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Prescription Patterns of Antimicrobial Agents Prescribed Empirically in The Emergency Medicine Department in a Tertiary Care Hospital

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Abstract

Antibiotics are essential in fighting infections by disrupting bacterial functions, but their misuse contributes to antibiotic resistance. Bacteria adapt through genetic mutations or gene transfer, reducing drug effectiveness. This study examines antibiotic prescribing patterns in the Emergency Department (ED), a critical setting for antimicrobial use due to its 24/7 services. Over six months, data from case reports and patient sheets at emergency department of a tertiary care hospital were analyzed, focusing on patients receiving antibiotics at admission. Exclusion criteria included post-culture prescriptions, pregnant or lactating women, and post-admission fatalities. Among 452 ED admissions, 320 involved antibiotic use. The average patient age was 50.53 years, with females accounting for 41.88% of cases. Peak admissions were between 2:00–4:00 PM, and common complaints included fever (13.53%) and breathlessness (9.81%). Frequent diagnoses were COPD (7.37%), hypertension (5.31%), and sepsis (3.44%). Ceftriaxone 1gm was the most prescribed antibiotic (43.32%), with intravenous administration in 84.38% of cases and an average initiation time of 2 hours and 13 minutes. Empiric therapy dominated (61.25%). This study provides valuable insights into ED antibiotic prescribing trends, highlighting areas to improve care and optimize antimicrobial stewardship.

Keywords: Antibiotics, Emergency Department, Prescription pattern.

Introduction

Antimicrobial agents are substances designed to combat microorganisms, including bacteria, viruses, fungi, and parasites. Among these, antibiotics are a specialized subgroup used primarily for bacterial infections. Antibiotics work by disrupting essential bacterial processes, either killing bacteria (bactericidal) or inhibiting their growth (bacteriostatic). This unique mechanism, while effective, also promotes the development of antibiotic resistance—a global health challenge that renders infections increasingly difficult to treat. Resistance arises through genetic mutations or gene transfer among bacteria, processes accelerated by the misuse or overuse of antibiotics.[1]

Antibiotics have significantly advanced medical practices since their introduction. The first antibiotic, salvarsan, was used in 1910, and penicillin's discovery in 1928 marked the beginning of a golden age of antibiotic development, drastically extending human lifespan by 23 years.[2] However, a decline in antibiotic discoveries, coupled with rising antimicrobial resistance (AMR), has created a healthcare crisis.

