

Microbial Profile of High Vaginal swab from Women of Reproductive Age Group in a Tertiary Care Hospital - A Cross-sectional Study

Beena Jha¹, Manisha Sharma¹, Chandra Prakash Bhatt², Susmita Neupane³

¹ Associate Professor,

² Professor,

³ Resident,

All from Department of Microbiology, Kathmandu Medical College and Teaching Hospital, Sinamangal, Kathmandu, Nepal

Corresponding Author

Dr Beena Jha,
Associate Professor
Department of Microbiology,
Kathmandu Medical College and Teaching
Hospital,
Sinamangal,
Kathmandu,
Nepal
Email: drbeenajha@gmail.com

Keywords

Antibiotics; Escherechia coli; Lactobacillus;
Pelvic inflammatory disease (PID)

Online Access



DOI: 10.64556/mjsbh.v24i2.632

Date of Submission - 2025 Sep 16

Date of Acceptance - 2025 Nov 23

Abstract

Introduction: Vaginal infections can be caused by staphylococcus aureus, enterococcus species, beta haemolytic streptococcus, neisseria species, escherechia coli, klebsiella species and candida species. If untreated they can lead to pelvic inflammatory disease (PID), which can cause long-term sequelae, such as tubal infertility, ectopic pregnancy, reproductive dysfunction and adverse pregnancy outcomes. Thus, the aim of this study is to identify organism causing vaginal infections among the women of child bearing age.

Methods: A prospective cross-sectional study was conducted in the Department of Microbiology at Kathmandu Medical College and Teaching Hospital, Kathmandu, Nepal. Two vaginal specimens were collected. Direct Gram staining and bacteriological cultures were carried out for all specimens. The antibiotic sensitivity of aerobic bacterial isolates was performed. Statistical package for the social sciences (SPSS) version 20.0 was used to analyse the data.

Results: Out of 80 vaginal swab culture, 11 (13.75%) showed pathogenic growth, whereas 69 (86.25%) showed normal vaginal flora. Escherechia coli was the most prevalent vaginal pathogen i.e. 81.81% followed by klebsiella pneumoniae and pseudomonas aruginosa. All the organisms isolated were 100% sensitive to tigecycline, polymyxin B, amikacin and piperacillin / tazobactam.

Conclusions: E. coli was the most prevalent vaginal pathogen followed by klebsiella pneumoniae and pseudomonas aruginosa. Maximum number of aerobic vaginitis (AV) were from the age group of 26 - 30 yrs. In our study pathogenic bacteria were found more frequently isolated than candida. Therefore, practice of empirical antifungal therapy without taking high vaginal swab needs to be revised. The use of appropriate antibiotics along with antifungal drugs may be beneficial.

© The Author(s) 2025. This work is licensed under a Creative Commons Attribution 4.0 International License. (CC BY-NC)



INTRODUCTION

Lactobacillus is the most common commensal in the vagina. This bacillus maintains the acidic pH of vagina.¹ The normal vaginal pH of women of reproductive age group is acidic (≤ 4.5) which gives protection to the vaginal mucosa. Along with lower pH lactobacilli also produce hydrogen peroxide to show bacterial antagonism

properly. Many other microorganisms may be present in lower concentrations include Staphylococcus aureus, enterococcus species, beta haemolytic streptococcus, neisseria species, escherechia coli, klebsiella species and candida species.²

Vaginal infections with bacterial vaginosis, candidiasis and

trichomoniasis are a global health problem for women³ and are responsible for majority of vaginal infections in women of reproductive age.⁴⁻⁵ Abnormal vaginal discharge, itching, burning sensation, irritation and discomfort are frequent complaints among patients attending obstetrics and gynecology clinics. Candida vaginitis is one of the most frequent infections in women of reproductive age.

Vaginal infections are associated with a significant risk of morbidity in women. If untreated they can lead to pelvic inflammatory disease, which can cause long-term sequelae, such as tubal infertility, ectopic pregnancy, reproductive dysfunction and adverse pregnancy outcomes. Thus, the present study has been conceptualized to identify organism causing vaginal infections among the women of child bearing age which would help the clinicians to better manage such cases.

