CODEN [USA]: IAJPBB ISSN : 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES
SJIF Impact Factor: 7.187
https://doi.org/10.5281/zenodo.20632364

Available online at: http://www.iajps.com Research Article

DRUG UTILIZATION EVALUATION OF BROAD-SPECTRUM ANTIBIOTICS

IN THE GENERAL MEDICINE DEPARTMENT OF ESI HOSPITAL, NACHARAM

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From the students of doctor of pharmacy department, vision college of pharmaceutical sciences and research, Hyderabad, telangana, India. We have done this Retrospective study under the guidence of P Soma Shekar, Assistant professor of department of pharmacy, vision college of pharmaceutical sciences and research, Boduppal, Hyderabad, Telangana

Abstract:

Background: *One of the biggest health dangers today comes from microorganisms that survive medicine, which are meant to kill them. A hospital in Nacharam, focused on worker wellness, offers rare insights into how doctors hand out these medicines. When strong drugs are used without any proper reason or required diagnosis, microbes adapt faster, therapy becomes costly, and patients face a greater risk of antibiotic resistance.*

Objective: *To check how often doctors prescribe a wide range of antibiotics to adult patients at ESI Hospital's general medicine unit in Nacharam, Hyderabad. The review looks into whether drugs prescribed fit medical standards. It examines whether treatments follow recommended guidelines or stray from them.*

Method: *A Retrospective observational Drug Utilization Evaluation (DUE) study was conducted on 150 adult patients got picked if they took any wide-range antibiotic during the three-month checked at ESI Hospital Nacharam. Running nonstop for twelve weeks, the look into drug habits stayed close to real-world care without changing usual routines. Data on patient demographics, clinical diagnosis, antibiotic selection, dose, frequency, route and culture testing practices were systematically collected and evaluated against national rules, and along with the global WHO AWaRe categories, shaped the frame used to judge each choice made by doctors.*

Results: *150 patients (mean age 49.6 ± 15.2 years; 56% male) were analyzed in the general medicine ward of ESI hospital Nacharam. Ceftriaxone (46%), piperacillin-tazobactam (30%), meropenem (12%), and levofloxacin (12%) were the most commonly prescribed drugs amoung the all antibiotics . The Empirical prescribing accounted for 75% of prescriptions, culture and sensitivity testing was performed in only 28% of cases. Overall prescription appropriateness was observed as 62%. WHO AWaRe distribution: Access 18%, Watch 68%, Reserve 14%.*

Conclusion: *Substantial empirical prescribing, suboptimal microbiological testing, and moderate guideline adherence were identified at ESI Hospital Nacharam. Implementation of a DUE program integrated with a clinical pharmacist led antimicrobial stewardship program (ASP) is urgently recommended.*

Keywords: *Drug Utilization Evaluation, Antimicrobial stewardship, Rational -prescribing, Antimicrobial resistance, WHO AWaRe categories, Empirical prescribing*

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Please cite this article in press *Goutham Duddela* ***et al., Drug Utilization Evaluation Of Broad-Spectrum Antibiotics.., Indo Am. J. P. Sci, 2026; 13(06).***