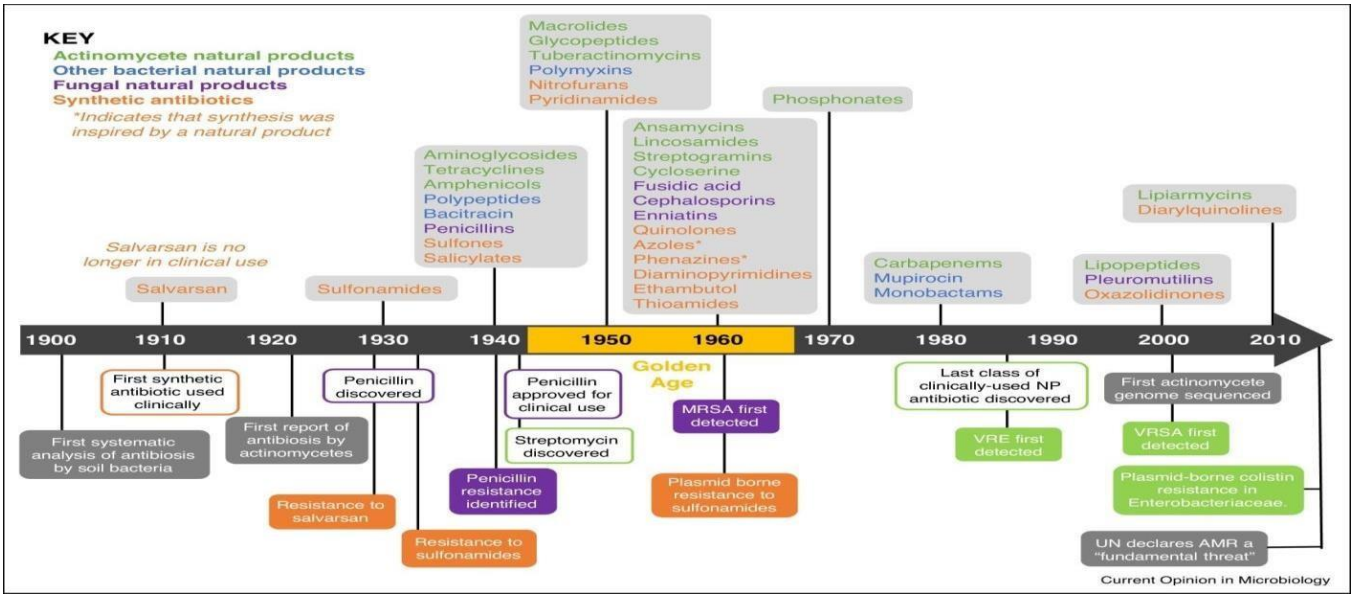


Figure1. Timeline showing the decade new classes of antibiotic reached the clinic. The antibiotics are coloured per their source: green = actinomycetes, blue = other bacteria, purple = fungi and orange = synthetic. At the bottom of the timeline are key dates relating to antibiotic discovery and antimicrobial resistance, including the first reports of drug resistant strains methicillin-resistant *S. aureus* (MRSA), vancomycin-resistant enterococci (VRE), vancomycin-resistant *S. aureus* (VRSA) and plasmid-borne colistin resistance in Enterobacteriaceae.[2]

Inappropriate antibiotic use, driven by patient demand, diagnostic uncertainty, and time pressures on clinicians, has fueled resistance. This necessitates judicious use of antibiotics to preserve their effectiveness.[3]

Antibiotics are among the most misused drugs globally, leading to widespread AMR. Pathogen resistance emerges from selective pressure, exacerbated by improper prescribing and dosing practices. Mechanistically, antibiotics achieve their effects through actions like inhibiting cell wall synthesis, protein synthesis, or nucleic acid synthesis.

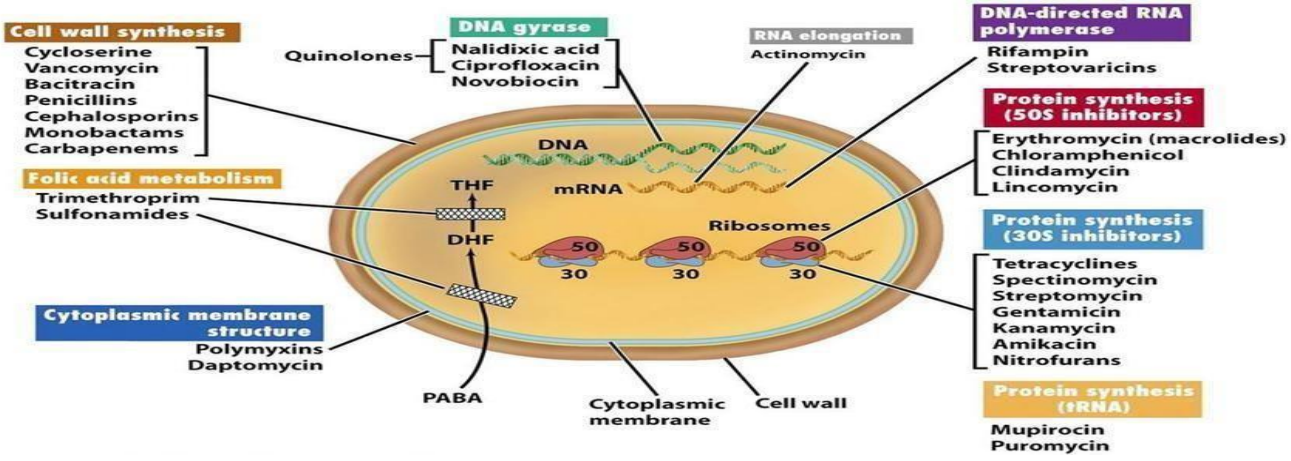
Five Basic Mechanisms of Antibiotic Action against Bacterial Cells [5]

