

A Study On Reserve Antibiotic Use And Clinical Outcomes In Geriatric Patients

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ABSTRACT

In clinical settings, using high-end or restricted antibiotics in elderly patients is a significant problem, especially when treating infections in senior individuals who have other comorbidities. The prescribing practices, safety, effectiveness, and clinical results related to the use of limited antibiotics in elderly individuals in a tertiary care hospital are assessed in this research.

The aim of the study was to access the clinical results, safety profile, and prescribing patterns of limited antibiotics in elderly individuals. Analyzing the effects of comorbidities on prescribing patterns, finding adverse events linked to antibiotics, and investigating the demographic factors impacting antibiotic use were among the particular goals. 163 elderly adults were enrolled in this six-month prospective observational study at a tertiary care facility. Comorbidities, clinical outcomes, antibiotic prescriptions, and patient demographics were among the information gathered. IBM SPSS was used for statistical analysis, and chi-square tests were used to evaluate the correlations between the variables.

The study found that the majority of people with comorbid conditions including diabetes and hypertension have been given restricted antibiotic prescriptions. The most often given antibiotic was meropenem. In 78.5% of cases, the therapeutic use of antibiotics was supported by microbiological data. According to clinical results, 31.9% of patients recovered, while 64.4% of patients remained stable. Adverse instances, which includes as bleeding and gastrointestinal problems, occurred in 42.7% of patients. A considerable percentage of elderly patients who receive limited antibiotics experience stability or recovery, indicating favorable clinical outcomes. However, the frequency of adverse events emphasizes the need for customized treatment regimens and careful monitoring. The findings highlight the importance of improving diagnostic capabilities and implementing comprehensive antibiotic stewardship programs to optimize utilization of antibiotics in the elderly.

Keywords: Restricted antibiotics, Geriatric patients, Antibiotic stewardship, Adverse events, Comorbidities, Clinical outcomes.

I. INTRODUCTION

Antibiotics' Historical Context

In the 20th century, antibiotics—whether synthetic or natural—revolutionized the way bacterial illnesses were treated. Alexander Fleming's discovery of penicillin in 1928 marked the beginning of the antibiotic era and significantly reduced the mortality rate from infectious diseases including pneumonia and sepsis. Antibiotics target particular bacterial processes such DNA replication, protein synthesis, and cell wall construction, and can either kill bacteria (bactericidal) or stop them from growing (bacteriostatic).

As a result of antibiotics' early success, other classes such as aminoglycosides, tetracyclines, and fluoroquinolones were discovered, increasing the number of infections that could be treated. The misuse and abuse of antibiotics has resulted in the development of resistant bacteria, despite their revolutionary benefits. This poses significant challenges for global health systems. ⁽¹⁾

Mechanism of Action of Antibiotics

Antibiotics are categorized based on their modes of action:

1. Cell Wall Synthesis Inhibition

- By preventing peptidoglycan cross-linking, antibiotics such as cephalosporins and penicillins prevent the formation of bacterial cell walls and cause bacterial lysis. When it comes to Gram-positive bacteria, this method

works especially well.

2. Inhibition of Protein Synthesis

- Protein synthesis is disrupted by antibiotics such as aminoglycosides, macrolides, and tetracyclines that interfere with bacterial ribosomes. For instance, tetracyclines bind to the 30S ribosomal subunit and prevent tRNA attachment.

3. Inhibition of Nucleic Acid Synthesis

- Drugs like rifampin and fluoroquinolones prevent the coding or multiplication of bacterial DNA. Fluoroquinolones target the enzyme DNA gyrase, that is required for bacterial DNA supercoiling.

4. Disruption of Cell Membrane Function

- Colistin is one example of a polymyxin that damages the membrane of bacterial cells, increasing permeability and ultimately leading to cell death. These medications are normally reserved for multidrug-resistant Gram-negative infections.

5. Metabolic Pathway Inhibition

- Folate synthesis, a vital mechanism for bacterial DNA replication and protein synthesis, is inhibited by sulfonamides and trimethoprim. A variety of bacterial infections can be effectively combatted by this synergistic action.⁽²⁾

Classification of Antibiotics

II. Antibiotics in Geriatric Care

Age-related variables including immunological senescence, which impairs immune responses, and comorbidities like diabetes and COPD, which raise infection risks, make the senior population more vulnerable to infections. As a result, antibiotics are required to treat conditions like urinary tract infections (UTIs), infections of the respiratory system, and skin infections.

The following are some major obstacles when providing antibiotics to elderly patients:

- Physiological Changes:** Drug metabolism is impacted by decreased renal and hepatic function, which calls for dose modifications (e.g., aminoglycosides to minimize nephrotoxicity).
- Polypharmacy:** Having many prescriptions raises the possibility of drug interactions (for example, taking macrolides with heart meds lengthens the QT interval).
- Altered Pharmacokinetics:** Lipophilic antibiotics, such as fluoroquinolones, are distributed differently when body composition changes (for example, an increase in the fat-to-lean mass ratio).

Inappropriate antibiotic use in geriatrics, such as overprescribing viral infections or prolonged therapy, exacerbates **antimicrobial resistance (AMR)**. Common resistant pathogens in the elderly include *Escherichia coli* (UTIs), *Staphylococcus aureus* (skin infections), and multidrug-resistant organisms in healthcare-associated infections.

