Current Bacteriological Profile of Aerobic Vaginitis in a Tertiary Care Setup

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Aerobic vaginitis interferes with female reproductive health and foetus at risk as associated with complications. A total of 190 cases of vaginitis were considered for the study. Prevalence of aerobic vaginitis was 28.95%. Majority of cases 57.9% were belong to age group of 26-35 years. Predominant bacteria were *E.coli* 30.44%, *Enterococcus faecalis* 23.19%, *Staphylococcus aureus* 18.84%, members of Enterobacteriaceae and non fermenters. Most effective antibiotics were clindamycin, linezolid & vancomycin for gram positive and imipenem & aminoglycosides for gram negative bacteria.

Keywords: Aerobic vaginitis, Bacterial aetiology, Antimicrobial susceptibility pattern

Aerobic vaginitis (AV) is defined as a disruption of the lactobacillary healthy vaginal flora with aerobes and facultative anaerobes characterized by yellowish vaginal discharge, dyspareunia, itching or burning sensation, increase in vaginal pH >4.5, vaginal inflammation with leukocyte infiltration, increase in pro-inflammatory cytokines such as IL-1,6 & 8 and decrease in lactic acid concentration[1,2]. Severe form of aerobic vaginitis is also known as desquamative inflammatory vaginitis (DIV). Increase production of cytokines can lead to preterm labour, premature rupture of membranes (PROM) and chorioamnionitis during pregnancy[2]. Aerobic vaginitis cases are more frequent in women having low-grade squamous intraepithelial lesions than with normal pap smear[3]. If it is not diagnosed early & treated correctly, can spread in the female genital tract and become a source of infection for the neonates[4]. The therapy of choice for aerobic vaginitis has two goals; Firstly, eradication of the pathogens by correct antibiotic therapy and secondly, to re-establishment of the homeostasis of the vaginal micro biota to prevent the conditions that favoured the onset of infection. The aim of the study was to isolate & identify the bacteria and their antimicrobial susceptibility pattern in aerobic vaginitis.

MATERIALS AND METHODS

A total of 190 clinically suspected cases of vaginitis attending outpatient department and those admitted in Obstetrics and Gynaecology wards over a period of 15 months from 1st December 2014 to 29th February 2016 in the reproductive age group of 15-45 years were considered for the study, after permission of the ethical committee of our institute. Menstruating women, aborted six weeks prior and those taken antibiotics one month before and pathogens such as anaerobic bacteria, *Candida albicans, Trichomonas vaginalis* & *Chlamydia trachomatis* were ruled out from the study.

Specimen collection and transportation

Three high vaginal swabs were collected by inserting them into upper part of vagina

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(posterior vault) & rotated for 30 seconds and brought to the microbiology laboratory immediately and processed within 30 minutes of collection.

Sample processing

First swab was used for Gram staining to screen the pus cells, squamous epithelial cells & bacteria and second swab for wet mount preparation by using one drop of normal saline and examined under high power field to determine the aerobic vaginitis score[5] [Table 1].

Culture Methods

Third swab was inoculated onto blood agar, chocolate agar & mac conkey agar and incubated at 37°C for 24 hours in 7-10 % CO_2 concentration. The isolated organisms were identified by standard microbiological techniques[6]. All the isolates were tested for antimicrobial susceptibility (Hi-Media Mumbai) by Kirby-Bauer disk diffusion method on Mueller- Hinton agar[7].

RESULTS

Among 190 cases, 55 showed aerobic culture growth, therefore prevalence was 28.95%, more in non pregnant 37.8% (48/127) than pregnant 11.1% (7/63) women. Out of 63 pregnant women, highest percentage of aerobic vaginitis was in primigravida 14.82% (4/27) followed by 2 [10.53% (2/19)] or ≥3 [5.88% (1/17)] gravida .

