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A study of aerobic bacteriological profile of abnormal vaginal discharge among the women of reproductive age group and anti-bacterial susceptibility patterns in a tertiary care hospital

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Abstract:

Background: Abnormal vaginal discharge is a prevalent gynecological complaint among women of reproductive age, often leading to diagnostic uncertainty. Accurate identification of causative bacterial pathogens and their antibiotic susceptibility is crucial for effective management and prevention of severe complications.
Aim: This study aimed to isolate, identify, and determine the antibacterial susceptibility patterns of aerobic bacterial pathogens causing abnormal vaginal discharge among reproductive-age women attending a tertiary care hospital.
Methods: A prospective study was conducted from January to June 2024 at the Department of Microbiology, GMC & GGH, Ongole. A total of 100 reproductive-age women presenting with abnormal vaginal discharge were included. Two high vaginal swabs were collected from each participant for Gram staining and culture. Isolates were identified using biochemical tests, and antibiotic susceptibility was determined by Kirby-Bauer disc diffusion method.
Results: Out of 100 participants, 73 showed culture positivity. Gram-negative bacilli accounted for 59% of isolates (E. coli 27%, Klebsiella 18%, Pseudomonas 14%), Gram-positive cocci 29% (Staphylococcus aureus 16%, Enterococcus spp. 7%, CONS 5%), and yeast (Candida species) 12%. Gram-negative isolates exhibited highest sensitivity to Meropenem (100%), Piperacillin-Tazobactam (90%), and Amikacin (70-82%). Among Gram-positive isolates, Vancomycin sensitivity was 100%. S. aureus was most sensitive to Azithromycin (83%), whereas Enterococcus spp. showed complete sensitivity to Gentamicin. Extended-spectrum beta-lactamase (ESBL) production was observed in 60% E. coli and 38% Klebsiella isolates. Methicillin-resistant strains constituted 33% of S. aureus and 100% of CONS isolates.
Conclusion: The study identified E. coli, Klebsiella, and S. aureus as predominant pathogens associated with abnormal vaginal discharge. High sensitivity to Meropenem and Vancomycin highlights their potential therapeutic roles. Regular monitoring of antimicrobial resistance, especially ESBL and MRSA prevalence, is essential for effective clinical management and reducing complications.

Keywords:

Abnormal Vaginal Discharge, Aerobic Bacteria, Antibiotic Susceptibility, Kirby-Bauer Method, ESBL, MRSA

Introduction

Abnormal vaginal discharge is the most prevalent gynaecological problem seen by primary care clinicians, in which the possibility of misdiagnosis remains high. Vaginal discharge can be physiological or pathological. (1)
Normal physiological discharge changes during the menstrual cycle which is clear during ovulation and may be thicker during luteal phase. Vaginal discharge may be increased with higher oestrogen states, including ovulation, the luteal phase, puberty, and pregnancy, as well as with oestrogen-based therapies such as combined hormonal contraception and hormone replacement therapy. (2)
Abnormal vaginal discharge is characterised by change in colour, consistency, volume or odour, and may be associated with symptoms such as itching, soreness, dysuria, pelvic pain, intermenstrual bleeding or postcoital bleeding. (3)
There are multiple causes for abnormal vaginal discharge, including 1) Infective: Bacterial vaginosis, Vaginal candidiasis, genital herpes, HPV infection, and Cervicitis caused by Chlamydial infection, Gonorrhoea, Syphilis, HIV. 2) Atrophic: Postmenopausal due to oestrogen deficiency. 3) Chemical: Chemical irritation or allergy 4) Neoplastic: Fibroid polyp or malignancy. (4)
7–72% of women suffering from vaginitis may not get a diagnosis and it has been referred to as "intermediate flora" and its treatment is different from that of bacterial vaginosis and it is known as "aerobic vaginitis." (5) For pregnant women who are at risk of preterm birth, it is extremely important to diagnose and treat as early as possible. It may also lead to various complications like infertility, miscarriage, preterm delivery and so many other consequences. Taking all these into consideration, the present study was conducted to isolate the bacterial pathogens causing abnormal vaginal discharge and their antibacterial susceptibility patterns to prevent adverse outcomes of a women of reproductive age group

AIM

To isolate and identify the aerobic bacteriological profile of abnormal vaginal discharge among reproductive age group and their antibacterial susceptibility patterns.