1. INTRODUCTION:

Antibiotic medications are of great significance to individuals. These are medicines that were initially in use during the 1900s. They transformed the treatment of infections by doctors. Treatment of infection which was previously fatal can be done by doctors. Antibiotic medications also ensured that people were safer when operating and getting cancer treatment. due to the high usage of these medicines by people, the bacteria are becoming stronger and the medicines are no longer as effective. This is one issue that is occurring in most nations and it is endangering the health of people. The antibiotics used to combat bacteria are not as effective as they were before. This is a problem. Every year over 700,000 individuals succumb to disease due to lack of medicines that can combat some infections. The World Health Organization believes that it is one of the health hazards in the world. Bacterial fighting medicines are a bargain and we must make sure that they continue to work. Without strong efforts to stop it, experts like those in the O'Neill Commission warn deaths could reach ten million yearly by 2050. That warning sparked changes across nations. One result was the WHO's 2015 plan meant to tackle how drugs lose their power over time. Out here in India, more people suffer from drug-resistant infections than almost anywhere else. With hospitals using more antibiotics than any other country, problems pile up - diseases spread easily, medicines are sold without prescriptions, doctors prescribe differently, testing labs aren't always reliable. Inside hospital walls, especially on general medical floors, these resistant bugs find perfect conditions to grow stronger. Resistance doesn't just appear. It builds where care is uneven and pills flow too freely. Not far from central Hyderabad, the ESI Hospital at Nacharam treats workers covered under the state insurance plan. Quality checks on medicine use happen here through a method called Drug Utilization Evaluation. This process looks closely at how prescriptions match up with trusted medical guidelines. Over time, it helps spot gaps between real practice and what research supports. One aim stands out - making sure treatments stay aligned with current knowledge. Through regular reviews, adjustments slowly take shape behind the scenes. Decisions get shaped by data instead of habit alone. Each round of assessment adds clarity to prescribing patterns across departments. In 2017, the WHO launched AWaRe - short for Access, Watch, Reserve - as a tool to measure how well antibiotics are prescribed around the world. Meeting global standards means using drugs from the Access category for at least six out of every ten antibiotic treatments. Yet nations like India, along with many lower- and middle-income regions, fall short on this mark. Their current usage patterns miss the recommended balance by a noticeable margin.

2. MATERIAL AND METHODS:

2.1 Study design and setting

The study was designed as retrospective observational DUE, conducted within the general medicine department of ESI Hospital, Nacharam, over a consecutive tewlvw week period. The retrospective design was chosen to allow the data collection already present in medical records thereby improving the accuracy and completeness of the clinical information gathered.

2.2 Study population and and sampling

Patients having 18 years of age or older, who admitted in the General Medicine ward and got administrated with a broad spectrum antibiotic were eligible for the study. Patients admitted in the ICU, those receiving antibiotics exclusively for surgical prophylaxis, paediatric patients, and outpatients were excluded. One after another medical records of patient were added into the study until there were exactly count of 150 cases.

2.3 Data collection

A structured, pre-validated data collection form was used to systematically record patient demographics, admitting diagnosis, antibiotic selection and dosing details, culture and sensitivity results, de-escalation decisions, adverse drug reactions, and total length of hospital stay.

2.4 Antibiotics Evaluated

The study focused on main four broad-spectrum antibiotic agents which are most commonly used among the all antibiotics in ESI hospital, nacharam : ceftriaxone (third-generation cephalosporin), piperacillin-tazobactam (beta-lactam/beta-lactamase inhibitor combination), meropenem (carbapenem), and levofloxacin (fluoroquinolone).

2.5 Appropriateness Evaluation

Each case sheet was evaluated against five domains: correctness of indication, dose appropriateness, frequency and route appropriateness, duration consistency, and microbiological guidance. Reference guidelines included IDSA, BSAC, National Treatment Guidelines of the Ministry of Health and Family Welfare (Government of India), and the WHO AWaRe classification 2021 update.

2.6 Statistical Analysis

Descriptive statistical analysis was performed. Frequencies and percentages show up for category-based data, while averages with spread appear for number-type values instead. Work on the dataset happened through Microsoft Excel 2021.

3. RESULTS AND DISCUSSION:

3.1 Demographic Profile

A total of 150 patients were enrolled across the twelve-week study period. The mean age was 49.6 ± 15.2 years. Male patients constituted 56% (n=84) and female patients 44% (n=66). The highest concentration of patients was in the 46–60 year bracket (30%; n=45), followed by the 61–75 year group (25.3%; n=38).

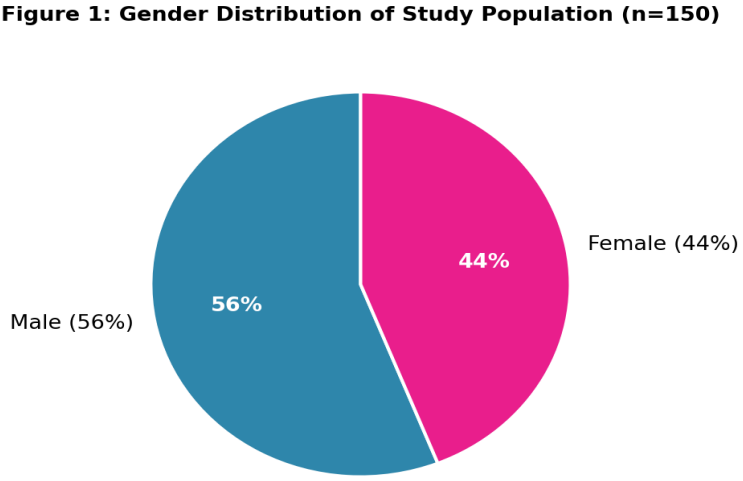

Figure 1: Gender Distribution of Study Population (n = 150, ESI Hospital Nacharam)