METHODS

This is a cross-sectional study was conducted in the Department of Microbiology at Kathmandu Medical College and Teaching Hospital, Sinamangal, Kathmandu, Nepal from 15th January 2025 to 14th March 2025. This is a tertiary care hospital, which is one of the teaching hospitals located in Kathmandu, Nepal. The study was initiated after receiving ethical clearance from Institutional Review Committee (IRC) of Kathmandu Medical College and Teaching Hospital (Ref. no 25222024/11). Study population included the patients with complaints of vaginal discharge who consented to be the part of the study. Two vaginal specimens were collected aseptically from study participants using sterile cotton swab with experienced nurses. The swabs were immediately dipped into a sterile tube containing two drops of sterile physiological saline and taken to the Microbiology Laboratory without any delay. Direct Gram staining and bacteriological cultures were carried out for all specimens. Gram-stained smears were prepared from vaginal swabs and examined under oil immersion at $\times 1000$ magnification to look for clue cells, budding yeasts, granulocytes and other gram-negative organisms. The second swab was inoculated into McConkey's agar, blood agar and chocolate agar. The aerobically incubated bacterial growth was identified by standard biochemical reactions. The antibiotic sensitivity of aerobic bacterial isolates was performed by Kirby Bauer disc diffusion technique as per the CLSI guidelines 2024.⁶

RESULTS

The study population included 80 women of child bearing age attending the Obstetrics and Gynaecology Department were included in the study. The women who were being evaluated for vaginitis were included.

The vaginal swabs were collected from the Obstetrics and Gynaecology Department and transferred to the Microbiology Departmental laboratory for cultures. Out of 80 vaginal swab culture, 11 (13.75%) showed growth, whereas 69 (86.25%) showed normal vaginal flora i.e. with gardenella morphotype, gram negative curved rods, fusiforms and lactobacilli were absent / present in low numbers (1-2+).

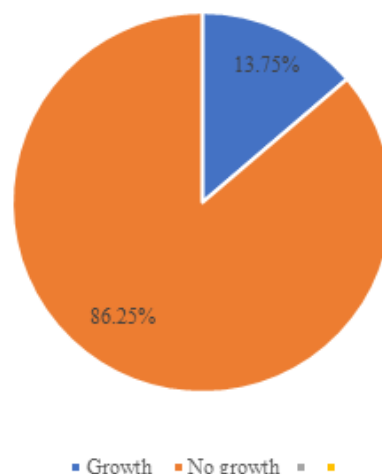


Fig 1: Prevalence of infection in HVS

Escherichia coli was the commonest organism isolated i.e. 9 (81.81%), followed by *klebsiella pneumoniae* 1 (9%) and *pseudomonas aeruginosa* 1 (9%).

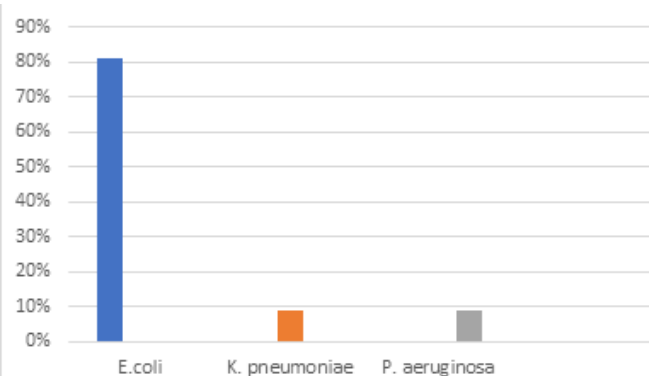


Fig 2: Organism wise distribution in percentage

The women included in this study were from reproductive age group i.e. between 15 - 45 years. Maximum number of aerobic vaginitis were in the age group of 26 - 30 years with 54% followed by female of age group 31 - 35 years with 36% and 41 - 50 years with 9.00%.

