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Aerobic Bacterial Isolates and their Changing Trend of Antimicrobial Resistance in Sterile Body Fluids: A Retrospective Study in Tertiary Care Hospital of Sub- Himalayan Region

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Abstract:-

- ***Introduction:***

Sterile body sites are those in which no bacteria or microbes exist as commensals when in a healthy state. These can be either pathological agents or contaminants from the skin. Microorganisms can invade sterile body sites, causing serious invasive diseases. These infections lead to serious life threatening conditions, therefore early detection and appropriate antibiotic therapy is crucial.

- ***Aims and objectives:***

To study aerobic bacterial isolates and their resistance pattern in our region.

- ***Material and Methods:***

Study area: Department of Microbiology Dr. RPGMC Kangra at Tanda (H.P)

- ***Study design and period:***

The study is comparative, retrospective analysis of Microbiology profile and antibiotic resistance pattern of sterile body fluids, over a period of 6 years i.e August 2016 to July 2022.

- ***Results:***

- **A total of 1954 clinical samples were obtained, out of which 450 (23%) samples were positive for bacterial growth. Male to female ratio in Aug 16- July 19 was 1.4:1 and Aug 17 – July 22 was 2.05: 1.**
- **Gram positive organisms, declined from 44% to 24.59%.In contrast to Gram negative organisms, this had up surged from 56% to 75.4%.**
- **For Gram negative bacteria, increased resistance was observed from imipenem from 12 % to 34.7% and amikacin from 27% to 40.2%.**

- ***Conclusion:***

- **In Gram negative organism resistance for imipenem and amikacin had significantly increased.**

I. INTRODUCTION

Sterile body sites are those in which no bacteria or microbes exist as commensals when in a healthy state. These can be either pathological agents or contaminants from the skin. Microorganisms can invade sterile body sites, causing serious invasive diseases. These infections lead to serious life threatening conditions, therefore early detection and appropriate antibiotic therapy is crucial.[1]

Positive cultures are expected to be low because of less number of pathogens as well as prior administration of empirical antibiotics.[2]

Data on antimicrobial susceptibility tests of the organisms isolated from sterile body fluid over a period of time can be used to create a local antibiogram. Knowledge on common causative organisms in various sterile body sites and their antimicrobial susceptibility pattern can help in starting appropriate empirical antibiotics.[3] Therefore, the present study was undertaken to evaluate aerobic bacteriological profile and their antimicrobial susceptibility pattern from various sterile fluids in a tertiary care hospital

- *Aims and objectives:*

To study aerobic bacterial isolates and their resistance pattern in our region.

II. MATERIAL AND METHODS

- *Study area:*

Department of Microbiology Dr. RPGMC Kangra at Tanda (H.P)

- *Study design and period:*

The study is comparative, retrospective analysis of Microbiology profile and antibiotic resistance pattern of sterile body fluids (CSF, ascetic fluid, pleural fluid, peritoneal fluid, pericardial fluid, bile fluid and synovial fluids), over a period of 6 years i.e August 2016 to July 2022. All samples were processed as per standard microbiological guidelines. Antimicrobial susceptibility was done by Kirby Bauer Disk Diffusion method, as per CLSI guidelines.

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III. RESULTS

- A total of 1954 clinical samples were obtained, out of which 450 (23%) samples were positive for bacterial growth.
- Maximum samples received were of CSF (51.2%) followed by pleural fluid (30.6%), ascetic fluid (11.8%), joint aspirate (3.4%), bile aspirate (2.14%) and pericardial fluid (0.66%). (Fig 1)