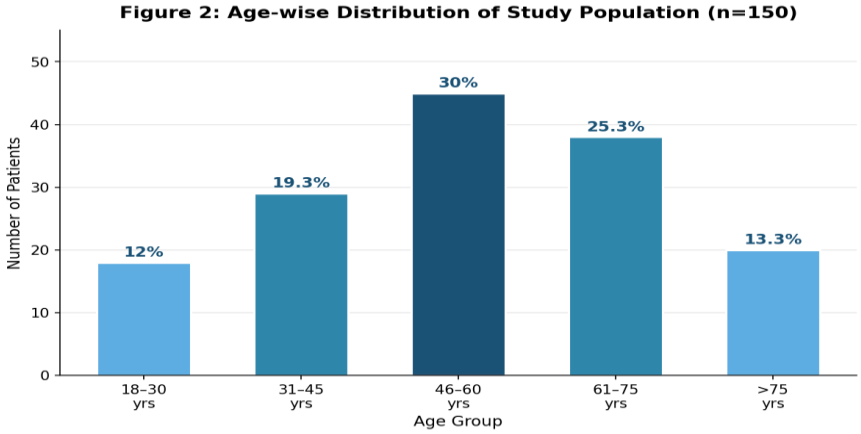

Figure 2: Age-wise Distribution of Study Population (n = 150, ESI Hospital Nacharam)

Table 1: Demographic Characteristics of Study Population (n = 150)

Characteristic	Value / n	Percentage (%)
Total patients enrolled	150	100%
Mean age (years)	49.6 ± 15.2	—
Male	84	56%
Female	66	44%
Age 18–30 yrs	18	12%
Age 31–45 yrs	29	19.3%
Age 46–60 yrs	45	30%
Age 61–75 yrs	38	25.3%
Age >75 yrs	20	13.3%

3.2 Clinical Indications for Antibiotic Use

Community acquired pneumonia (CAP) was the most common clinical indication for broad-spectrum antibiotics usage, accounting for 32% (n=48) of cases. Urinary tract infections (UTIs) represented 25.3% (n=38) of the cases. Sepsis accounted for 18% (n=27) of cases, followed by skin and soft tissue infections (SSTIs) around 14.7% (n=22), and others at 10% (n=15).

Figure 3: Clinical Indications for Broad-Spectrum Antibiotic Use (n=150)