Optimizing antibiotic use in geriatric care requires:

- Tailored Dosing:** Adjustments based on organ function.
- Culture-Based Prescribing:** Reducing reliance on empirical broad-spectrum antibiotics.
- Antimicrobial Stewardship Programs (ASPs):** Focused on monitoring, de-escalation, and education to improve outcomes and combat AMR.⁽⁴⁾

Antibiotic Resistance in the Elderly Population

One of the primary reasons why antibiotic resistance is a rising dilemma is the elderly's abuse of antibiotics.

The selection pressure for resistant microorganisms is increased by elements including the overuse of broad-spectrum antibiotics, improper prescriptions for viral infections, and extended treatment periods. Infections from multidrug-resistant organisms such as *Escherichia coli*, *Staphylococcus aureus*, and carbapenem-resistant Enterobacteriaceae pose an increased risk to the older population, which is already at risk due to age-related immunological loss and comorbidities.

Inappropriate use of antibiotics can also result in negative medication reactions, higher medical expenses, and less successful treatment outcomes. For example, macrolides may interact negatively with medications that older adults often take, and antibiotics such as aminoglycosides may result in nephrotoxicity.

Antimicrobial stewardship programs (ASPs) and other evidence-based interventions are crucial to reducing these difficulties. These initiatives support culture-guided treatment, train medical professionals in sensible prescription practices, and guarantee dose modifications according to hepatic and renal function. The need for antibiotics is further decreased by improved infection prevention strategies including immunization and good cleanliness.

We can fight resistance, maintain the effectiveness of currently available antimicrobials, and enhance health outcomes for this susceptible group by optimizing the use of antibiotics in elder care. Appropriate prescription practices are essential for protecting public health and thwarting the worldwide danger posed by AMR.⁽⁵⁾

The rationale of restricted antibiotics used in the Elderly.

The use of high-end antimicrobial agents in the elderly is justified by their capacity to treat serious or potentially fatal infections brought on by rare or resistant pathogens, especially when standard antibiotics are ineffective or inappropriate because of physiological alterations associated with age or comorbidities. Usually only used for particular illnesses, these specialty antibiotics—such as carbapenems, vancomycin, linezolid, and daptomycin—require close monitoring and antimicrobial stewardship to prevent side effects and the development of new resistance.

According to the American Geriatrics Society, as older persons are more susceptible to adverse medication reactions, *C. difficile* transmission, and multidrug-resistant organisms, antibiotic stewardship is an essential practice to ensure prudent antibiotic usage. When antibiotics are required, the emphasis is on identifying the best agent for the pathogen, maximizing its spectrum of action, and figuring out the right dosage, delivery method, and length of treatment. This focused strategy reduces risks like renal damage, hepatotoxicity, and antibiotic-associated problems while also improving clinical results.

Antibiotic stewardship initiatives in elderly care settings have been shown to improve patient safety and treatment efficacy while lowering antibiotic misuse. Healthcare providers can guarantee the supply of high-end antibiotics for important patients and lessen the impact of resistance to antibiotics in this susceptible group by enacting stringent regulations on their use.⁽¹⁵⁾

Meropenem

Mechanism of action: The mechanism of action of the broad-spectrum carbapenem antibiotic meropenem is to prevent the formation of bacterial cell walls. It interferes with the synthesis of peptidoglycan chains by attaching itself to proteins that bind to penicillin (PBPs) on the bacteria's cell wall. Bacterial mortality and cell lysis result from this weakened cell wall. It works well against a variety of bacterial species, both Gram-positive and Gram-negative, because it is stable against several beta-lactamases.⁽¹⁸⁾

Teicoplanin

Mechanism of action: The glycopeptide antibiotic teicoplanin prevents the formation of bacterial cell walls. It stops peptidoglycan precursors from being incorporated into the cell wall by binding to their D-alanyl-D-alanine terminal. Bacterial cell death results from this activity, which weakens the cell wall by preventing transglycosylation and transpeptidation. It works very well against (MRSA) and other Gram-positive bacteria.⁽²⁰⁾

Linezolid

Mechanism of action: Bacterial protein synthesis is inhibited by the oxazolidinone antibiotic linezolid. By binding to the 50S subunit's 23S ribosomal RNA, it stops the initiation complex—which is necessary for translation—from forming. This has bacteriostatic action against Gram-positive bacteria, such as vancomycin-resistant *Enterococcus* (VRE) and methicillin-resistant *Staphylococcus aureus* (MRSA), by preventing the synthesis of vital proteins. ⁽³⁷⁾

Ceftazidime-avibactam

Mechanism of action: By attaching itself to penicillin-binding proteins (PBPs), the third- generation cephalosporin antibiotic ceftazidime prevents the formation of bacterial cell walls. Peptidoglycan cross-linking is broken, causing bacterial mortality and damage to the cell wall. Avibactam is a beta-lactamase inhibitor that increases ceftazidime's effectiveness against resistant Gram-negative bacteria, such as *Pseudomonas aeruginosa* and *Enterobacteriaceae*, by shielding it from beta-lactamase enzyme breakdown. ⁽²⁸⁾