Majority of cases 57.9% (110/190) were belong to age group of 26-35 years and least 6.32% (12/190) between 41-45 years. In our study, out of 55 culture positive cases women education graduate or above, mild, moderate & severe cases were 38.18% (21/55), 81.82% (45/55), 14.55% (8/55) and 3.63% (2/55) respectively. Among 55 culture positive swabs a total of 69 isolates were identified, of which 43 (78.18%) monomicrobial and 12

Table 1. Criteria for the microscopic diagnosis of aerobic vaginitis

AV Score	Lactobacillary Grades (LBG)	Number of leukocytes	Proportion of Toxic leukocytes	Background flora	Proportion of parabasal Epitheliocytes (PBCs)
0	I and IIa	≤ 10 / HPF	None or sporadic	Unremarkable or cytolysis	None or <1%
1	IIb	>10 / HPF ≤10 / EC	≤50% of leukocytes	Small coliform bacilli	≤ 10%
2	III	>10 / EC	>50% of leukocytes	Cocci or chains	>10%

LBG I –Numerous pleiomorphic *lactobacilli*, no other bacteria, LBG IIa-Mixed flora but predominantly *lactobacilli*, LBG IIb-Mixed flora but proportion of *lactobacilli* severely decreased due to increased number of other bacteria, LBG III-*lactobacilli* severely depressed or absent because of overgrowth of other bacteria, HPF-high power field, EC-epithelial cells, AV Score <3 no signs of aerobic vaginitis, 3-4 Mild, 5-6 Moderate, >6 Severe aerobic vaginitis

Table 2. Polymicrobial pattern of aerobic vaginitis

Type of Bacteria	Number of cases	Total N. of mixed isolates
Escherichia coli + CoNS + Enterobacter spp.	1	3
Enterococcus faecalis + Acinetobacter spp.+ CoNS	1	3
Escherichia coli + Pseudomonas aeruginosa	1	2
Escherichia coli +Group B haemolytic streptococci	1	2
Escherichia coli + Enterococcus faecalis	2	4
Escherichia coli + CoNS	1	2
Escherichia coli + Staphylococcus aureus	2	4
Staphylococcus aureus + Klebsiella pneumoniae	1	2
Enterococcus faecalis+ Klebsiella pneumoniae	1	2
Enterococcus faecalis+ CoNS	1	2
Total	12	26

Table 3. Antimicrobial susceptibility pattern of aerobic vaginitis

Antibiotics	Conc. µg	Staph. N=13(%)	Cons N=8(%)	GBS N=2(%)	E.faecalis N=16(%)	E.coli N=21(%)	Kleb. N=3(%)	Entero. N=1(%)	Pseudo. N=3(%)	Acineto. N=2(%)
Amikacin	30	11(84.62)	5(62.5)	NT	NT	18(85.7)	3(100)	1(100)	3(100)	2(100)
Amoxy-clavulanic acid	20/10	2(15.39)	2(25)	2(100)	9(56.25)	9(42.86)	0	NT	NT	NT
Cefotaxime	30	NT	NT	2(100)	NT	10(47.62)	0	0	NT	1(50)
Ceftazidime	30	NT	NT	NT	NT	12(57.1)	1(33.33)	0	1(33.33)	1(50)
Ciprofloxacin	5	7(53.85)	4(50)	NT	8(50)	16(76.19)	2(66.67)	1(100)	2(66.67)	1(50)
Clindamycin	2	12(92.31)	7(87.5)	2(100)	NT	NT	NT	NT	NT	NT
Cotrimoxazole	23.75/1.25	3(23.08)	2(25)	NT	NT	7(33.33)	0	0	NT	0
Gentamicin	10	8(61.54)	4(50)	NT	NT	17(80.95)	2(66.67)	1(100)	2(66.67)	2(100)
Imipenem	10	NT	NT	NT	NT	19(90.48)	3(100)	1(100)	3(100)	2(100)
Levofloxacin	5	10(76.9)	6(75)	1(50)	11(68.75)	15(71.43)	2(66.67)	1(100)	2(66.67)	1(50)
Linezolid	30	13(100)	8(100)	2(100)	16(100)	NT	NT	NT	NT	NT
Piperacillin-Tazobactam	100/10	NT	NT	NT	13(81.25)	14(66.67)	1(33.33)	1(100)	2(66.67)	1(50)
Vancomycin	30	13(100)	8(100)	2(100)	16(100)	NT	NT	NT	NT	NT