OBJECTIVES

1. To isolate and identify the aerobic bacterial organisms causing abnormal vaginal discharge among reproductive age groups.
2. To determine the antibacterial susceptibility patterns among the isolates by Kirby-Bauer disc diffusion method

MATERIALS AND METHODS

It was a Prospective study done for a period of 6months (January2024-June2024) in Department of Microbiology, GMC & GGH, Ongole with Sample size – 100 and collected 2 high vaginal swabs / each patient for Gram staining and culture.

INCLUSION CRITERIA

- Women of child bearing age group having complaints of abnormal discharge per vagina, itching, abdominal or low back pain, pruritus, dysuria, intermenstrual bleeding and post coital bleeding.
- Women with Informed consent.

EXCLUSION CRITERIA

- Pregnancy and menstruating women.
- Patients on antibiotic treatment.
- Patients not given Informed consent.

METHODOLOGY

The present study was conducted with sample size of 100 patients complaining of abnormal vaginal discharge. 200 clinical samples (2 high vaginal swabs/ each patient) were collected and processed in the Department of Microbiology, GMC, Ongole after obtaining acceptance from Institutional Ethical Committee, and informed consent from the patients. Detailed history was obtained like age, marital

status, pregnancy, methods of contraception and complaints like type of vaginal discharge, colour, consistency, and associated complaints. Two high vaginal swabs were collected from each patient, one for Gram stain and second for culture and the specimens were processed according to the Standard microbiological procedures.

A smear was prepared on clean glass slide and stained by Gram staining technique. The smear was examined under 100X oil immersion for Lactobacilli, Clue cells, polymorphs, Gram positive budding yeast cells and any other organisms.

The specimens were inoculated on Nutrient agar, blood agar and MacConkey agar plates and incubated aerobically at 37° C for 24 hours. Lactose fermenting (LF) mucoid colonies, small dry LF colonies, non-lactose fermenting (NLF) colonies with metallic Sheen on MacConkey agar were seen. Greenish pigmented colonies and golden yellow pigmented colonies with well-defined colony morphology on Nutrient agar were observed. Beta haemolysis and hemodigestion was observed on Blood agar.

Specific identification of each bacterial isolate was done by using different biochemical reactions which includes Indole, Simmon's Citrate, Urease, Triple sugar Iron test, Oxidase, MR-VP and other reactions as per standard laboratory guidelines. Antimicrobial susceptibility testing was done for all bacterial isolates by modified Kirby Bauer disk diffusion method

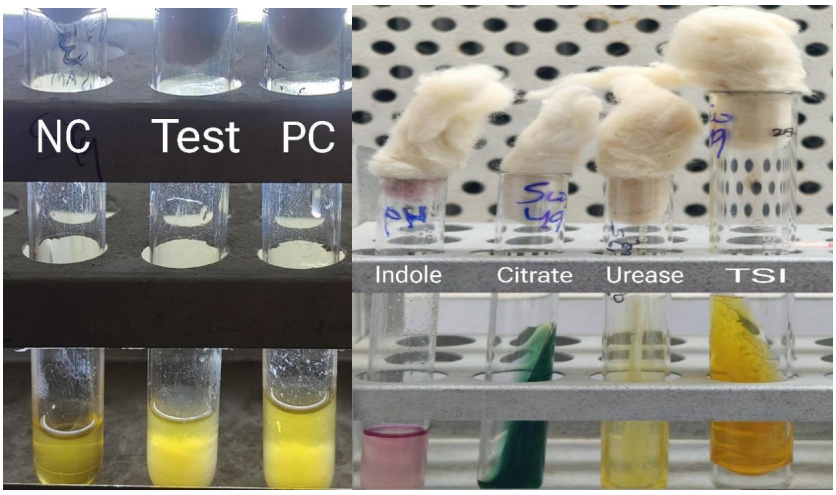
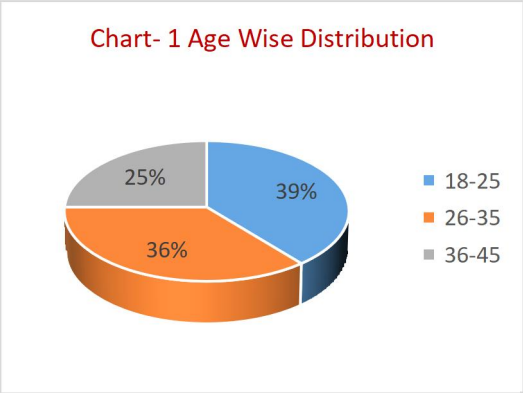