Aztreonam

Mechanism of action: Gram-negative bacteria are the only target of the monobactam antibiotic aztreonam. It functions by attaching itself to proteins that bind to penicillin (PBPs), especially PBP-3, which prevents the cell of bacteria wall from synthesizing peptidoglycan. Bacterial mortality and cell lysis result from this rupture, which weakens the cell wall. Aztreonam works well against a variety of Gram-negative bacteria, including *Pseudomonas aeruginosa*, since it is resistant to numerous beta-lactamases. ⁽²¹⁾

Polymyxin B

Mechanism of action: A polypeptide antibiotic called polymyxin B works against Gram- negative bacteria by rupturing their cell membranes. It displaces calcium and magnesium ions by binding to the phospholipids and lipopolysaccharides (LPS) in the outer membrane. Bacterial cell death results from this disruption of membrane integrity, which also increases permeability and allows cellular contents to flow out. It works especially well against Gram- negative bacteria that are resistant to many drugs, such as *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. ⁽⁴³⁾

Vancomycin

Mechanism of action: The synthesis of bacterial cell walls is inhibited by the glycopeptide antibiotic vancomycin. It stops peptidoglycan precursors from being incorporated into the developing cell wall by binding to their D-alanyl-D-alanine terminal. This weakens the cell wall and causes cell lysis by preventing transglycosylation and transpeptidation. (MRSA) and other Gram-positive bacteria are the main targets of its effectiveness. ⁽⁴⁷⁾

Tigecycline

Mechanism of action: By attaching itself with the 30S ribosome subunit and preventing aminoacyl-tRNA from entering the ribosome, tigecycline prevents bacteria from synthesizing proteins. This efficiently stops bacterial growth by preventing peptide chains from elongating (bacteriostatic action). Because of its distinct structure, it avoids standard tetracycline resistance mechanisms (such as efflux pumps and ribosome protection).

Faropenem

Mechanism of Action: By attaching itself to proteins that bind to penicillin (PBPs), which are necessary for peptidoglycan cross-linking, faropenem prevents the formation of bacterial cell walls. Cell lysis and death result from this activity (bactericidal effect). It works well against some bacteria that are resistant to beta-lactam antibiotics because it is robust against a variety of beta-lactamases.

Imipenem + Cilastatin

Mechanism of action: By attaching itself to proteins that bind to penicillin (PBPs), imipenem prevents the formation of bacterial cell walls, breaks down peptidoglycan cross-linking, and causes cell lysis (bactericidal action). Because of its strong resistance to beta-lactamases, it works well against a variety of organisms that are resistant to drugs. Cilastatin stops the kidneys from breaking down imipenem by inhibiting renal dehydropeptidase I. ⁽²⁹⁾

Colistin

Mechanism of Action: Colistin is a the polymyxin antibiotic that breaks down the cell membranes of Gram-negative bacteria. It displaces calcium and magnesium ions via binding to phospholipids in the interior membrane and lipopolysaccharides, or LPS, in the outer membrane. Bacterial cell death results from this disruption of membrane integrity, which also increases permeability and allows cellular contents to flow out. It works well against Gram- negative bacteria that are resistant to many drugs, such as *Acinetobacter baumannii* and *Pseudomonas aeruginosa*. ⁽²⁹⁾

II. LITERATURE REVIEW

1. **(Kumar & Kumar, 2021)** study on restricted antibiotic use in inpatients revealed that 90.85% of prescriptions were given intravenously, mostly for bone fractures (29.42%), fever (15.71%), pneumonia (13.42%), and operations (18.57%). Stricter control and commitment to antimicrobial stewardship are necessary to prevent resistance and encourage sensible usage, as the majority of antibiotics were used empirically, frequently without alignment with bacteriological findings. ⁽⁴¹⁾

2. **(Talpaert et al., 2011)** study assessed the effects of updated antibiotic recommendations and improved stewardship on the incidence of *Clostridium difficile* infection (CDI) and the usage of broad-spectrum antibiotics in adult wards at University Hospital Lewisham. The intervention, which was first implemented in April 2006, advocated low-risk antibiotics (such penicillin and clarithromycin) and opposed high-risk ones (like fluoroquinolones and cephalosporins). Over a 12-month period, the usage of cephalosporins and fluoroquinolones declined by 45.93 DDDs/1000 OBDs/month ($P < 0.0001$) and 105.33 DDDs/1000 OBDs/month ($P < 0.001$), respectively, while the overall use of antibiotics remained unchanged. The incidence of CDI decreased considerably [IRR 0.34, $P < 0.0001$]. Results improved as a result of the intervention's proven ability to lower antibiotic use and CDI risk. ⁽³⁸⁾

3. **(Chandrasekhar et al., 2019)** study examined 180 elderly patients' inappropriate usage of antibiotics and measured the effects of a 12-month clinical pharmacist intervention. After the intervention, antibiotic inappropriateness dropped from 70% to 48.8% ($p = 0.004$), with the main problem being improper drug duration (pre: 41.2%, post: 27.8%). From 15% to 25.6%, compliance with national criteria increased. The most frequent indication was respiratory tract infections (30.6%), and 30.55% of patients underwent bacteriological testing prior to receiving treatment. The average length of stay in the hospital decreased from 7.52 to 4.93 days. The results emphasize the necessity of monitoring tools to guarantee prudent antibiotic usage and enhance patient outcomes. ⁽³⁹⁾