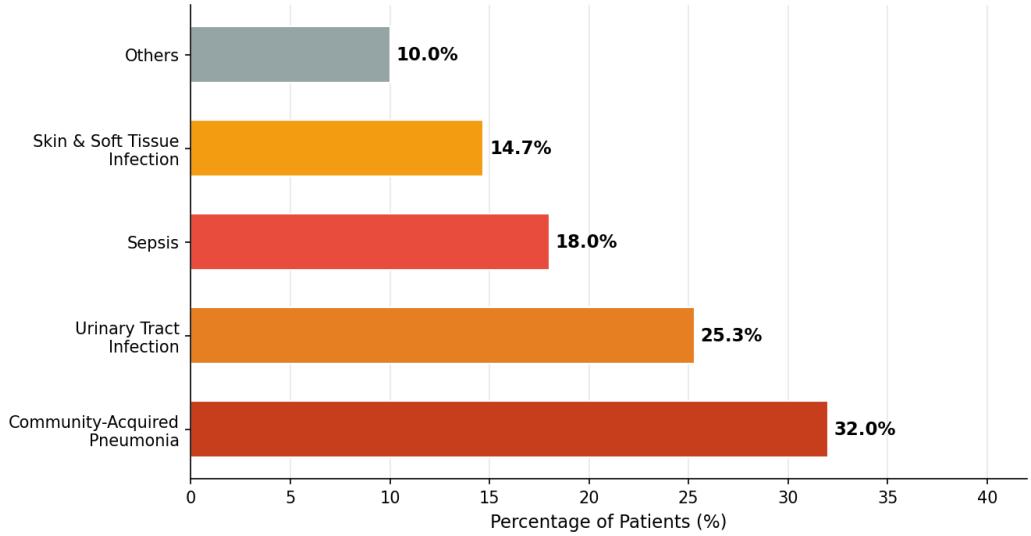

Figure 3: Clinical Indications for Broad-Spectrum Antibiotic Use (n = 150, ESI Hospital Nacharam)

Table 2: Clinical Indications for Antibiotic Use (n = 150)

Clinical Indication	n	%	AWaRe Concern
Community-Acquired Pneumonia	48	32.0%	High
Urinary Tract Infection	38	25.3%	Moderate
Sepsis	27	18.0%	High
Skin & Soft Tissue Infection	22	14.7%	Moderate
Others	15	10.0%	Variable

3.3 Antibiotic Utilization Pattern

Ceftriaxone was the most frequently prescribed antibiotic, accounting for 46% (n=69) of all antibiotic courses. Piperacillin-tazobactam was second at 30% (n=45). Meropenem and levofloxacin each accounted for 12% (n=18 each) of prescriptions.

Figure 4: Antibiotic Utilization Pattern (n=150)

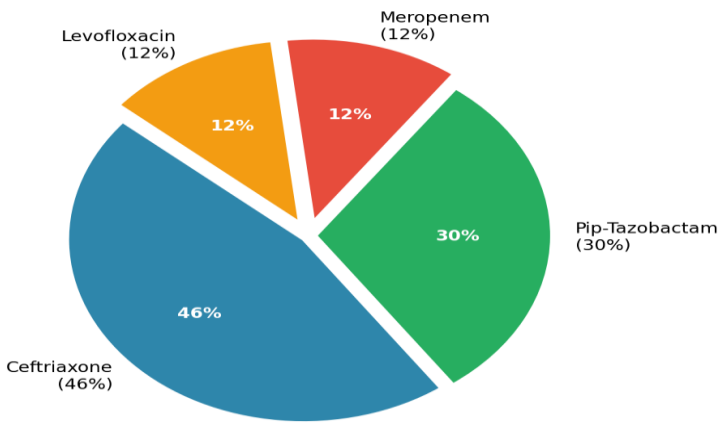

Figure 4: Antibiotic Utilization Pattern Proportion of Each Agent Prescribed (n = 150)

Table 3: Antibiotic Utilization Pattern with AWaRe Classification

Antibiotic	n	%	Drug Class	AWaRe
Ceftriaxone	69	46%	3rd-gen Cephalosporin	Watch
Piperacillin-Tazobactam	45	30%	BL/BLI Combination	Watch
Meropenem	18	12%	Carbapenem	Reserve
Levofloxacin	18	12%	Fluoroquinolone	Watch

3.4 Prescribing Characteristics

Empirical antibiotic therapy accounted for 75% (n=112) of all prescriptions. Only 25% (n=38) represented definitive, culture-guided therapy. Culture and sensitivity (C&S) testing was ordered for 28% (n=42) of the cases. De-escalation was performed only in 15% (n=23) of the cases.