Table 1: Age wise distribution of culture positive

Age group (in years)	No. of positive cases (N = 11)	%
15 - 20	0	0
21 - 25	0	0
26 - 30	6	54
31 - 35	4	36
36 - 40	0	0
41 - 50	1	9

Table 2: Antibiotic sensitivity pattern

Escherechia coli										
S. N	TGC	PB	AK	MRP	PIT	CFM	CIP	CTR	AZM	AMC
1.	S	S	S	S	S	R	R	R	R	R
2.	S	S	S	S	R	R	R	R	R	R
3.	S	S	S	S	S	R	R	R	R	S
4.	S	S	S	S	S	R	S	R	R	S
5.	S	S	S	S	S	S	S	R	R	S
6.	S	S	S	S	S	R	S	S	R	S
7.	S	S	S	S	S	R	S	R	R	R
8.	S	S	S	S	S	R	S	R	R	R
9.	S	S	S	S	S	S	S	S	R	S
Klebsiella pneumoniae										
1.	S	S	S	S	S	S	S	S	R	S
Pseudomonas aeruginosa										
1.	S	S	S	S	S	R (CAC)	S	R (CAZ)		

TGC-Tigecycline, PB- Polymyxin B, AK- Amikacin, MRP- Meropenem, PIT- Piperacilin/Tazobactam, CFM - Cefixime, CIP- Ciprofloxacin, CTR- Ceftriaxone, AZM- Azithromycin, AMC- Amoxycylav, CAC- Ceftazidime Clavunic acid, CAZ- Ceftazidime

DISCUSSION

The microbial flora of vagina plays a crucial role in the prevention of any vaginal infection in women. Lactobacillus is mainly responsible for maintaining the acidic vaginal pH (< 4.5) and thereby preventing the multiplication of potentially pathogenic microorganisms.¹ The unhealthy vaginal environment can be described as an imbalance in the vaginal bacterial ecosystem.⁷

In this cross sectional study, we had performed culture of high vaginal swab in women of reproductive age. Our study showed 13.75% of culture positivity which simulates to the study done in Nepal by Sharma J et al i.e. 22 (19.66%) and Anna Cherlan et al i.e 18%.⁸⁻⁹ In contrast to our study, a higher rate of organisms growth was shown by study done by Gopal Kumar et al (46.5%) and Manoj et al (27.16%).^{10,11} This discrepancies among growth rates could

be explained by the different set ups and different places where the studies have been conducted.

Escherechia coli was the most prevalent vaginal pathogen i.e. 81.81% followed by klebsiella pneumoniae and psuedononas aruginosa which is similar to the study done by Sharma J where the higher prevalence of escherechia coli (52.17%) was found. Comparable results were seen in a study done by Jahic et al, Li N et al and Geetanjali et al in different regions of the world.¹²⁻¹⁴ The higher prevalence of this organism could be correlated with hygiene. As this organism is a normal commensal organism of the gastrointestinal tract, this organism would show higher prevalence among women who have poor personal hygiene. The closer proximity of the female genital tract and the anal opening makes it easy for these organisms to spread to the genitourinary tract with sexual intercourse, facilitating this transmission.

Escherichia coli which has a strong association with preterm delivery as well as very low birth weight infants. This organism is also notorious for causing neonatal diseases such as neonatal sepsis, meningitis as well. During passage through the birth canal, *Escherichia coli* can invade the chorioamnion or amniotic fluid and can lead to complications in the neonate.⁹ But there are many other studies which have reported *Staphylococcus*, *Enterococcus* and *Klebsiella* as the most common organisms isolated as in Bitew A et al and Mulu W et al.¹⁵⁻¹⁶ This difference in organisms could also be explained by the different regions and the different study set ups where the researches have been conducted.

Maximum number of aerobic vaginitis were in the age group of 26 - 30 years (54%) followed by female of age group 31 - 35 years (36%). This could be explained by the fact that married women are more likely to have more aerobic organisms.

