RESEARCH PAPER

Antimicrobial Stewardship Program In A Tertiary Care Hospital- Small Steps For A Big Change

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Abstract :
Antimicrobial resistance (AMR) is a growing global concern driven by inappropriate antimicrobial use, leading to increased multidrug-resistant (MDR) organisms. Antimicrobial Stewardship Programs (AMSPs) are essential to optimize antibiotic use and reduce resistance. **Objectives:** To assess the trend of MDR bacteria and evaluate the impact of a policy-driven AMSP in a tertiary care hospital. **Methods**: A retrospective cross-sectional study was conducted from June 2022 to May 2025 in two phases: Phase 1 (policy preparation and restricted use) and Phase 2 (implementation of structured AMSP with audit, feedback, and surveillance). MDR trends were analyzed year-wise and organism-wise. Antibiotic susceptibility testing followed CLSI guidelines. **Results:** MDR cases increased from 342 (2022) to 389 (2023), followed by a decline to 220 (2024) and 105 (2025), showing a 69.3% reduction ($p < 0.001$). Klebsiella spp., Pseudomonas spp., and Escherichia coli showed significant reductions, while Acinetobacter spp. showed a slight increase. **Conclusion:** Structured AMSP implementation significantly reduced MDR burden, highlighting the importance of sustained stewardship and infection control strategies.

Key words: Antimicrobial stewardship, multidrug resistance, antimicrobial resistance, AMSP, infection control, tertiary care hospital, antibiotic policy, surveillance

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INTRODUCTION:

In the era of increasing multidrug-resistant (MDR) bacteria, compounded by excessive and inappropriate use of antimicrobials, antimicrobial resistance (AMR) has emerged as a major public health concern [1,2]. AMR is progressing at a pace faster than the development of new antimicrobial agents, and since the advent of penicillin, many antibiotics have lost their effectiveness in combating microbes due to irrational and unnecessary usage.[3].Antimicrobial Stewardship Programs (AMSPs) act as a checkpoint and play a crucial role in optimizing antimicrobial use and reducing the burden of resistance[4] The decline of MDR bacteria is a critical outcome measure and a key indicator of the effectiveness of AMSPs[5]. Effective stewardship interventions that optimize antibiotic use are directly linked to reduced selection pressure, thereby lowering the incidence of MDR organisms.[6,7]Hence, the present study was undertaken to observe the trend of MDR bacteria over a period of four years (2022–2025). The findings were correlated with the timeline of implementation of various audit-based interventions as part of AMSP. The study reflects the effectiveness of AMSP implementation in our hospital.

AIMS AND OBJECTIVES

- To determine the prevalence of multidrug-resistant bacteria over a period of 3 years.
- To evaluate the impact of a policy-driven Antimicrobial Stewardship Program (AMSP infection control, resistance trends, in a tertiary care hospital in India over a 3-year period.

MATERIALS AND METHODS

This retrospective cross-sectional study was conducted in the Department of Microbiology and Infection Control at a tertiary care hospital, covering a period from June 2022 to May 2025.The study was divided into two phases. The phase 1 (June 2022 to May 2023) reflected antimicrobial stewardship approach in primary approach of policy preparation and restricted usage. The phase 2(June 2023 to May 2025) marked the implementation of a policy-driven AMSP coordinated by a multidisciplinary institutional AMS team, implementation periodic audits, continuous education and awareness, conduction of periodic meetings.

Microbiology Data: This study included clinical samples yielding bacterial isolates that fulfilled the criteria for multidrug resistance. Bacterial identification and speciation were performed using standard microbiological protocols and a battery of biochemical tests. Antibiotic susceptibility testing was carried out

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using the Kirby–Bauer disk diffusion method, and resistance patterns were interpreted according to the Clinical and Laboratory Standards Institute (CLSI) guidelines.[8] Data analysis was performed based on patient age group, type of organism isolated, and departmental distribution.