1. Inhibition of Cell Wall Synthesis (most common mechanism)
2. Inhibition of Protein Synthesis (Translation) (second largest class)
3. Alteration of Cell Membranes
4. Inhibition of Nucleic Acid Synthesis
5. Antimetabolite Activity

The pharmacology behind their classification involves understanding the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). A bactericidal antibiotic has an MBC to MIC ratio ≤4, while bacteriostatic antibiotics exhibit a ratio >4, though some bacteriostatic agents can show bactericidal activity depending on conditions.[4]

Antimicrobial resistance is an inevitable consequence of antibiotic exposure. Indiscriminate prescribing amplifies unnecessary selection pressure, accelerating the spread of resistant bacteria. This issue is particularly pronounced in Emergency Departments (EDs), where clinicians often prescribe broad-spectrum antibiotics empirically due to the urgency of care and limited time for microbiological confirmation.[8] While prompt administration of antibiotics is critical in life-threatening conditions like sepsis—where delays increase mortality by 7.8% per hour—such practices can lead to inappropriate selection, increasing AMR risks.[8]

Figure2. Antibiotic target sites (Madigan and Martinko, 2006)



Emergency Departments, operating 24/7, are pivotal in antimicrobial stewardship. EDs serve as the first point of contact for critically ill patients, and their practices influence both outpatient and inpatient settings. Studies reveal alarming trends in antibiotic overuse in EDs, such as 63% of acute respiratory infections receiving antibiotics, often unnecessarily.[6] Similarly, inappropriate prescribing rates for conditions like urinary tract infections (UTIs) have reached 65% in some settings.[9] These practices contribute significantly to AMR, limiting treatment options for hospital-acquired infections and increasing patient mortality and treatment costs.[10]

To address AMR effectively, strategies must focus on reducing unnecessary antimicrobial use. This includes raising awareness, improving diagnostic accuracy, and promoting adherence to evidence-based guidelines.8 While empiric therapy is necessary in many ED scenarios, balancing urgent treatment with antibiotic stewardship is essential to minimize adverse effects, prevent treatment failure, and reduce AMR prevalence.

In conclusion, antibiotics remain a cornerstone of modern medicine, but their misuse threatens their efficacy. Emergency Departments, as major contributors to antimicrobial use, must lead efforts in optimizing antibiotic prescribing. Responsible practices can preserve the gains achieved in infectious disease management, ensuring improved patient outcomes and combating the growing threat of AMR.

Purpose of the study

The aim of the present study is:

A) To describe the prescribing patterns of antibiotics in emergency department.

The objectives of the present study are:

1. To describe the prescribing patterns of antibiotics prescribed empirically in emergency department

based on provisional diagnosis, indications and route of administration.

2. To identify the time gap between admission to Emergency Department and 1st antibiotic administered.

Material and Methods

This observational study, conducted over six months in the Emergency Medicine Department at ESIC MC-PGIMSR, Bengaluru, aims to analyze antibiotic prescribing practices. Data sources include case report forms and patient case sheets. Patients who received at least one antibiotic upon presentation or admission were included, while those prescribed antibiotics post-culture sensitivity, pregnant or lactating women, and post-admission fatalities were excluded. Data collection involved using validated forms to record demographic details, medical conditions, vitals, systemic examinations, adverse events, and medication specifics, including dose, route, frequency, and duration. Collected data were entered into Microsoft Excel for descriptive analysis and analyzed using SPSS (Version 25) for advanced statistical evaluation, including means, standard deviations, ranges, frequencies, and percentages. Using the Kish Leslie formula, with assumptions of a 95% confidence level, an 80% population proportion, and a 5% margin of error, the required sample size was estimated at 283 from an eligible population of approximately 4000 patients over 100 days. This study seeks to provide insights into prescribing patterns, patient characteristics, and healthcare practices, addressing key aspects of antibiotic use in emergency medicine.