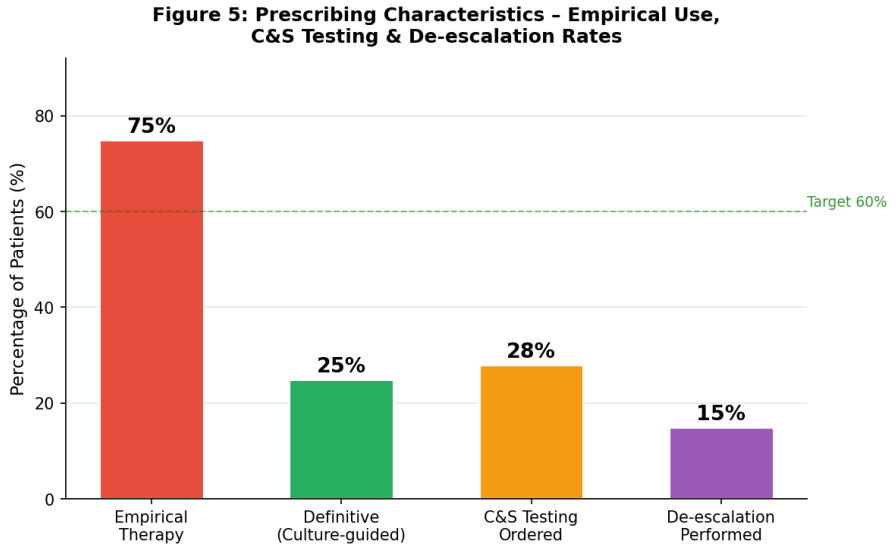

Figure 5: Prescribing Characteristics — Empirical Use, C&S Testing & De-escalation Rates

Table 4: Prescribing Characteristics (n = 150)

Parameter	n (number of cases)	%
Empirical therapy initiated	112	75%
Definitive (culture-guided) therapy	38	25%
Culture & sensitivity testing ordered	42	28%
De-escalation performed	23	15%

3.5 Appropriateness Assessment

Overall, 62% (n=93) of antibiotic prescriptions were classified as fully appropriate of the 38% (n=57) deemed inappropriate: 18% (n=27) involved incorrect indication; 10% (n=15) involved incorrect dosing and 10% (n=15) involved excessive duration beyond guideline-recommended courses.

Figure 6: Appropriateness Assessment of Antibiotic Prescriptions (n=150)

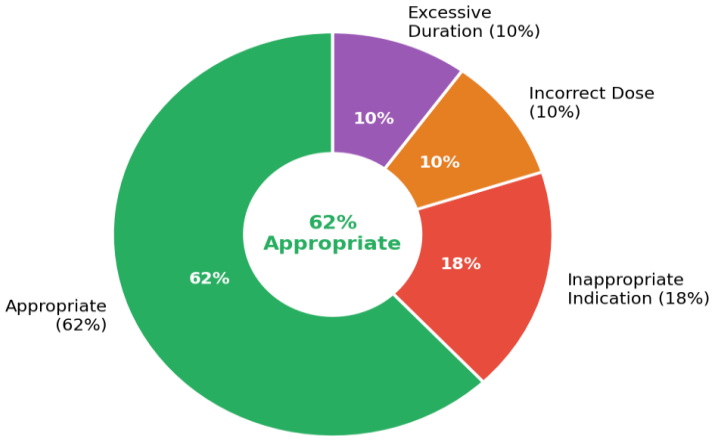

Figure 6: Appropriateness Assessment of Antibiotic Prescriptions (n = 150, ESI Hospital Nacharam)

Table 5: Appropriateness Assessment of Antibiotic Prescriptions (n = 150)

Assessment Category	n	%
Appropriate prescriptions	93	62%
Inappropriate indication	27	18%
Incorrect dose	15	10%
Excessive duration	15	10%
Total inappropriate	57	38%

3.6 WHO AWaRe Category Distribution

Analysis of prescriptions by WHO AWaRe category revealed that Watch group antibiotics constituted 68% of total antibiotic use, while Reserve group agents accounted for 14% and Access group antibiotics represented only 18%. This represents a marked divergence from the WHO global target that Access antibiotics constitute a minimum of 60% of antibiotic use.

Figure 7: WHO AWaRe Category Distribution (n=150)