Staph.= *Staphylococcus aureus*, Cons= *Coagulase negative Staphylococci*, GBS= *Group B Streptococci*, E.faecalis= *Enterococcus faecalis*, E.coli= *Escherichia coli*, Kleb.= *Klebsiella pneumoniae*, Entero.= *Enterobacter spp.*, Pseudo.= *Pseudomonas aeruginosa*, Acineto.= *Acinetobacter spp.*, NT=Not Tested
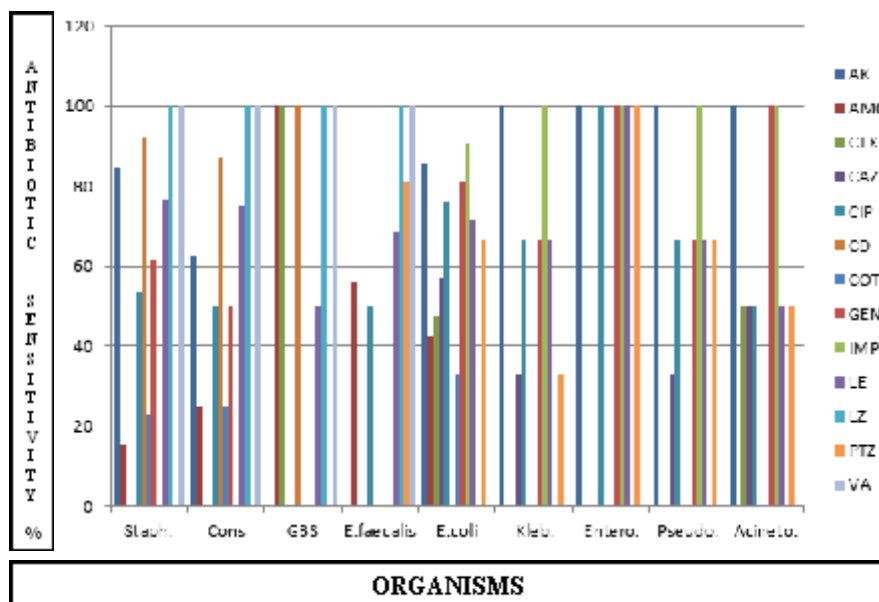
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AK= Amikacin, AMC= Amoxy-Clavulanic acid, CTX= Cefotaxime, CAZ= Ceftazidime, CIP= Ciprofloxacin, CD= Clindamycin, COT= Cotrimoxazole, GEN= Gentamicin, IMP= Imipenem, LE= Levofloxacin, LZ= Linezolid, PTZ= Piperacillin-Tazobactam, VA= Vancomycin

Fig. 1. Antibiotic sensitivity pattern of aerobic vaginitis

(21.82%) were polymicrobial [Table 2]. Predominant bacteria were *E.coli* 21 (30.44%), *Enterococcus faecalis* 16 (23.19%), *Staphylococcus aureus* 13 (18.84%) including 2 (2.9%) isolates of methicillin resistant, members of Enterobacteriaceae and non fermenters.

DISCUSSION

The prevalence of aerobic vaginitis was 28.95% which varies from as low as 7.9% to as high as 95.45%[2,8]. The prevalence of aerobic vaginitis varies from place to place and time to time even in same place might be related to population density, nutrition, personal hygiene, living standard, injudicious use of antibiotics either self or prescription of unqualified medical practitioners which inhibit the growth of *lactobacilli* and allowing the growth of resistant bacteria[9,14]. Aerobic vaginitis less common in pregnancy 11.1% similar to other study[10] due to the fact of high level of oestrogen in pregnancy supply more glycogen to *lactobacilli* which inhibit pathogens growth, adhesiveness and blockage of their diffusion[11,12]. Aerobic vaginitis rate decreased as number of gravida increased which correlate with Dichen TC et al report[13].

Aerobic vaginitis common in 26-35 years age group might be due to more sexual activity[14]. Educated women better take care of personal health & consult doctors but less educated may self diagnose & take treatment because of shyness rather than consult to doctors, therefore more chance of disease when education level is low. Majority of cases were mild while least severe grade which is in agreement with Zodzika J et al study[10]. Commonest isolated bacteria were *E.coli* and *Enterococcus faecalis* similar to Tempera G et al finding[12]. *Enterococcus faecalis* was reported as commonest bacteria by some[4,15,16] and *Staphylococcus aureus* by other studies[11,17]. Isolation of more number of gastrointestinal floras indicates unhygienic bowel practices and bacteria migrating into vagina causing aerobic vaginitis.

Most effective antibiotics were clindamycin, linezolid & vancomycin for gram positive and imipenem & aminoglycosides for gram negative bacteria. Amoxicillin-Clavulanate combination showed lowest sensitivity but highest prescribed antibiotic by clinicians, therefore its use should be restricted to susceptible isolate only.