Figure- *Positive Tube coagulase for S.aureus and Biochemical tests for E .coli*

RESULTS

A total of 100 patients of the reproductive age group were evaluated during a period of six months.39% of the women belongs to the age group of 18-25 years age, 36% of the women 26-35 years and 25% of 36-45 years of age. Chart-1 shows the age wise distribution among the women included in the study. The most common associated symptom was itching seen in 65 (65%) cases, followed by pain abdomen seen in 43 (43%) and dysuria in 25(25%). Less common complaint was backache seen in 10 (10%) cases which are depicted in chart 2.



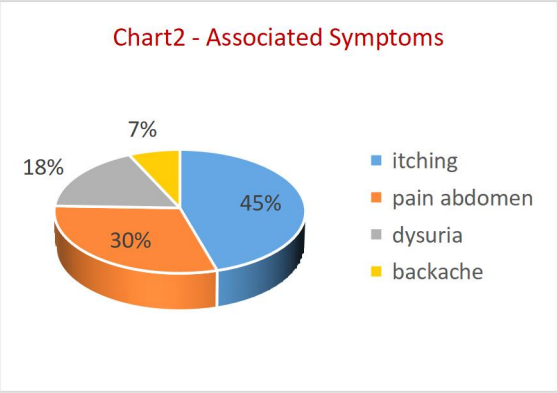
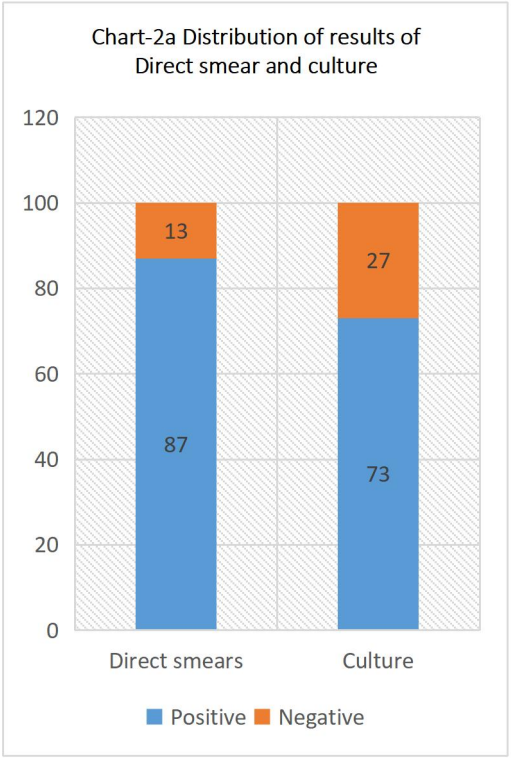


Table- 1 and chart-2a is showing the distribution of results of the Direct smears and culture. and Table- 2 and chart 2b is showing the distribution of Gram positive and Gram-negative organisms in direct smears and positive cultures.

Table-1 Distribution of results of Direct smears and Culture			
Nature of the test	Positive	Negative	Total Count
Direct Smear	87	13	100
Culture	73	27	100