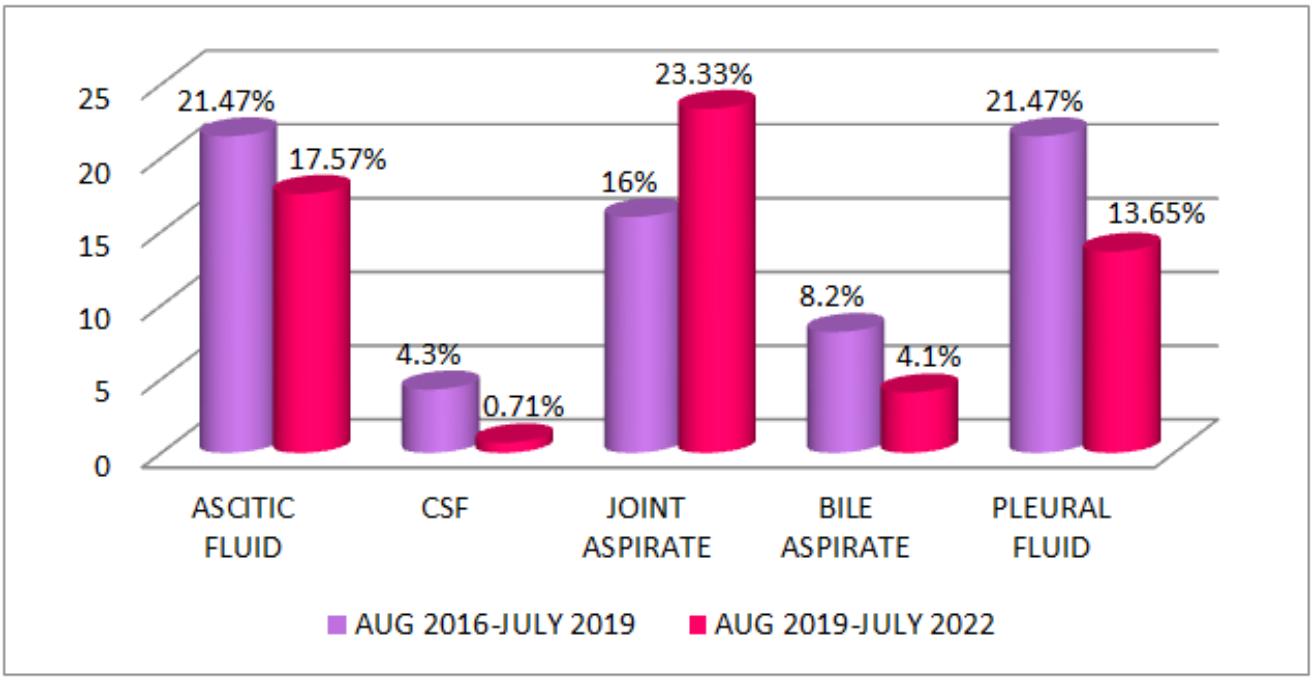

Fig 1 Positive Cultures Among Various Samples

- Male to female ratio in Aug 16- July 19 was 1.4:1 and Aug 17 – July 22 was 2.05: 1. (Fig 2)