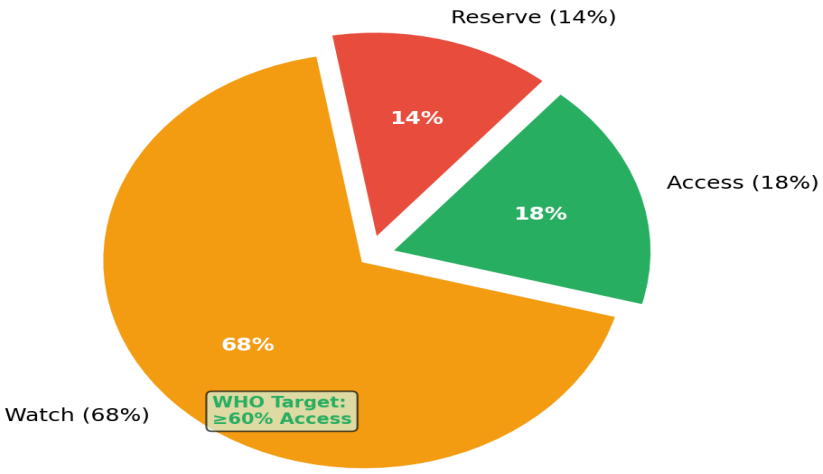

Figure 7: WHO AWaRe Category Distribution of Antibiotic Prescriptions (n = 150, ESI Hospital Nacharam)

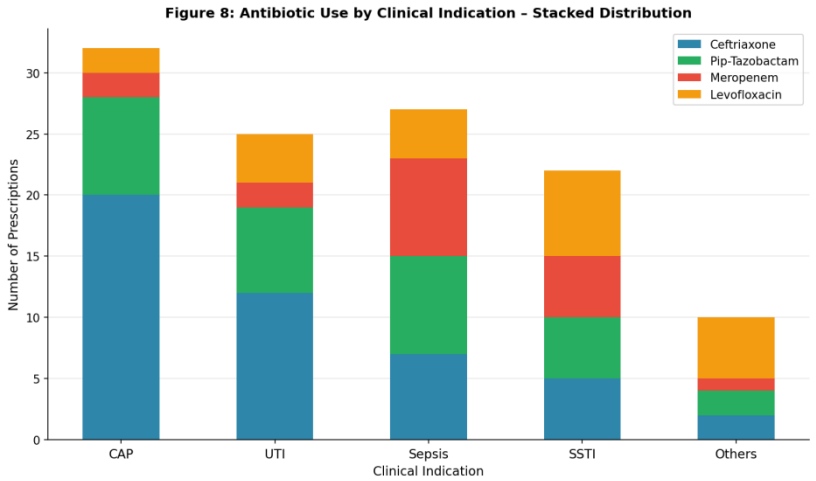

Figure 8: Antibiotic Use by Clinical Indication — Stacked Distribution (ESI Hospital Nacharam)

3.7 Empirical Prescribing and the Diagnostic Gap

The finding that 75% of antibiotic prescriptions were empirical is consistent with patterns reported from comparable tertiary care general medicine settings across India and other low- and middle-income countries. At ESI Nacharam, this rate is compounded by the fact that C&S testing was ordered in only 28% of cases, creating a fundamental informational deficit that precludes culture-guided decision-making for the majority of patients.Improving C&S testing rates requires a multipronged approach. Pre-antibiotic specimen collection should be formalised as a standard nursing and medical protocol. Electronic medical record alerts prompting C&S specimen collection prior to antibiotic ordering represent a low-cost, high-impact intervention demonstrated to improve culture rates in several hospital settings.

3.8 Ceftriaxone Dominance: Utility and Overuse

Ceftriaxone tops the list of antibiotics among the chosen antibiotics used in ESI hospitl, Nacharm, making up 46% of prescriptions its appeal lies in hitting a wide range of gram-negative bacteria while still managing some gram-positive types. One shot per day through a vein keeps things simple for staff. It spreads well into body tissues, which helps it reach infections effectively. In India, price matters, and here too it holds an edge with lower costs compared to others. Still, because it works so reliably on many fronts, doctors often choose it even when milder options would do just fine. Overuse creeps in not by accident but habit, nudging aside more targeted treatments. Uncomplicated urinary tract infections see too much ceftriaxone use - this worries experts. Groups like IDSA, WHO, and ICMR say simpler oral antibiotics should come first. Because when stronger drugs spread, bacteria such as ESBL-producing Enterobacterales tend to follow.

3.9 Meropenem and Reserve Antibiotic Stewardship

Meropenem accounted for 12% of prescriptions at ESI Nacharam, and at 14% of total antibiotic use, Reserve group agents substantially exceeded the threshold consistent with responsible stewardship. Effective carbapenem stewardship typically requires pre-authorisation or Retrospective audit mechanisms. Such mechanisms have been shown to reduce carbapenem use by 20–40% without adverse clinical outcomes.