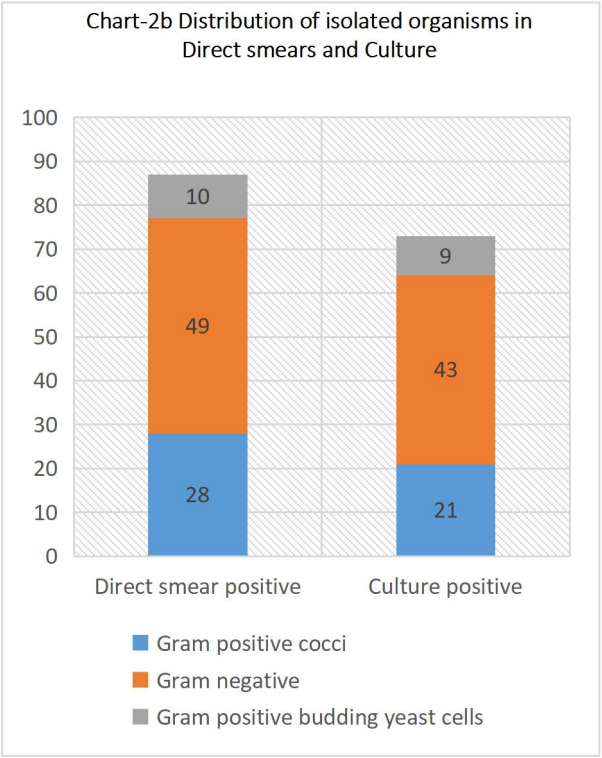
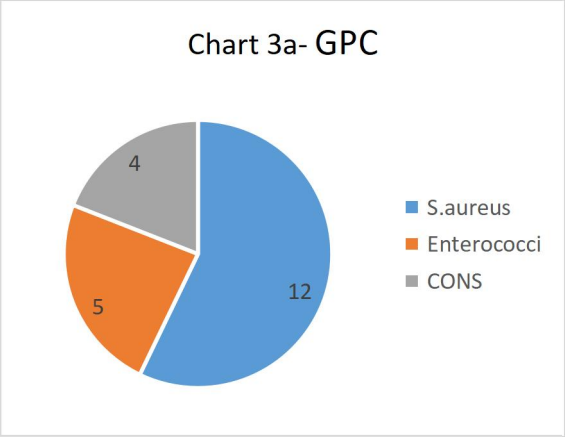


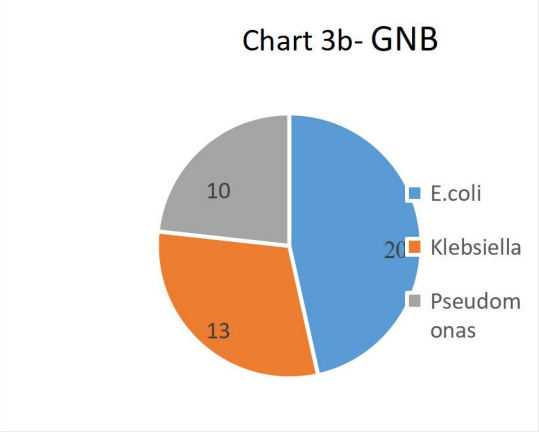
Table-2 Distribution of isolated organisms in Direct smears and Culture

Nature of the test	Gram-Positive Cocci	Gram-Negative Bacilli	Gram positive budding yeast cells	Total Count
Direct Smear Positive	28	49	10	87
Culture Positive	21	43	9	73

Out of 100 cultures, 73 were culture positive. Out of 73, 43(59%) were Gram negative bacilli. (E. coli-20, Klebsiella- 13, Pseudomonas-10), 21(29%) were Gram positive arranged in singles, pairs and clusters. (12-Staphylococcus aureus, 5-Enterococci, 4- CONS) and 9 (12%)- were candida species. Table -3 shows the organism isolated in the culture. Chart 3a and 3b are the graphs showing the distribution of Gram positive and Gram-negative organisms.

Table-3 Organisms isolated in culture			
S.No	Name of the isolate		Number
1.	Gram negative bacilli	E.coli	20
2.		Klebsiella	13
3.		Pseudomonas	10
4.	Gram Positive cocci	Staphylococcus aureus	12
5.		Enterococcus sps	5
6.		CONS	4
7.	Gram positive budding yeast cells		9





All the isolated E. coli (20), Klebsiella (13) and Pseudomonas (10) showed sensitivity to Meropenem (100%). E. coli showed sensitivity to Piperacillin tazobactam (90%) followed by Amikacin (80%). Klebsiella were sensitive to Piperacillin tazobactam (90%) followed by Amikacin (82%) and Gentamicin (62%). Pseudomonas showed sensitivity to piperacillin tazobactam (90%) followed by Amikacin (70%) and Gentamicin (70%), Chart-4 shows the antibacterial susceptibility patterns of Gram-negative organisms.