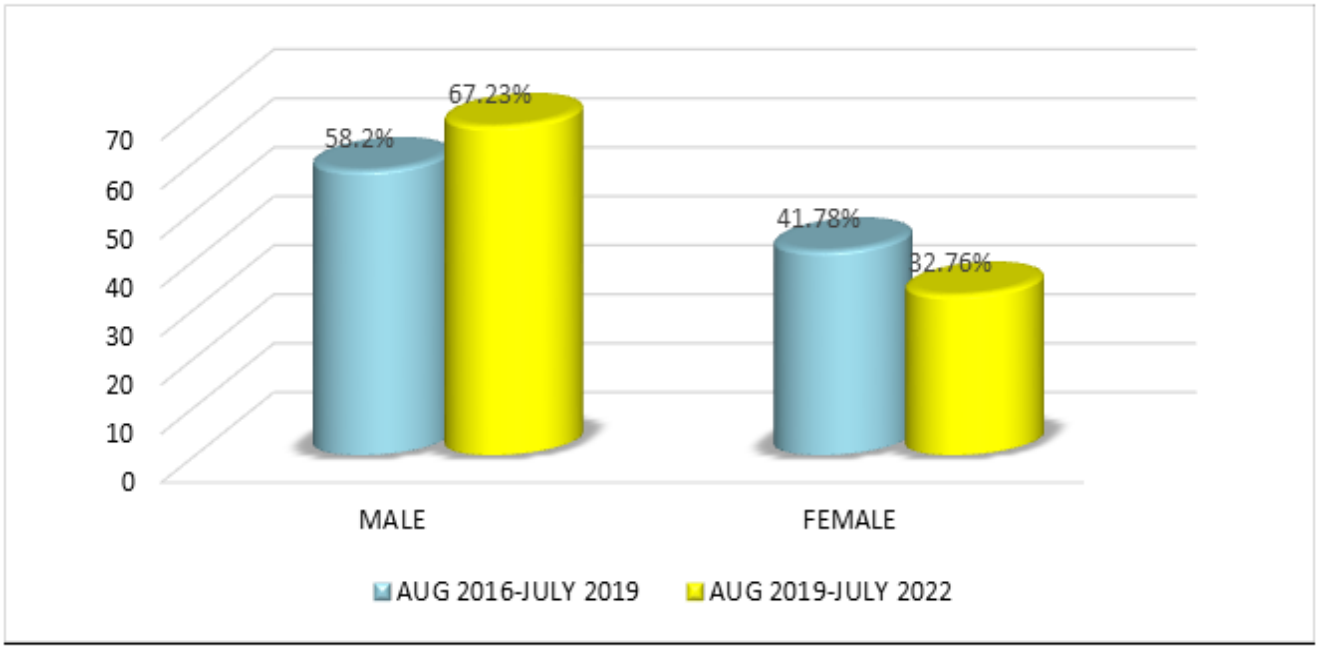

Fig 2 Sex Distribution

- Organisms isolated during the period from Aug 2016 – July 2019 and Aug 2019- July 2022 varied markedly.
- Significant changes were seen in later 3 years (2019- 2022) which included:
- Gram positive organisms, declined from 44% to 24.59%.In contrast to Gram negative organisms, this had up surged from 56% to 75.4%. (Fig 3)

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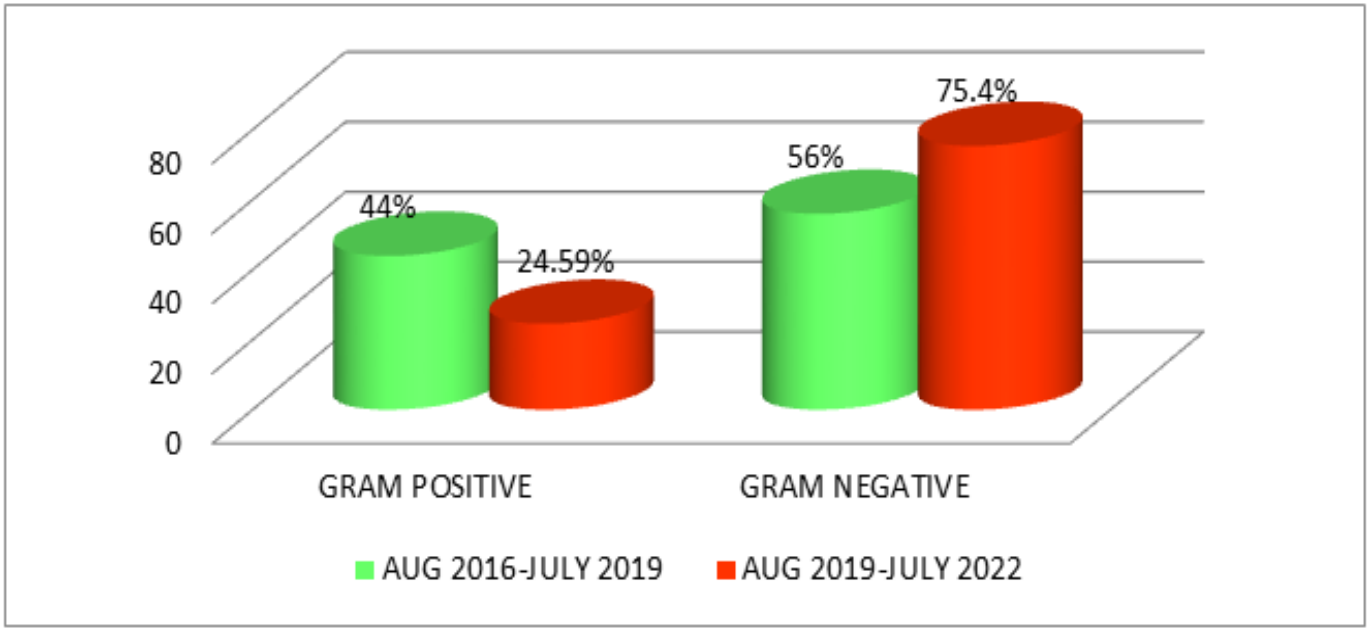