4. **(Nicholson et al., 1997)** study evaluated the prevalence of upper respiratory infections among 533 senior citizens in Leicestershire, England, ranging in age from 60 to 90. 231 pathogens were found in 497 episodes with diagnostic specimens: rhinoviruses accounted for 52%, coronaviruses for 26%, influenza A/B for 9.5%, and respiratory syncytial virus for 7%. Every year, there were 1.2 episodes of infections per individual, with lower respiratory tract symptoms complicating 65% of cases and leading to a 2.4- fold increase in medical visits ($P < 0.001$). For influenza, the median time to consultation was three days; for other diseases, it was five days. The highest disease burden was attributed to rhinoviruses and unidentified infections, underscoring difficulties in diagnosis and raising doubts over the effectiveness of antiviral therapy for influenza. ⁽²⁰⁾

5. **(Davies & O'Mahony, 2015)** According to the International Conference on Harmonization, older adults are a "special population" that has particular difficulties because of comorbidities, polypharmacy, changed pharmacokinetics, and susceptibility to adverse drug reactions (ADRs). This group includes a large number of Type A ADRs that are preventable and associated with frequently given medications. Benzodiazepines, neuroleptics, antidepressants, and antihypertensives are linked to falls, while broad- spectrum antibiotics raise the risk of *Clostridium difficile* and lengthen hospital admissions. Antipsychotics increase the risk of stroke in people with dementia. ADRs and incorrect prescribing can be decreased by following prescribing guidelines and doing routine medication evaluations. To address the heterogeneity and avoid negative outcomes in older persons, individualized care is crucial. ⁽²¹⁾

III.NEED FOR STUDY

Due to changes related to age and comorbidities, geriatric people are more susceptible to infections and are therefore more likely to be prescribed reserve antibiotics. Nevertheless, improper use of these medicines might exacerbate antimicrobial resistance (AMR), a problem that is becoming more and more widespread. There is little information on the trends and clinical results of reserve antibiotic use in the elderly population, despite their crucial role in treating multidrug-resistant illnesses. By investigating the kinds, length, and microbiological data that support the use of reserve antibiotics in older patients, this study seeks to close this gap. The study aims to improve therapeutic outcomes in geriatric care and optimize antibiotic stewardship policies by assessing patient demographics, comorbidities, and clinical outcomes. The results will help healthcare clinicians make evidence-based prescribing decisions for this susceptible population, lower the risk of AMR, improve patient safety, and shed light on the proper use of expensive medicines.

IV.AIM & OBJECTIVES

AIM

This study aims to evaluate the prescribing patterns, justification, and clinical outcomes of reserve antibiotics in geriatric patients in a tertiary care hospital, to optimize antibiotic stewardship and improve patient care while mitigating antimicrobial resistance.

OBJECTIVES

- To evaluate the prescribing patterns of reserve antibiotics in geriatric patients in a hospital for tertiary care.
- To evaluate the rationale behind the use of reserve antibiotics in elderly individuals.
- To determine the clinical outcomes of geriatric patients receiving reserve antibiotics (recovered, stable, or dead).
- To examine the correlation between clinical outcomes and antibiotic justification (empirical vs. therapeutic use).

V.METHODOLOGY

Study Site: The research was carried out at Kims Hospital, located at 1-8-31/1, Minister Rd, Krishna Nagar Colony, Secunderabad, Telangana 500003

Study Period: This investigation employed a prospective observational design, set in a hospital environment.

Study Design: This investigation employed a prospective observational design, set in a hospital environment.

Sample Size: A 77.1% prevalence, a 95% confidence level, and a 7.5% margin of error were used to determine the starting sample size. This computation yielded a preliminary sample size of 151 individuals. A 10% not responding rate was taken into consideration, therefore 163 people were added to the sample size.

Ethical Consideration: The Kims Hospital's Institutional Ethical Committee in Hyderabad gave its clearance for the project.

Data Collection

In this prospective observational study, 163 elderly patients (60 years of age and older) who were prescribed reserve antibiotics participated in a tertiary care hospital in Hyderabad. Based on preset inclusion and exclusion criteria, the patients were chosen. Patient demographic information, such as age, gender, and concomitant conditions like diabetes, hypertension, and chronic renal disease, was gathered. Prescriptions for reserve antibiotics were noted, with particular attention paid to the kind, dosage, and length of treatment, as well as whether the prescriptions were therapeutic (based on verified microbiological evidence) or empirical (based on

clinical judgment). The most commonly given antibiotics were linezolid, teicoplanin, and meropenem. Adverse events such as renal difficulties and gastrointestinal problems were recorded, and clinical outcomes were categorized as stable, recovered, or deceased.

In order to protect participant privacy and anonymity, ethical permission was acquired before the study began, guaranteeing tight secrecy and granting only the principal investigator access to patient data.