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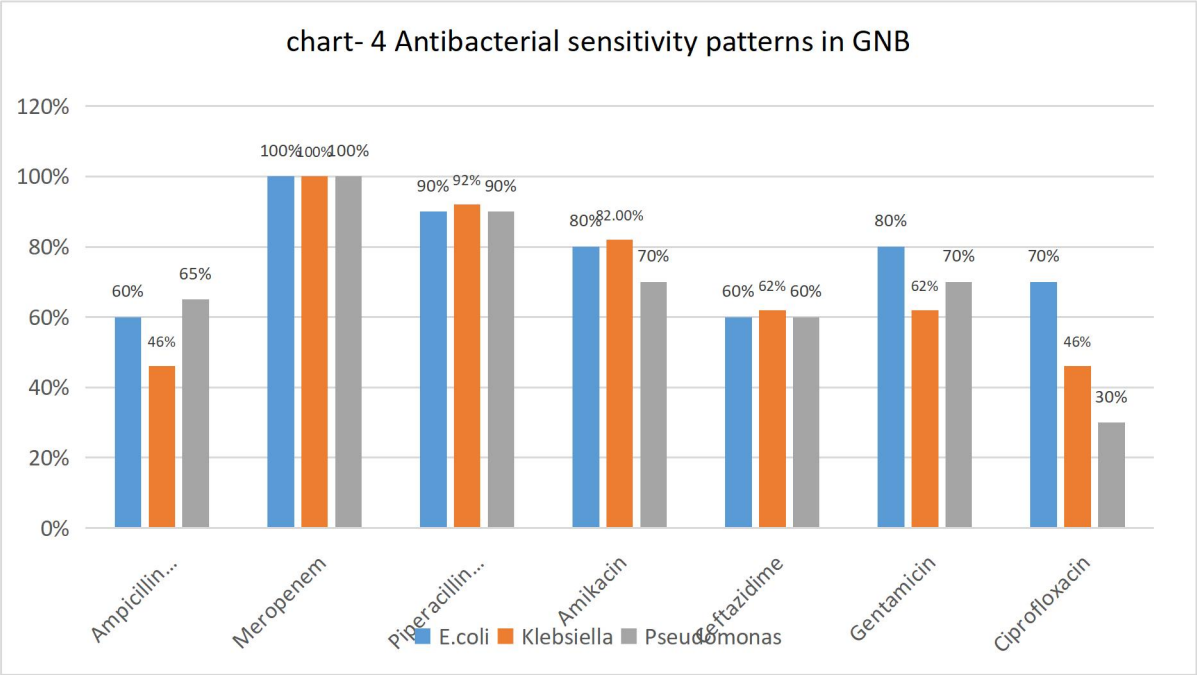
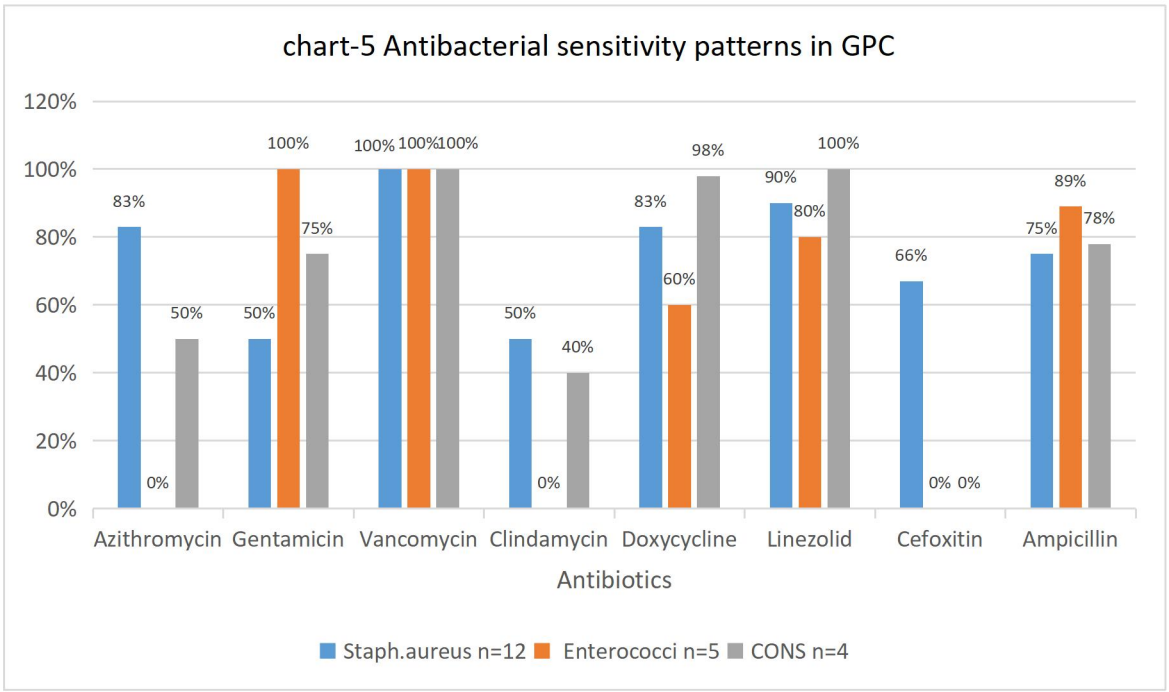