Fig 3 Depiction of Gram Positive and Gram Negative Isolates Obtained after Culture

- Among Gram negative bacteria, significant increase was observed for *Klebsiella* spp., *Pseudomonas* spp. and *Acientobacter* spp. (Fig 4)

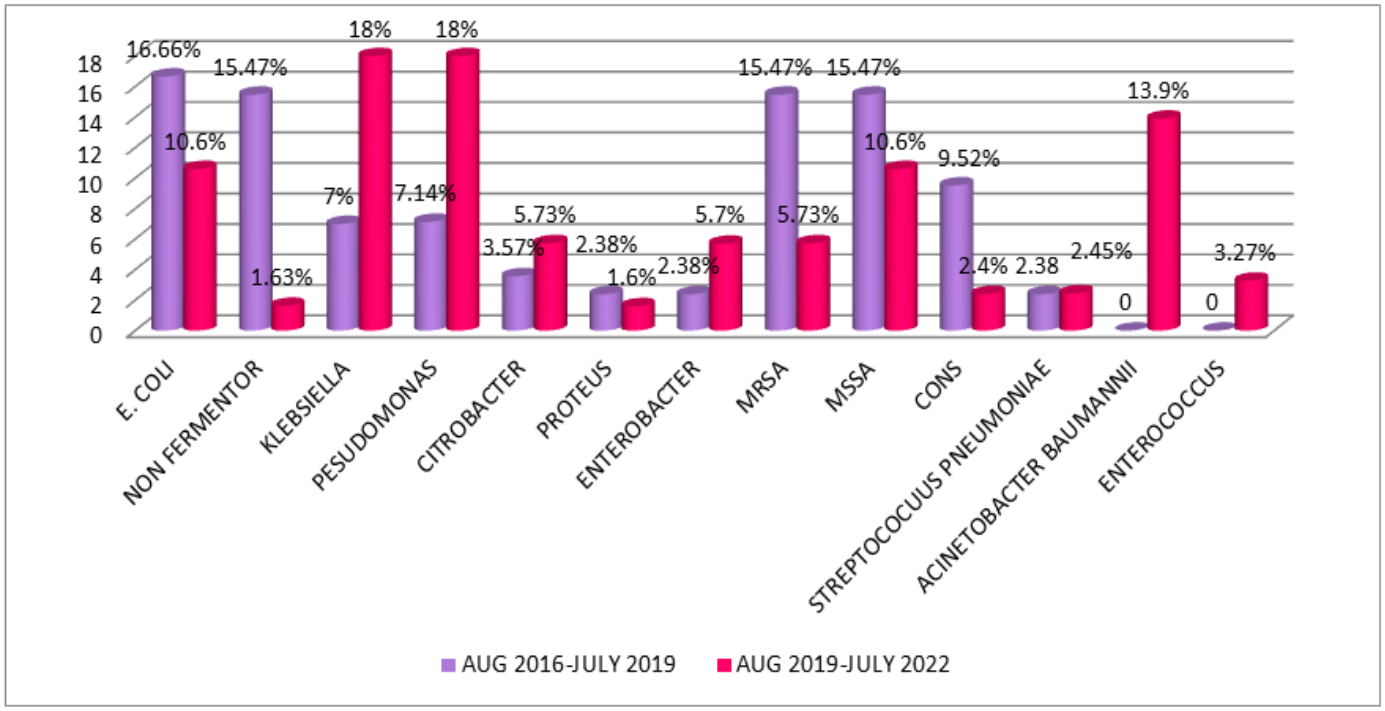

Fig 4 Organisms Isolated from Culture of Sterile Body Fluids

- For Gram negative bacteria, increased resistance was observed from imipenem from 12 % to 34.7% and amikacin from 27% to 40.2%. (Fig 5)