VI.RESULTS

I. Age Distribution

The distribution of patients across age groups reveals key trends in the use of reserve antibiotics among geriatric patients. The 70–74 age group has the highest frequency, with 40 patients (25%), followed by the 75–79 years group, including 35 patients (21.9%). These age groups are the most likely to receive reserve antibiotics, likely due to higher vulnerability to infections and comorbidities. The 65–69 years group has 30 patients (18.8%), and the 60–64 years group includes 25 patients (15.6%), indicating that reserve antibiotics are also frequently prescribed to younger geriatric patients. However, the frequency decreases with age, with the 80–84 years group having 20 patients (12.5%) and the 85–89 years group the least affected, with just 10 patients (6.3%). Overall, the majority of prescriptions (47%) are concentrated in the 70–79 years group, highlighting the need for focused antibiotic stewardship in this high-risk population.

Age Group (Years)	Frequency
60–64	25
65–69	30
70–74	40
75–79	35
80–84	20
85–89	10
Total	160

Table 1: Age Distribution

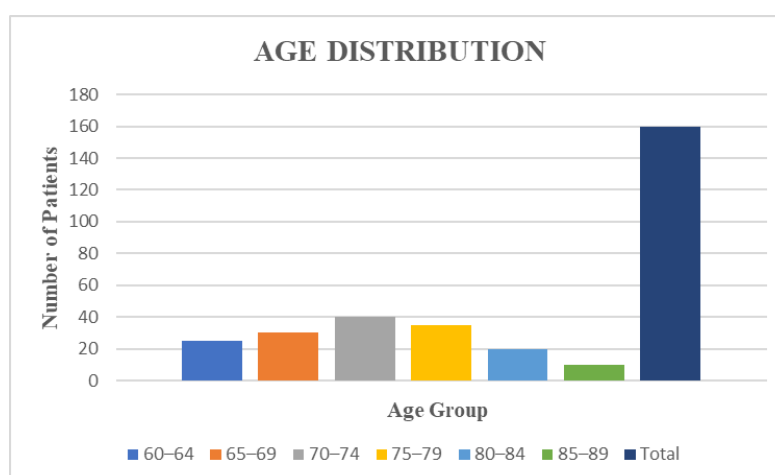


Figure 1: Age Distribution

II. Comorbidities

The data set reveals the comorbidity distribution among the 163 geriatric patients prescribed reserve antibiotics. The most common comorbidity is hypertension (73.6%), followed by diabetes mellitus (52.1%), highlighting the prevalence of chronic conditions in this population. Coronary artery disease (30.7%) and chronic kidney disease (24.5%) are also significant, requiring careful antibiotic management due to potential complications. Other notable comorbidities include COPD (15.3%), stroke (9.2%), and cancer (6.1%), which can complicate infection treatment. The presence of these comorbidities emphasizes the importance of individualized treatment approaches, considering how these conditions may influence antibiotic effectiveness and patient outcomes.

Comorbidity	Frequency	Percentage
Hypertension	120	73.60%
Diabetes Mellitus	85	52.10%
Coronary Artery Disease	50	30.70%
Chronic Kidney Disease	40	24.50%
Chronic Obstructive Pulmonary Disease (COPD)	25	15.30%
Stroke	15	9.20%
Cancer	10	6.10%
Asthma	12	7.40%
Other	5	3.10%

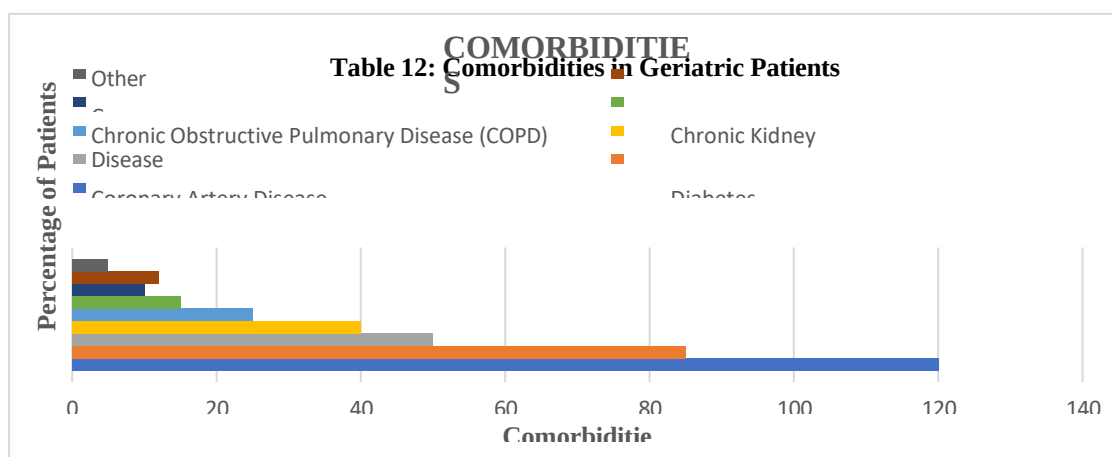


Figure 2: Comorbidities in Geriatric Patients

III. Number of Reserve Antibiotics Used Per Patient

The table indicates the distribution of the number of reserve antibiotics prescribed to geriatric patients. Most patients, 120 (73.8%), were prescribed only 1 reserve antibiotic, suggesting that most cases required a single strong antibiotic to manage the infection. A smaller group of patients, 30 (18.4%), were prescribed 2 reserve antibiotics, reflecting more complex infections that required dual antibiotic therapy. 10 patients (6.1%) received 3 reserve antibiotics, indicating highly complex or multi-drug-resistant infections. In comparison, only 3 patients (1.8%) required 4 reserve antibiotics, highlighting extreme cases of infection where a broad-spectrum or combination approach was necessary. This distribution underscores the varying severity of infections in geriatric patients and the tailored approach to antibiotic therapy based on the clinical situation.

