sangeetha *et al.* [2,14,16] However Cherian *et al* and Sopia *et al.* showed predominance of gram-negative bacteria in their study [1,12]. Most common gram positive cocci isolated in present study was *S.*

aureus (40.5%) followed by *Str. Agalactiae* (13.5%). Rate of isolation of *S. aureus* varies from 7.8% to 24.2% as shown in previous studies [1,2]. Cherian *et al.* has shown 12% prevalence of *Str. agalactiae* in their study which is comparable with present study [1]. Third most common gram positive cocci isolated in present study was *Enterococcus species* (10.8%). Many other studies have shown *Enterococcus species* as the most common pathogen causing aerobic vaginitis [12,14,16].

Among gram negative bacilli *E. coli* (13.5%) and *K. pneumoniae* (13.5%) were most common and equally isolated. Rate of isolation of *E. coli* in present study is similar to study done by Lakshmi *et al.* (15%) [17]. Enterobacterales constitute the major gram-negative pathogens causing aerobic vaginitis in study conducted by Kumar *et al.*, Swamy *et al.*, Ravishankar *et al.* [5,18,19] Gram positive cocci showed highest sensitivity to Linezolid, Vancomycin and Teicoplanin. *Enterococcus species* and *Str. agalactiae* showed good sensitivity for Penicillin, Ampicillin and Amoxicillin clavulanic acid. Out of all isolates of *S. aureus*, 40% were methicillin resistant (**Table 4**), which is very important finding in this study, which markedly affects the empirical treatment for aerobic vaginitis. All the isolates of gram-negative bacteria were sensitive to Imipenem, Meropenem, Amikacin and Gentamicin. They showed moderate sensitivity to Piperacillin tazobactam. Prevalence of ESBL in Enterobacterales was 60%. which is quite high. (**Table4**)

Vaginitis is a very common and recurrent infection in reproductive age group especially worrisome in pregnant females. If it is misdiagnosed and left untreated or wrongly treated can lead to serious complications [13]. WHO also recommends screening for vaginitis in pregnant females and women with bad obstetric history. Etiology for vaginitis can be Bacterial (aerobic/anaerobic), fungal or parasitic [6]. Also as described in the present study there is lot of variation in bacteriological profile of aerobic vaginitis in different studies. In present study 60% ESBL producers and 40% MRSA were detected which shows that there are high chances of treatment failure or

recurrence if patient is not treated with appropriate antibiotic. All these factors emphasize the need for microbial culture-sensitivity and other supporting laboratory investigations-based diagnosis and treatment of this condition to avoid misdiagnosis and inappropriate treatment to the patient. This will also help in judicious use of antibiotic and prevent emergence of drug resistance.

CONCLUSION:

With higher prevalence of aerobic vaginitis and changing etiological and susceptibility pattern of pathogens, present study recommends complete laboratory investigations for each case of vaginitis to avoid misdiagnosis, treatment failure, recurrence leading to complications. Study also highlights the importance of availability of local data about common pathogens and most effective antimicrobial agent to guide physician regarding selection of appropriate empirical therapy.

REFERENCES:

- [1]. Cherian A, Sasikumari O. Microbial Profile of High Vaginal Swab from Women of Reproductive Age Group in a Tertiary Care Hospital. *Int. J. Curr. Microbiol. App. Sci.* 2017; 6,7: 2366-2370.
- [2]. Krishnasamy L, Saikumar C, Kumaramanickavel G. Aerobic Bacterial Pathogens Causing Vaginitis in Patients Attending A Tertiary Care Hospital and their Antibiotic Susceptibility Pattern. *J. Pure Appl. Microbiol.* 2019; 13,2: 1169-1174.
- [3]. Forbes BA, Daniel FS, Alice SW. Bailey and Scott's Diagnostic Microbiology. 12th ed. USA: Mosby Elsevier Company. 2007; p. 860.
- [4]. Schorge J, Schaffer J, Halvorson L, Hoffman B, Bradshaw K, Cunningham FG. Williams Gynecology, Second Edition. New York: McGraw-Hill Company; 2012. Chap 3: p. 547.
- [5]. Kumar G, Singh K. Microbial Profile of High Vaginal Swab from Symptomatic Women of Reproductive Age Group: Data from Tertiary Care Hospital. *Int. J. Sci. Res.* 2015; 4,7: 2672-2673.
- [6]. Wójkowska-Mach J, Pomorska-Wesołowska M, Romanik M, Romaniszyn D. Prevalence and Antimicrobial Susceptibility Profiles of Microorganisms Associated with Lower Reproductive Tract Infections in Women from Southern Poland—Retrospective Laboratory-Based Study. *Int. J. Environ. Res. Public Health.* 2021; 18: 335.
- [7]. Donati L, Di Vico A, Nucci M, Quagliozzi L, Spagnuolo T, Labianca A, Bracaglia M, Ianniello F, Caruso A, Paradisi G. Vaginal Microbial Flora and Outcome of Pregnancy. *Arch. Gynecol. Obstet.* 2010; 281: 589-600.
- [8]. Tansarli GS, Kostaras EK, Athanasiou S, Falagas ME. Prevalence and Treatment of Aerobic Vaginitis among Non-Pregnant Women: Evaluation of the Evidence for an Underestimated Clinical Entity. *Eur. J. Clin. Microbiol. Infect. Dis.* 2013; 32: 977-84.
- [9]. Pereira N, Edlind TD, Schlievert PM, Nyirjesy P. Vaginal Toxic Shock Reaction Triggering Desquamative Inflammatory Vaginitis. *J. Low Genit. Tract Dis.* 2013; 17: 88-91.
- [10]. Seliga-Siwecka JP, Kornacka MK. Neonatal Outcome of Preterm Infants Born to Mothers with Abnormal Genital Tract Colonization and Chorioamnionitis: A Cohort Study. *Early Hum. Dev.* 2013; 89: 271-275.
- [11]. Drekonja D, Filice G, Greer N, Olson A, MacDonald R, Rutks I, Wilt T. Antimicrobial Stewardship in Outpatient Settings: A Systematic Review. *Infect. Control Hosp. Epidemiol.* 2015; 36: 142-152.
- [12]. Sopia AR, Joseph PID, Kalyani M, Ananthi B, Dhanaraj S, Henry AJ. Aerobacterial Vaginosis among Women Attending an Infertility Clinic at a Tertiary Care Hospital in Chennai, India and Susceptibility Pattern of Isolates. *J. Pure Appl. Microbiol.* 2021; 15,1: 194-200.
- [13]. Khan I, Khan UA. A Hospital-Based Study of Frequency of Aerobic Pathogens in Vaginal

- Infections. J. Rawal Med. Coll. 2004; 29,1: 22-25.
- [14]. Sangeetha KT, Golia S, Vasudha CL. A Study of Aerobic Bacterial Pathogens Associated with Vaginitis in Reproductive Age Group Women (15-45 years) and their Sensitivity Pattern. Int. J. Res. Med. Sci. 2015; 3: 2268-2273.
- [15]. Shaikh S, Waghmare P, Sharma A, Ingole K, Bawane R. A Retrospective Evaluation of Vaginitis in Women of Reproductive Age Group in a Tertiary Care Hospital in Solapur, India. Int. J. Curr. Microbiol. App. Sci. 2018; 7,2: 762-768.
- [16]. Sharan H. Current Bacteriological Profile of Aerobic Vaginitis in a Tertiary Care Setup. J. Pure Appl. Microbiol. 2016; 10,3: 2361-2365.
- [17]. Lakshmi K, Chitralkha S, Illamani V, Menezes GA. Prevalence of Bacterial Vaginal Infections in Asymptomatic Diabetic Women. J. Med. Sci. Technol. 2012; 1,3: 9-15.
- [18]. Swamy N, Ramalingappa P, Bhatara U. Antimicrobial Sensitivity Pattern of Microorganisms Isolated from Vaginal Infections at a Tertiary Hospital in Bangalore, India. Int. J. Med. Students. 2015; 3,1: 34-39.
- [19]. Ravishankar N, Prakash M. Antibigram of Bacterial Isolates from High Vaginal Swabs of Pregnant Women from Tertiary Care Hospital in Puducherry, India. Int. J. Curr. Microbiol. App. Sci. 2017; 6,1: 964-972.

Cite of article: Devhare D. Aerobic vaginitis (AV): disease burden, bacteriological profile and antimicrobial susceptibility pattern in western Maharashtra. Int. J. Med. Lab. Res. 2023; 8,1:26-31. <http://doi.org/10.35503/IJMLR.2023.8104>

CONFLICT OF INTEREST: Authors declared no conflict of interest

SOURCE OF FINANCIAL SUPPORT: Nil

International Journal of Medical Laboratory Research (IJMLR) - Open Access Policy

Authors/Contributors are responsible for originality of contents, true references, and ethical issues.

IJMLR publishes all articles under Creative Commons Attribution- Non-Commercial 4.0 International License (CC BY-NC). <https://creativecommons.org/licenses/by-nc/4.0/legalcode>