In present study, all the three isolated Gram-positive organisms were sensitive to vancomycin (100%). S.aureus were most sensitive to Azithromycin (83%), followed by cefoxitin (66%) and least sensitive to clindamycin (50%). CONS were most sensitive to Doxycycline (98%). Enterococcus spp. were most sensitive to Gentamicin (100%) followed by ampicillin (89%). Chart-5 shows the antibacterial sensitivity patterns of Gram- Positive organisms.



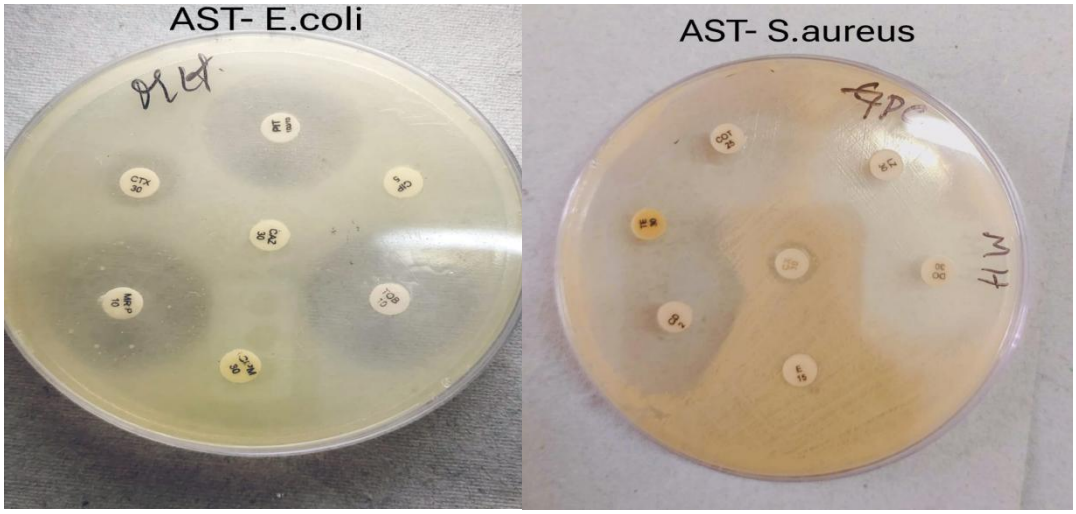
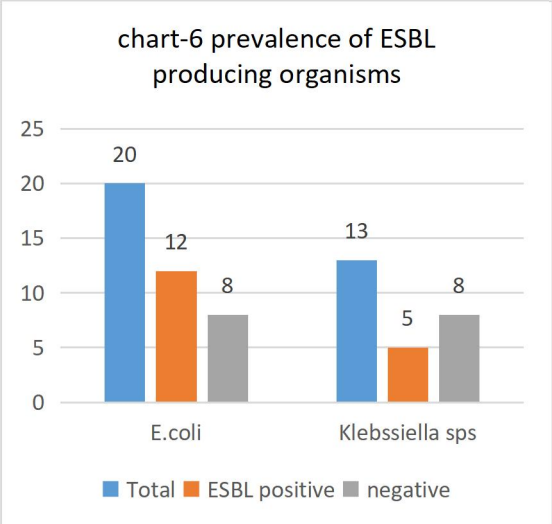
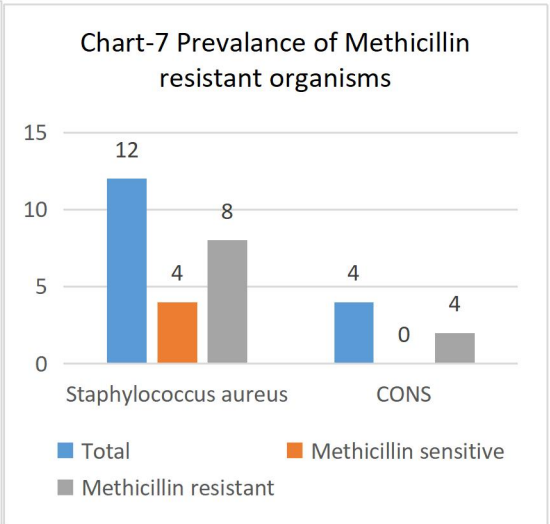


Figure – Antibacterial susceptibility testing by Kirby Bauer disk diffusion method.