Number of Reserve Antibiotics	Frequency	Percentage
1	120	73.80%
2	30	18.40%
3	10	6.10%
4	3	1.80%

Table 3: Number of Reserve Antibiotics Per Patient

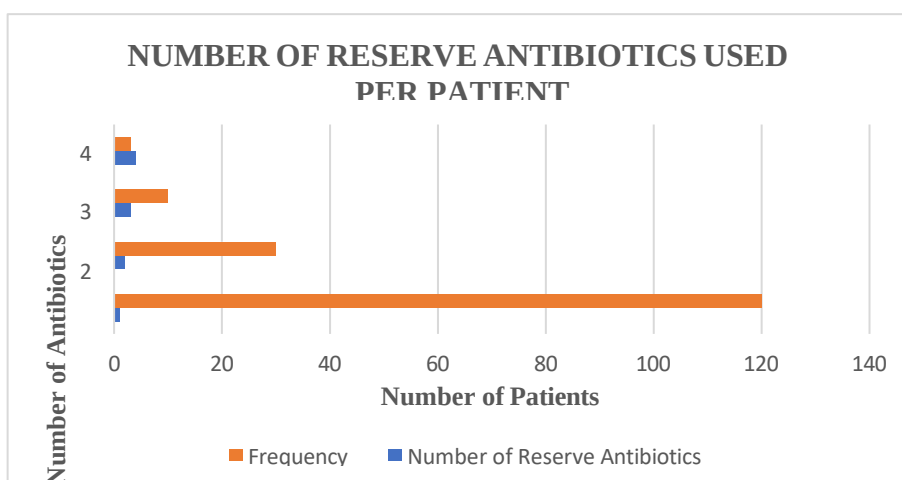


Figure 3: Number of Reserve Antibiotics Used Per Patient

IV. Mode of Antibiotic Use

The data on the use of reserve antibiotics among geriatric patients reveals that out of 163 prescriptions, 35 (21.5%) were made empirically, relying on clinical judgment without microbiological evidence. This indicates that these prescriptions were likely based on the urgency of the clinical situation or limitations in obtaining diagnostic results in time. On the other hand, 128 patients (78.5%) received antibiotics therapeutically, with prescriptions supported by confirmed microbial evidence. This high percentage of therapeutic use reflects a strong adherence to evidence-based practices and demonstrates effective antimicrobial stewardship. However, the notable proportion of empirical prescriptions underscores the need to enhance diagnostic accessibility and turnaround times to further reduce empirical use and optimize antibiotic prescribing.

Antibiotic Use	Frequency	Percentage
Empirical Use	35	21.50%
Therapeutic Use	128	78.50%

Table 4: Mode of Antibiotic Use

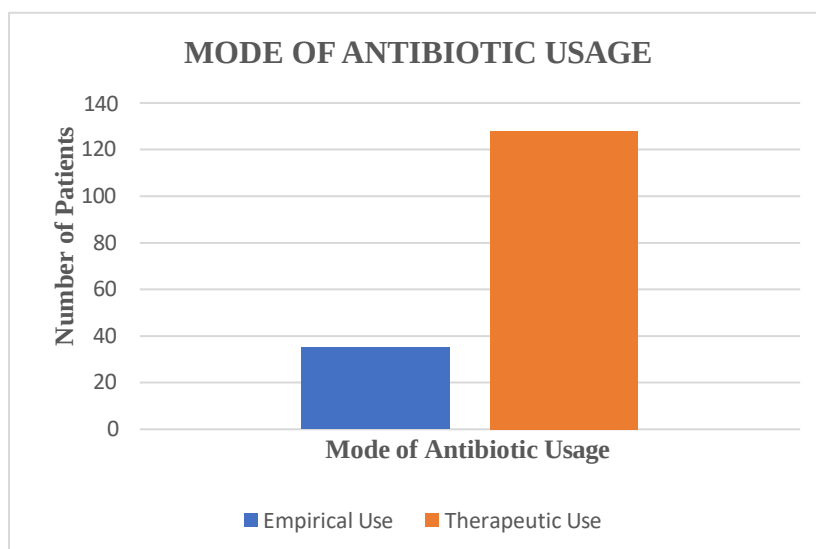


Figure 4: Mode of Antibiotic Usage

V. Duration of Antibiotic Use

The majority of patients (42.9%) received reserve antibiotics for a duration of 4-7 days, followed by 27.6% of patients who were prescribed antibiotics for 1-3 days. A smaller proportion of patients (21.5%) had antibiotic use lasting 8-14 days, and only 8% of patients received antibiotics for more than 14 days. This suggests that the majority of reserve antibiotic prescriptions are relatively short-term, indicating either effective initial therapy or quick resolution of the underlying infections.