Infection Prevention and Control Data: Number of audits performed in different department, data on restricted antibiotic usage in each department, antibiotic usage audits done, prophylactic antibiotic usage data, environmental surveillance performed The above front end and back end strategies implemented were categorised as critical care, semi critical care and non critical care areas The data will be correlated will be MDR strains isolated in the same zonal categories for a period of 3 years.Data analysis was performed based on patient age group, type of organism isolated, and departmental distribution.Number of audits performed in different department, data on restricted antibiotic usage in each department, antibiotic usage audits done, prophylactic antibiotic usage data, environmental surveillance performed .[9,10]The above front end and back end strategies implemented were categorised as critical care, semi critical care and non-critical care areas The data will be correlated will be MDR strains isolated in the same zonal categories for a period of 3 years.

Results:

Figure 1: The number of MDR bacteria from 2022-2025

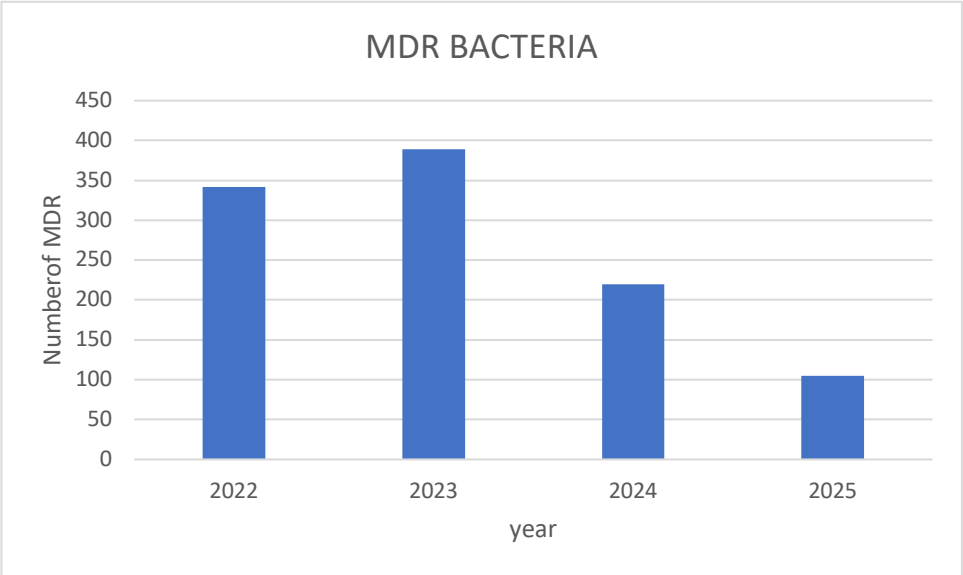


Table 1: Year-wise Trend of MDR Organisms Before and After AMSP Implementation

Year	Phase	MDR Cases (n)	% Change from Previous Year	Cumulative % Change (from 2022)
2022	Phase 1	342	—	—
2023	Phase 1	389	+13.7%	+13.7%
2024	Phase 2	220	−43.4%	−35.7%
2025	Phase 2	105	−52.3%	−69.3%

Table 1 shows the temporal trend of multidrug-resistant (MDR) organisms across the study period. An initial increase during Phase 1 is followed by a marked and sustained reduction after implementation of a structured antimicrobial stewardship program (Phase 2).