In present study, all isolates of E. coli (20), Klebsiella sp. (13) were tested for ESBL production, 5 (38%) Klebsiella sp and 12 (60%) E. coli were ESBL producers. In present study, all 12 isolates of S.aureus and 4 CONS isolates were tested for Methicillin resistance. Out of 12 S.aureus, 4(33%) were MRSA and out of 4 CONS, all were MRCONS. Chart 6 and 7 are the graphs showing the prevalance of resistant organisms.





Discussion

The present study aimed to identify aerobic bacterial pathogens associated with abnormal vaginal discharge and their antibiotic susceptibility patterns, comparing the results with previous literature.

In our study, Escherichia coli showed maximum sensitivity to Meropenem (100%), Piperacillin-Tazobactam (90%), and Amikacin (80%), with

lowest sensitivity to Cotrimoxazole (30%). This aligns closely with Mumtaz S et al. (8), who also reported comparable patterns. Klebsiella spp. exhibited maximum sensitivity to Meropenem (100%) and Piperacillin-Tazobactam (92%), moderate sensitivity to Ciprofloxacin (46%), and least sensitivity to Cotrimoxazole (30.7%), which closely corresponds to findings by Sangheeta K et al. (9). Similarly, Kareem Raheem and Abdulhamid Said (11) noted high sensitivities to Meropenem and Piperacillin-Tazobactam in Klebsiella isolates, further supporting our observations. Pseudomonas spp. showed 100% sensitivity to Meropenem and high sensitivity to Piperacillin-Tazobactam (90%), while sensitivity to Gentamicin was moderate (70%) and lowest for Ciprofloxacin (30%). These findings are consistent with observations by Mumtaz S et al. (8).

Among Gram-positive isolates, Staphylococcus aureus demonstrated complete sensitivity to Vancomycin (100%), consistent with findings from Mumtaz S et al. (8), who reported 93.6% sensitivity to Vancomycin. Linezolid also showed high sensitivity (90%), suggesting its potential utility. Enterococcus spp. isolates were fully sensitive to Vancomycin and Gentamicin (100%), while exhibiting low sensitivity to Cotrimoxazole (12.5%), paralleling the results observed by Mumtaz et al. (8). Coagulase-negative Staphylococci (CONS) showed full sensitivity to Vancomycin and Linezolid (100%), but low sensitivity to Clindamycin (40%), supported by comparable results from Mumtaz S et al. (8).

Studies from Ethiopia by Mulu et al. (12) and Bitew et al. (14), and Uganda by Ahabwe et al. (10) reinforce the significance of frequent antibiotic resistance monitoring. Bhavana et al. (13) from India also reported antibiotic susceptibility patterns similar to our findings, emphasizing the consistency in antibiotic resistance patterns across geographical locations.

Therefore, Meropenem, Vancomycin, and Piperacillin-Tazobactam remain highly effective antibiotics against aerobic pathogens causing abnormal vaginal discharge. Regular surveillance of antibiotic susceptibility patterns remains crucial for optimal management and preventing adverse outcomes in women of reproductive age.

Conclusion

Abnormal vaginal discharge remains a significant clinical concern among women of reproductive age, contributing to increased morbidity, mortality, and adverse pregnancy outcomes. The emergence of multidrug-resistant (MDR) strains complicates the treatment of bacterial vaginosis, underscoring the necessity for precise microbiological diagnosis and antibiotic susceptibility testing. The present study highlights the importance of routine microbiological examination and antimicrobial susceptibility profiling to ensure prompt and effective therapy. Such an approach not only facilitates appropriate patient management but also mitigates the risk of developing antimicrobial resistance (AMR) associated with irrational and inappropriate antibiotic use.

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