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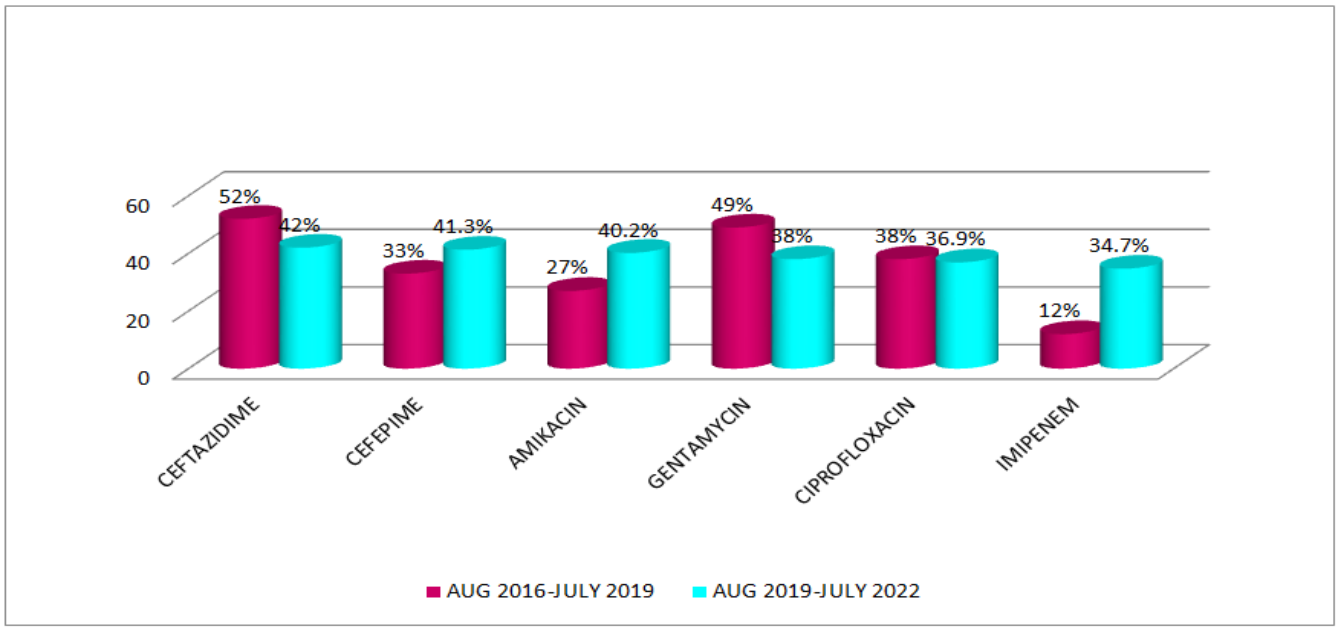

Fig 5 Resistance Pattern of Gram Negative Isolates

- In Gram positive organisms, organisms isolated were MSSA (Methicillin Sensitive *Staphylococcus aureus*), MRSA (Methicillin resistant*Staphylococcus aureus*)and *streptococcus pneumonia*. Increased resistance was observed in penicillin from52% to 63.3%, clindamycin from 20 % to 30% while resistance for cotrimoxazole 40% to 30% was decreased. (Fig 6)