Figure 2: Graphical representation of decline of number of MDR bacreria

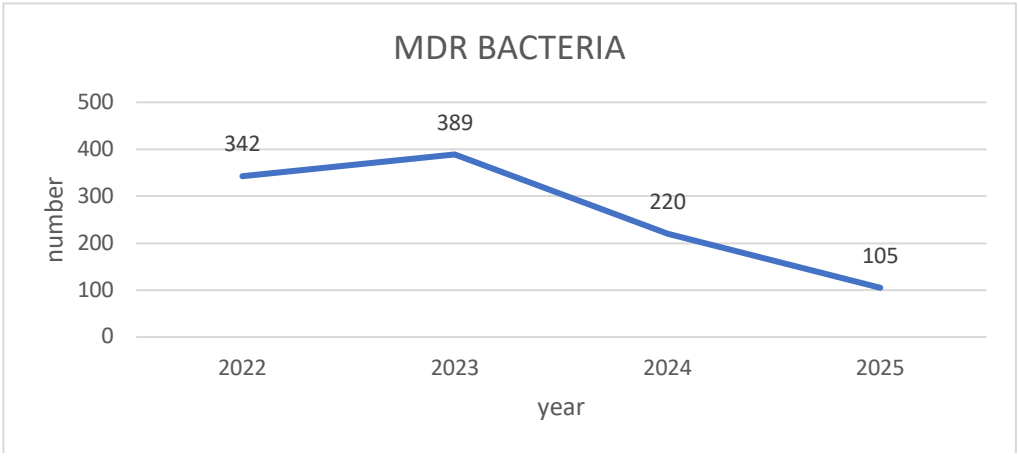


Figure 2 : Klebsiella spp. showed a marked decline representing a **63.8% reduction**. Pseudomonas spp 46.4% reduction, Escherichia coli (E. coli) isolates reduced from 83 to 42, reflecting a 49.4% decline ,in contrast, Acinetobacter spp. showed a slight increase from 16 to 18 isolates (12.5% increase),

Figure 3 COMPARISION OF ISOLATES FROM 2022-2025

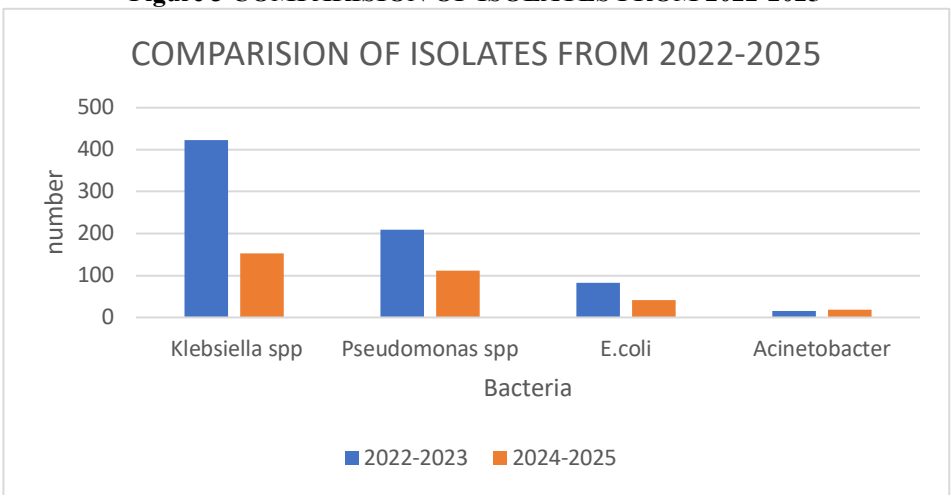
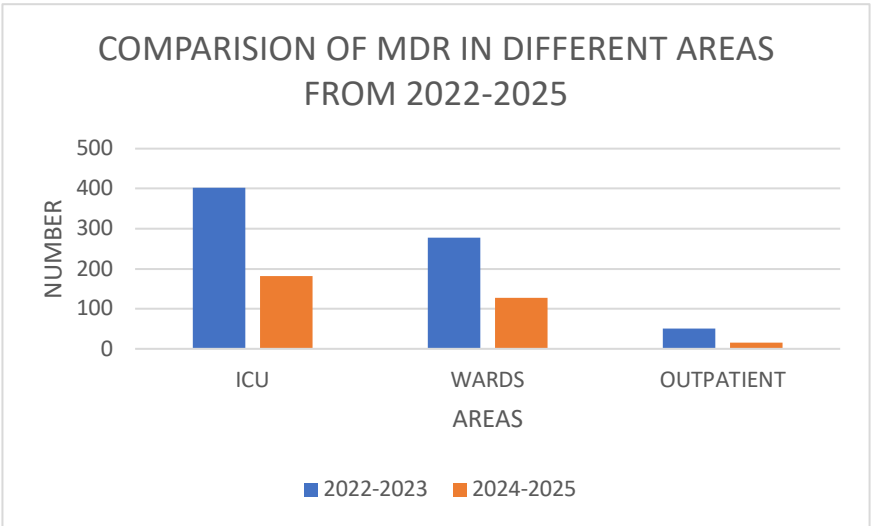