The present study showed that all the organisms isolated were 100% sensitive to tigecycline, polymyxin B, amikacin and piperacillin / tazobactam. However, *Escherichia coli* and *Klebsiella pneumoniae* were 100% resistant to azithromycin. For *Escherichia coli*, the highest resistance rates were recorded (100%) with azithromycin, cefixime, ceftriaxone (22.22%), followed by amoxycylav. Furthermore, the lowest resistance rates (11.11%) were recorded with piperacillin / tazobactam ampicillin followed by ciprofloxacin. In *Klebsiella pneumoniae*, the highest resistance rates (100%) were recorded with azithromycin, and was sensitive to all other antibiotics used. Similarly, for *Pseudomonas aeruginosa* highest resistance rates (100%) were recorded with ceftazidime and ceftazidime / clavulanic acid and were (100%) sensitive to polymyxin B, amikacin, meropenem, piperacillin / tazobactam and ciprofloxacin. This could be showing the rising and changing trend of antibiotic microbial resistance among different pathogenic organisms.

Bacterial vaginosis has yet to be shown as an independent risk factor for pelvic inflammatory disease, infertility and miscarriage in the absence of sexually transmitted infections.¹⁷ It is strongly recommended to investigate for culture and sensitivity to choose proper antibiotic and treat effectively. The resistance bugs are in rise in many communities and the relapses are common in bacterial vaginosis, so it is better to track the pathogen by utilizing the laboratory services and start antibiotics after choosing suitable drug. In our studies pathogenic bacteria were found more frequently than candida. Therefore, practice of empirical antifungal therapy without taking high vaginal swab needs to be revised.

Although this is a small sample cross sectional study involving a small number of women from a single centre, the results of this research may not be easily generalized. The significance of the growth of these organisms could not be fully analysed. We did not follow up whether these women may have led to preterm deliveries or neonatal sepsis in the future. For long term implications, further larger, multicentric, prospective studies would be warranted in the future.

CONCLUSIONS

Escherichia coli was the most common aerobic organisms causing bacterial vaginosis in women of child bearing age. Most of the vaginitis involved the women of age group of 26 - 30 years. The predominantly organisms were gram negative bacteria. Gram negative organism's susceptibility pattern which we found is that most of the pathogens are 100% sensitive to tigecycline, polymyxin B, amikacin and piperacillin / tazobactam where as *Escherichia coli* and *Klebsiella pneumoniae* were 100% resistant to azithromycin.

ACKNOWLEDGEMENT

The author greatly acknowledge department of Obstetric and Gynaecology Department, Kathmandu Medical College and Teaching Hospital for providing us the sample and the patients who participated in this study.

FUNDING SOURCE: None

CONFLICT OF INTEREST: Not any

REFERENCES

1. Sandhiya R, Lakshmipriya R, and Esthermary. Res J Pharm Biol Chem Sci. 2013;4(4):1262
DOI: [10.9790/0853-1810144549](https://doi.org/10.9790/0853-1810144549)
2. Lakshmi K, Chitralkha S, Illamani V and Menezes GA. Common cause of infectious vaginitis is bacterial vaginosis, vulvovaginal candidiasis and trichomoniasis. Int J Pharm Bio Sci. 2012; 3(4B) 949-56
3. Go VF, Quan VM, Celentano DD, Moulton LH, Zenilman JM. Prevalence and risk factors for reproductive tract infections among women in rural vietnam. Southeast Asian J Trop Med Public Health. 2006;37:185-9
DOI: [10.2188/jea.15.163](https://doi.org/10.2188/jea.15.163)
PMID: 16195636 PMCID: PMC7904302