Duration (Days)	Frequency	Percentage
1-3	45	27.60%
4-7	70	42.90%
8-14	35	21.50%
>14	13	8.00%

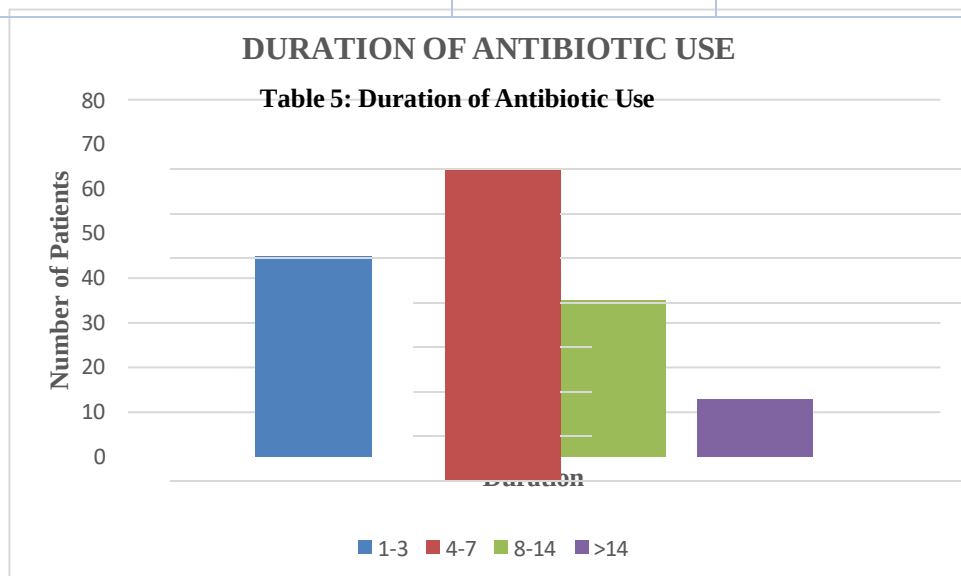


Figure 5: Duration of Antibiotic Use

VI. Outcomes

The clinical outcomes of the geriatric patients who were prescribed reserve antibiotics show that the majority of patients had stable outcomes, accounting for 64.4% of the total. A significant portion of patients recovered (31.9%), while a small percentage, 3.7%, died. This indicates that, while the use of reserve antibiotics in geriatric patients is associated with positive clinical outcomes for most, there remains a small but concerning number of patients who experience fatal results.

Outcome	Frequency	Percentage
Stable	105	64.40%
Recovered	52	31.90%
Death	6	3.70%

Table 6: Outcomes

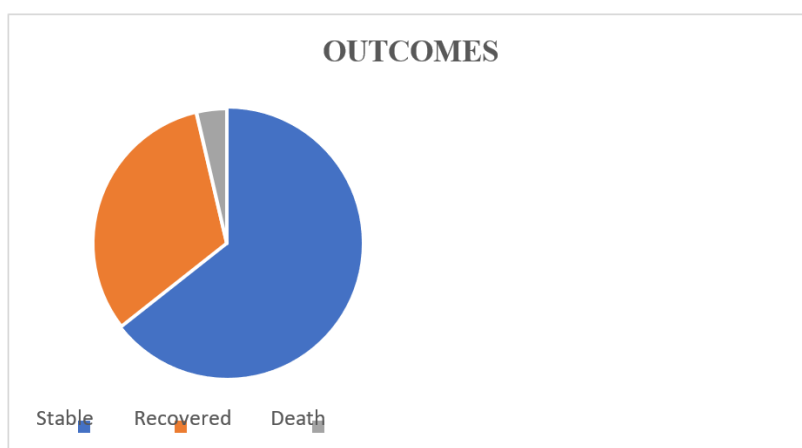


Figure 6: Outcomes Chi-Square Test Results Interpretation

Test Statistic	Value
Pearson Chi-Square	110
Degrees of Freedom (df)	100
p-value	0.232
Interpretation	Fail to reject the null hypothesis
Conclusion	No statistically significant relationship between comorbidities and the use of reserve antibiotics in geriatric patients
Test Statistic	Value

Pearson Square	Chi-	72
Degrees of Freedom (df)	of	64
p-value		0.23
Interpretation		Fail to reject the null hypothesis
Conclusion		No statistically significant association between the department and the use of reserve antibiotics.

DISCUSSION

The findings of this study are consistent with trends reported in prior research on reserve antibiotic usage in geriatric populations. A study by Adebisi et al. (2020) highlighted the predominance of meropenem and teicoplanin among reserved antibiotics, underscoring their essential role in combating multidrug-resistant organisms. Similarly, the present study found meropenem (27.6%) to be the most commonly prescribed, aligning with global stewardship programs prioritizing this antibiotic's controlled use.

In a retrospective analysis by Kollef et al. (2019), empirical antibiotic prescriptions accounted for 25% of all cases in critically ill patients, close to the 21.5% observed in this study. These results reaffirm the challenge of balancing timely initiation of antibiotics against the risks of overuse and resistance.