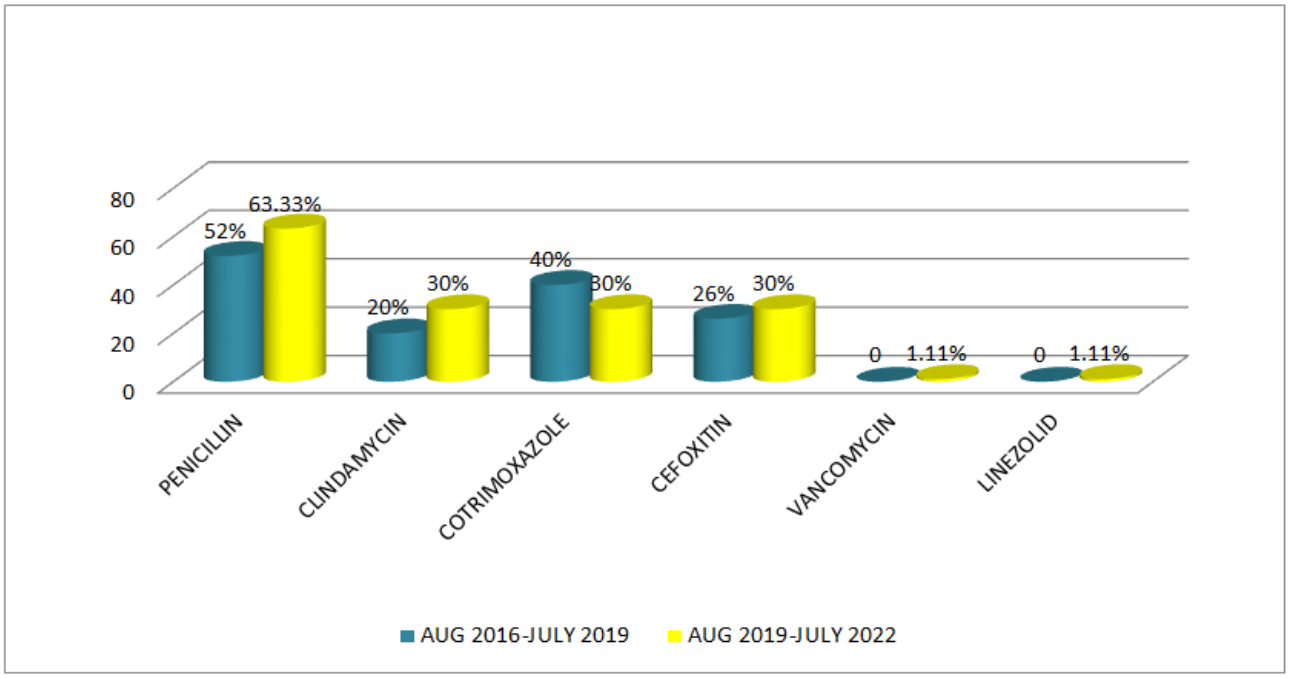

Fig 6 Resistance Pattern of Gram Positive Isolates

IV. DISCUSSION

- Infections of the sterile body sites typically have greater clinical urgency and these infections could be life-threatening. [4,5]
- However, if any of the organisms such as bacteria, fungi, parasites, or viruses are isolated from these sterile fluids, then they are considered as significant and would be life-threatening to the patient, either immune-competent or immuno-compromised.[6,7]
- Moreover, these microorganisms as well as their antimicrobial susceptibility patterns may change every now and then. Therefore, it is important to know the correct identification of the organisms as early as possible and the susceptibility pattern of these organisms to start the patient on targeted antimicrobial therapy immediately.
- A total of 1954 clinical samples were obtained, out of which 450 (23%) samples were positive for bacterial growth.

- In this study 23% samples give culture positive result, which is in comparison to other studies conducted on similar lines, were 31% and 24% positive results.[8,9]
- A total of 1954 clinical samples were obtained, out of which maximum samples received were of CSF (51.2%) followed by pleural fluid (30.6%), ascetic fluid (11.8%), joint aspirate (3.4%), bile aspirate (2.14%) and pericardial fluid (0.66%). In our study, were significant increase was observed for *Klebsiella* spp., *Pseudomonas* spp. and *Acientobacter* spp. In Sujatha et al and Evan et al predominant organisms were*Klebsiella*, *Acinetobacter*and *Pseudomonas aeruginosa.*[8,10]
- In our study,increased resistance was observed from imipenem up to 34.7% and amikacin up to 40.2%. Similar results were seen with Madigubba, et al were amikacin resistance was 59.8%. [11]
- The various factors responsible for differences increased resistance could be geographical variations, variations in treatments followed, infection control practices and patient related factors.[13]
- In Gram positive organisms, increased resistance was observed in penicillin from52% to 63.3%, clindamycin from 20 % to 30% while resistance for cotrimoxazole 40% to 30% was decreased.
- The variation in the distribution of MDR organisms and their AST patterns could be due to different bacterial strains confined to that particular hospital environment, geographical variations, awareness of patients toward antibiotic usage, easy over the counter availability of antibiotics, difference in antimicrobial prescribing policies, different hospital infection control practices, and indiscriminately using antimicrobials consequently resulting in emergence and transmission of resistance against antimicrobials.[14]

V. CONCLUSION

- Gram negative bacteria were observed to be predominant in both 2016- 2019 and 2019- 2022.
- In Gram positive organisms increased resistance to penicillin and clindamycin resistance was observed.
- In Gram negative organism resistance for imipenem and amikacin had significantly increased.
- Regular monitoring of the prevalent pathogenic organisms and their sensitivities aids the clinician's appropriate selection of antibiotic therapy to prevent the development of antimicrobial resistance.

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