3.10 The De-escalation Deficit

De-escalation was documented in only 15% of patients at ESI Nacharam — a strikingly low rate. Studies consistently demonstrate that systematic de-escalation programs, supported by clinical pharmacist review and regular stewardship ward rounds, can increase de-escalation rates to 40–60% without increasing treatment failure or adverse outcomes.

3.11 WHO AWaRe Performance and Benchmarking

The AWaRe distribution observed — 18% Access, 68% Watch, 14% Reserve — represents a considerable divergence from the WHO global target of at least 60% Access antibiotic use. Achieving AWaRe targets will require both prescribing behaviour change and formulary management.

3.12 The Clinical Pharmacist as Stewardship Leader

A substantial body of evidence documents that pharmacist-led stewardship interventions consistently reduce inappropriate antibiotic use, decrease antibiotic-associated costs, lower the incidence of Clostridioides difficile infection, and improve patient outcomes. In the Indian context, clinical pharmacists trained in antimicrobial stewardship have demonstrated significant improvements in prescription appropriateness rates.

4. Clinical Implications and Recommendations

Based on the findings of this DUE study at ESI Hospital Nacharam, the following evidence-based recommendations are proposed:

- Establish a formal Antimicrobial Stewardship Program (ASP) with institutional governance support, comprising infectious disease-trained physicians, a clinical microbiologist, a clinical pharmacist, an infection control nurse, and hospital administration.
- Implement pre-antibiotic specimen collection protocols as standard care for all patients requiring parenteral antibiotic initiation. A target C&S testing rate of ≥60% should be established and monitored monthly.
- Develop and operationalise a structured 48–72 hour antibiotic review protocol. De-escalation should be targeted to ≥40% of eligible patients within the first year of ASP implementation.
- Implement a carbapenem and Reserve antibiotic pre-authorisation policy. A target Reserve antibiotic use rate of ≤5% of total antibiotic prescriptions should be established.
- Generate and maintain a local antibiogram updated annually from C&S data collected at ESI Nacharam to inform empirical antibiotic guidelines specific to the institution.
- Conduct regular prescriber education programs addressing AWaRe classification, rational antibiotic prescribing principles, de-escalation practice, and the clinical and public health consequences of antimicrobial resistance.

5. Limitations and Future Scope

As a single-centre, twelve-week study, the generalizability of findings may be limited. The study did not track resistance outcome data and adverse drug reaction rates were not systematically quantified. No pharmacoeconomic analysis was conducted.

Future research should prioritise multi-season, Retrospective cohort designs with longer follow-up. Interventional studies evaluating the impact of pharmacist-led ASP implementation and multi-centre ESI hospital network studies are particularly needed.

6. CONCLUSION:

This Drug Utilization Evaluation of broad-spectrum antibiotics at ESI Hospital Nacharam — the first published DUE from this institution — reveals a prescribing landscape characterised by high empirical antibiotic use (75%), low microbiological testing rates (28%), poor de-escalation practice (15%), moderate overall appropriateness (62%), and a WHO AWaRe distribution heavily skewed toward Watch and Reserve categories (82% combined).

Antimicrobial resistance is already a present clinical reality at tertiary care institutions across India. ESI Nacharam, as a government-funded institution with access to policy levers, institutional governance structures, and pharmacy infrastructure, is well-positioned to implement meaningful antimicrobial stewardship reform.

Implementation of a structured DUE program, integrated with clinical pharmacist-led antimicrobial stewardship and supported by improved microbiological infrastructure and prescriber education, represents the most direct pathway toward rational antibiotic use at ESI Hospital Nacharam. These investments are a clinical and ethical obligation to the patients served, and a contribution to the collective effort to preserve the therapeutic efficacy of antibiotics for future generations.

7. Acknowledgement

I wish to express my sincere gratitude to my parents for their constant love and sacrifices, and to my mentors for their invaluable guidance.

Special thanks to my school and Vision College of Pharmaceutical Science and Research for providing a supportive learning environment. I am particularly grateful to our Principal, Ch. Ajay Babu, for his leadership and encouragement throughout my academic journey.

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