In terms of clinical outcomes, Shah et al. (2022) observed that 30% of geriatric patients recovered completely post-antibiotic therapy, which parallels the 31.9% recovery rate in this study. This consistency across studies suggests that appropriate antibiotic use in elderly populations can lead to favourable outcomes.

The study underscores the importance of adhering to WHO AWaRe guidelines for optimizing antibiotic usage in tertiary care settings. The high proportion of therapeutic prescriptions supported by microbial evidence (78.5%) reflects an encouraging trend; however, further reducing empirical use through rapid diagnostic tools is essential.

The findings of this study emphasize the critical need for targeted strategies to optimize antibiotic use, particularly in the geriatric population. Strengthening diagnostic capabilities through the implementation of rapid diagnostic tools and point-of-care testing can significantly reduce empirical antibiotic prescriptions, ensuring timely and precise therapy. Additionally, conducting regular educational interventions for healthcare providers on evidence-based prescribing practices is essential, with a focus on the judicious use of reserve antibiotics. Department-specific stewardship programs tailored to high-prescribing specialties, such as Nephrology, Neurosurgery, and Cardiothoracic Surgery, can further enhance compliance with WHO AWaRe guidelines. Robust adverse event monitoring systems should be established to track and address potential safety concerns effectively. Lastly, reinforcing the importance of optimizing antibiotic duration by promoting shorter courses when clinically appropriate can help mitigate resistance while maintaining therapeutic efficacy. These measures collectively aim to improve patient outcomes, reduce antimicrobial resistance, and ensure the sustainable use of reserve antibiotics in tertiary care hospitals. Additionally, clinical pharmacists are integral to antimicrobial stewardship programs, where they conduct audits, educate healthcare teams on WHO AWaRe classifications, and advocate for diagnostic-driven prescribing. These efforts collectively help minimize antimicrobial resistance while improving therapeutic outcomes.

VII.CONCLUSION

The study on reserve antibiotic use and clinical outcomes in geriatric patients provides valuable insights into the prescribing practices, clinical justification, and outcomes associated with the use of high-end antibiotics in a vulnerable population. Through an in-depth analysis of various parameters, including age, gender, comorbidities, departmental distribution, microbial evidence, and the clinical outcomes of antibiotic usage, it was evident that meropenem and teicoplanin were the most frequently prescribed reserve antibiotics, with empirical use being more common than therapeutic use.

The findings highlight that the majority of patients prescribed reserve antibiotics had a stable clinical outcome,

with a smaller portion of patients recovering and a few unfortunately passing away. These outcomes suggest that the judicious use of reserve antibiotics in a hospital setting may be linked to better clinical management and potentially reduced mortality in the geriatric population. Additionally, the study underscores the importance of appropriate justification and microbial evidence in the prescription of reserve antibiotics, which can significantly reduce the risk of antimicrobial resistance.

From a clinical perspective, the study emphasizes the need for robust antibiotic stewardship programs, especially in geriatric care. Older adults often have multiple comorbidities, which complicate treatment decisions, making them more susceptible to infections. It is therefore crucial for healthcare providers to carefully evaluate each case and ensure that reserve antibiotics are used only when necessary, supported by clear microbial evidence and in accordance with established protocols.

The role of clinical pharmacists emerged as vital in promoting rational use of antibiotics through collaborative efforts, monitoring adverse events, and participating in antimicrobial stewardship programs. These findings underscore the importance of ongoing education, stewardship, and multidisciplinary approaches to optimize antibiotic use and mitigate resistance. Strengthening these interventions can improve patient outcomes while ensuring the prudent use of reserve antibiotics, particularly in high-risk geriatric populations.

The study also offers a foundation for further research in this area, particularly with a focus on long-term impacts, potential side effects, and resistance patterns, which are crucial in addressing the growing concern of antimicrobial resistance in healthcare settings. Future studies may expand on this work by including a larger, more diverse population and by assessing the broader impact of educational interventions on antibiotic prescribing behaviors.

SUMMARY

This thesis examines the usage of expensive or restricted antibiotics in elderly patients at a Hyderabad tertiary care facility. Given that the elderly are particularly vulnerable to infections and comorbidities, the study sought to evaluate the safety, clinical results, and prescribing trends of these antibiotics in this population. Data on age, gender, comorbidities, antibiotic prescriptions, and clinical outcomes were gathered from 163 elderly individuals during a six-month period.

According to the survey, the most often prescribed reserve antibiotics were teicoplanin and meropenem, with a significant portion of prescriptions being supported by microbiological data. A lesser percentage of patients recovered, a few sadly died, and the remainder experienced stable clinical results. In order to minimize empirical antibiotic use and optimize treatment based on microbiological data, the study also emphasized the significance of antibiotic stewardship.

The results emphasize the need for targeted initiatives to reduce antibiotic resistance and improve senior patients' quality of life. The study promotes strong antibiotic stewardship programs and the role of clinical pharmacists in ensuring responsible antibiotic use. In addition to offering helpful information into the safe and effective use of costly antibiotics in vulnerable populations, this study makes recommendations for future developments in clinical processes.

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