4. Hacer H, Reyhan B, Sibel Y. To determine of the prevalence of Bacterial Vaginosis, Candida sp, mixed infections (Bacterial Vaginosis+Candida sp), Trichomonas Vaginalis, Actinomyces sp in Turkish women from Ankara, Turkey. *Ginekol Pol.* 2012;83:744-8
PMID: 23383559
5. Spinillo A, Bernuzzi AM, Cevini C, Gulminetti R, Luzzi S, Santolo AD. The relationship of bacterial vaginosis, candida and trichomonas infection to symptomatic vaginitis in postmenopausal women attending a vaginitis clinic. *Maturitas.* 1997;27:253-60
DOI: [10.1016/S0378-5122\(97\)00038-8](https://doi.org/10.1016/S0378-5122(97)00038-8)
PMID: 9288698
6. CLSI. Performance Standards for Antimicrobial Disk Susceptibility Tests. 14th ed. 2024.
7. Verstraelen H, Verhelst R. Bacterial vaginosis: an update on diagnosis and treatment. *Expert Rev Anti Infect Ther.* 2009, 7:1109- 24
DOI: [10.1586/eri.09.87](https://doi.org/10.1586/eri.09.87)
PMID: 19883331
8. Sharma J, Tiwari S, Thapa D, Yadav R. Vaginal Microflora in High Vaginal Swab in Prelabour Rupture of Membrane: A Descriptive Cross-sectional Study. *JNMA J Nepal Med Assoc.* 2024 Jul 31;62(276):532-5
DOI: [10.31729/jnma.8737](https://doi.org/10.31729/jnma.8737)
PMID: 39369392 PMCID: PMC11455651
9. Cherian A, Sasikumar O. Microbial Profile of High Vaginal Swab from Women of Reproductive Age Group in a Tertiary Care Hospital. *Int J Curr Microbiol Appl Sci.* 2017 Jul 10;6(7):4545-9.
DOI: [10.20546/ijcmas.2017.607.338](https://doi.org/10.20546/ijcmas.2017.607.338)
10. 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):2672-3
DOI: [10.21275/sub157190](https://doi.org/10.21275/sub157190)
11. Manoj K, Khushboo K, Ashok KS. Microbiological Profile of High Vaginal Swabs of Symptomatic Women of Reproductive age-group. 2018; Oct 18(10):45-9
DOI: [10.9790/0853-1810144549](https://doi.org/10.9790/0853-1810144549)
12. Jahic M, Mulavdic M, Hadzimehmedovic A, Jahic E. Association between aerobic vaginitis, bacterial vaginosis and squamous intraepithelial lesion of low grade. *Med Arch.* 2013; 67(2):94-6
DOI: [10.5455/medarh.2013.67.94-96](https://doi.org/10.5455/medarh.2013.67.94-96)
PMID: 24341052
13. Li N, Yue Y, Chen Q. Pathogen profile and risk factors of aerobic vaginitis in pregnant women: a retrospective cohort study. 2021 Aug;10(8):8881-8
DOI: [10.21037/apm-21-1710](https://doi.org/10.21037/apm-21-1710)
PMID: 34488375
14. Geetanjali T, Soumya CN, Surekha A, Srilatha BN. Aerobic Gram Negative Bacterial Profile in High Vaginal Swab. *Int J Pharma Clin Res.* 2024; 16(6): 548-53
DOI: [10.5281/zenodo.12733807](https://doi.org/10.5281/zenodo.12733807)
15. Bitew A, Mengist A, Belew H, Aschale Y, Reta A. The prevalence, antibiotic resistance pattern, and associated factors of bacterial vaginosis among women of the reproductive age group from felegehiwot referral hospital. *Ethiopia Infection and Drug Resistance.* 2021; 14:2685
DOI: [10.2147/IDR.S305329](https://doi.org/10.2147/IDR.S305329)
PMID: 34285521 PMCID: PMC8286113
16. Mulu W, Yimer M, Zenebe Y, Abera B. Common causes of vaginal infections and antibiotic susceptibility of aerobic bacterial isolates in women of reproductive age attending at Felegehiwot referral Hospital, Ethiopia: a cross-sectional study. *BMC Women's Health.* 15, ArticleNo.42
DOI: [10.1186/s12905-015-0197-y](https://doi.org/10.1186/s12905-015-0197-y)
PMID: 25968607 PMCID: PMC4438529
17. Masand DL, Patel J, Gupta S. Utility of microbiological profile of symptomatic vaginal discharge in rural women of reproductive age group. *J Clin Diagn Res.* 2015 Mar;9(3):QC04-7
DOI: [10.7860/JCDR/2015/12161.5623](https://doi.org/10.7860/JCDR/2015/12161.5623)
PMID: 25954668 PMCID: PMC4413118