CONCLUSION

Women education regarding personal hygiene is essential mainly in sexually active age group. Antibiotic treatment of aerobic vaginitis should be in such a way to kill pathogenic bacteria and beneficial effect on *lactobacilli*. As bacteriology & antibiogram of aerobic vaginitis change with time, therefore more studies are essential to formulate an effective antibiotic policy which should be updated regularly for prevention of development of resistant strains and reducing occurrence of complications.

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REFERENCES

1. Donders GGG, Van CK, Bellen G, Reybrouck R, Van den Bosch T, Riphagen I et al. Predictive value for preterm birth of abnormal vaginal flora, bacterial vaginosis and aerobic vaginitis during the first trimester of pregnancy. *Br J Obstet Gynecol* 2009; **116**:1315–24.
2. Donders GGG, Vereecken A, Bosmans E, Dekeersmaecker A, Salembier G, Spitz B. Definition of a type of abnormal vaginal flora that is distinct from bacterial vaginosis: aerobic vaginitis. *Br J Obstet Gynecol* 2002;**109**:34–43.
3. Jahic M, Mulavdic M, Hadzimehmedovic A, Hahic E. Association between aerobic vaginitis, bacterial vaginosis and squamous intraepithelial lesion of low grade. *Med Arch* 2013; **67**:94-6.
4. Khan I, Khan UA. A hospital based study of frequency of aerobic pathogens in vaginal infections. *J Rawal Med Coll* 2004; **29**(1):22-5.
5. Donders G, Bellen G, Rezeberga D. Aerobic vaginitis in pregnancy. *Br J Obstet Gynecol* 2011;**118**:1163–70.
6. Collee JG, Miles RS, Watt B. Tests for the identification of bacteria. In:Collee JG, Marmion BP, Fraser AG, Simmons A, editors. Mackie and Mc Cartney Practical Medical Microbiology.14th ed. London: Churchill Livingstone; 2006:131-49.
7. CLSI. Performance Standards for Antimicrobial Susceptibility Testing; Twenty -Fifth Informational Supplement. CLSI document M100-S25.Wayne, PA: Clinical and Laboratory Standards Institute; 2015.
8. Razzak MSA, Al-Charrakh AH, Al-Greitty BH. Relationship between lactobacilli and opportunistic bacterial pathogens associated with vaginitis. *North Am J Med Sci* 2011; **3**:185-92.
9. Mumtaz S, Ahmed M, Aftab I, Akhtar N, Ul Hassan M, Hamid A. Aerobic vaginal pathogens and their sensitivity pattern. *J Ayub Med Coll Abbottabad* 2008; **20**(1):113-7.
10. Zodzika J, Jermakowa I, Rezeberga D, Vasina O, Vedmedovska N, Donders GG. Factors related to elevated vaginal pH in the first trimester of pregnancy. *Acta Obstet Gynecol Scand* 2011; **90**:41–6.
11. Zarbo G, Coco L, Leanza V, Genovese F, Leanza G, D'Agati A et al. Aerobic vaginitis during pregnancy. *Research in Obstetrics and Gynecology* 2013; **2**(2):7-11.
12. Tempera G, Furneri PM. Management of aerobic vaginitis. *Gynecol Obstet Invest* 2010; **70**:244-9.
13. Dechen TC, Sumit K, Ranabir P. Correlates of vaginal colonization with group B streptococci among pregnant women. *J Global Infect Dis* 2010; **2**: 236-41.
14. Ali HHM. The bacterial causative agents of aerobic vaginitis in sexually active nonpregnant women and their antibiotic sensitivity pattern. *Wasit Journal for Science & Medicine* 2010; **3**(2):48-59.
15. Tariq N, Jaffery T, Ayub R, Alam AY, Javid MH, Shafique S. Frequency and antimicrobial susceptibility of aerobic bacterial vaginal isolates. *J Coll Physicians Surg Pak* 2006; **16**(3):196-9.
16. Fan A, Yue Y, Geng N, Zhang H, Wang Y, Xue F. Aerobic vaginitis and mixed infections: Comparison of clinical and laboratory findings. *Arch Gynecol Obstet* 2013; **287**:329–35.
17. Ling C, Wang JiaYi. The vaginal micro-flora of aerobic vaginitis and bacterial Vaginosis. *Zhongguo Weishengtaxixue Zazhi / Chinese Journal of Microecology* 2009; **21**(12):1107-9.