Figure 4 COMPARISION OF MDR IN DIFFERENT AREAS FROM 2022-2025



Discussion

The present study demonstrates a significant reduction in multidrug-resistant (MDR) organisms following the phased implementation of an antimicrobial stewardship program (AMSP) in a tertiary care hospital. The overall MDR burden initially increased from **342 cases in 2022 to 389 in 2023 (+13.7%)**, followed by a substantial decline to **220 in 2024 and 105 in 2025**, representing a **69.3% cumulative reduction**. This trend highlights the effectiveness of transitioning from a preparatory

stewardship phase to a structured, policy-driven AMSP. The initial rise in MDR cases during Phase 1 (2022–2023) is consistent with findings from other studies, where early stewardship efforts often lead to improved detection and reporting rather than immediate reduction.[11] Though AMSP was structured much earlier, it was followed by policy preparation, formulating the instructions , but from 2024 there were enhanced microbiological surveillance and stricter diagnostic practices during this phase may have contributed to the observed increase. Several auditing tools like prescription audit, restricted antibiotic usage audit, prophylactic antibiotic usage audits, surgical prophylaxis audits were done periodically and documented. Antibiotic committee meetings were held periodically along with the preparation and distribution of antibiotic bulletins, newsletters. This helped as a continuous education tool regarding emerging resistance and other updates on newer antibiotics. Annual celebration of world antimicrobial awareness week in the month of November-december, involving all the faculty in various activities like puzzle solving , creative thinking on antibiotics also made the way much easier to educate and share the insights about AMSP. Following implementation of coordinated AMSP interventions in Phase 2, a marked and statistically significant decline in MDR organisms was observed ($p < 0.001$). This aligns with recent evidence demonstrating that structured stewardship interventions—including prospective audit and feedback, antimicrobial restriction, and guideline-based prescribing—lead to meaningful reductions in antimicrobial resistance[9,10] Studies have consistently shown that sustained AMSP efforts are associated with improved antimicrobial utilization and decreased resistance trends over time. Organism-wise analysis revealed substantial reductions in **Klebsiella spp. (63.8%)**, **Pseudomonas spp. (46.4%)**, and **Escherichia coli (49.4%)**, indicating decreased antimicrobial selection pressure and improved prescribing practices. Similar reductions in Gram-negative resistance patterns have been reported in recent tertiary care studies following AMSP implementation.[12] These findings reinforce the role of stewardship in controlling high-burden hospital pathogens. In contrast, **Acinetobacter spp.** demonstrated a slight increase (12.5%), reflecting its known persistence in hospital environments and ability to develop resistance despite antimicrobial regulation. This observation is in agreement with recent studies highlighting Acinetobacter as a challenging pathogen due to its environmental resilience, biofilm formation, and survival on hospital surfaces.[13] This underscores the importance of integrating AMSP with robust infection prevention and control (IPC) measures. The area-wise distribution of MDR organisms further emphasizes the importance of targeted interventions in high-risk areas such as intensive care units (ICUs), where antimicrobial pressure and invasive procedures are higher. Previous studies have demonstrated that ICU-focused stewardship and IPC interventions significantly reduce MDR incidence in these settings.[14] The observed decline in MDR organisms in this study can be attributed to multiple AMSP strategies implemented during Phase 2, including antimicrobial restriction policies, prospective audit and feedback, and continuous surveillance. These interventions are in line with global recommendations, which emphasize a multidisciplinary and sustained approach to antimicrobial stewardship.[15,16]Importantly, the findings suggest that the impact of AMSP is gradual, with significant reductions becoming evident only after sustained implementation. Similar lag effects have been reported in recent literature, where measurable reductions in resistance patterns are observed after 12–24 months of continuous stewardship efforts.[17] Despite the significant reduction, the persistence of MDR organisms indicates that AMSP alone cannot completely eliminate resistance. A combined strategy integrating AMSP with infection control practices and ongoing surveillance is essential for sustained success.

Conclusion

The findings of this study reinforce that structured and sustained antimicrobial stewardship interventions can lead to substantial reductions in MDR organisms, supporting the concept that incremental, coordinated efforts can result in significant long-term impact in tertiary care settings. The findings were correlated with the timeline of implementation of various audit-based interventions as part of AMSP. The study reflects the effectiveness of AMSP implementation in our hospital.

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