Inclusion Criteria:

A. Patient presented /admitted to emergency department given at least one antibiotic.

Exclusion Criteria:

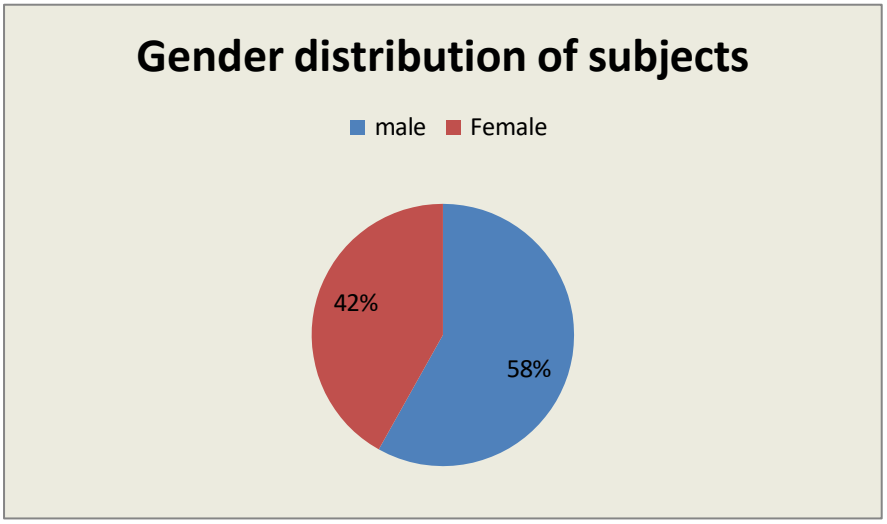
A. Patients prescribed with antibiotics after culture sensitivity report available.
B. Pregnant and lactating women.
C. Patient died after admission.

Results:

During the study period, a total of **452 patients** were admitted to the Emergency Department, and upon meticulous verification of case files, **320 patients**, constituting **70.79%** of the total, were identified as having been prescribed antibiotics, making them the focus of the study **(N=320).** The mean age of the subjects was

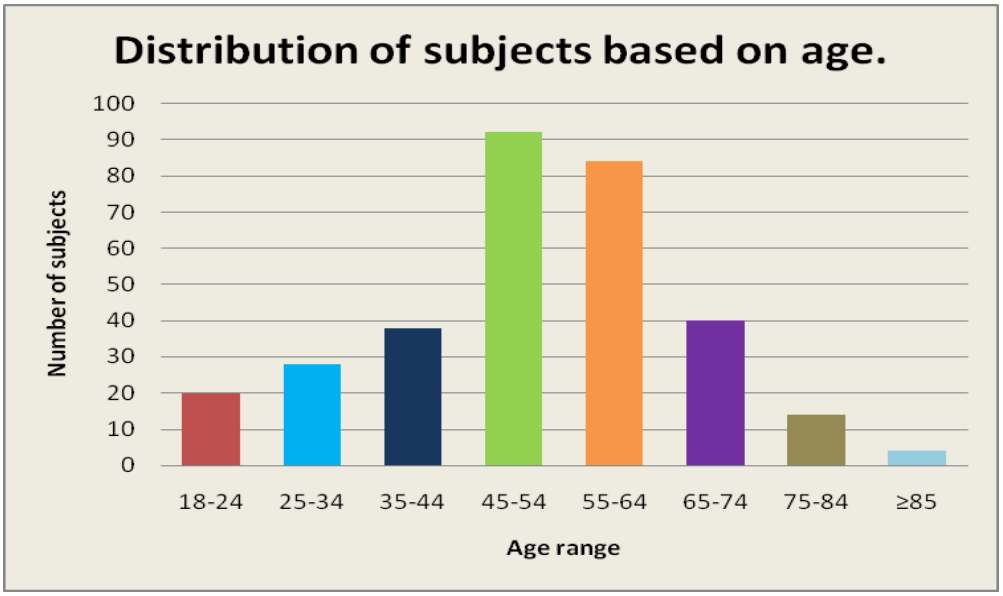
calculated to be **50.53**, with a median age of **53**, indicating a central tendency in the age distribution. In terms of gender distribution, the study comprised **186** male subjects and **134** female subjects, reflecting a slightly higher representation of males in the dataset.

Figure4. Gender distribution of subjects



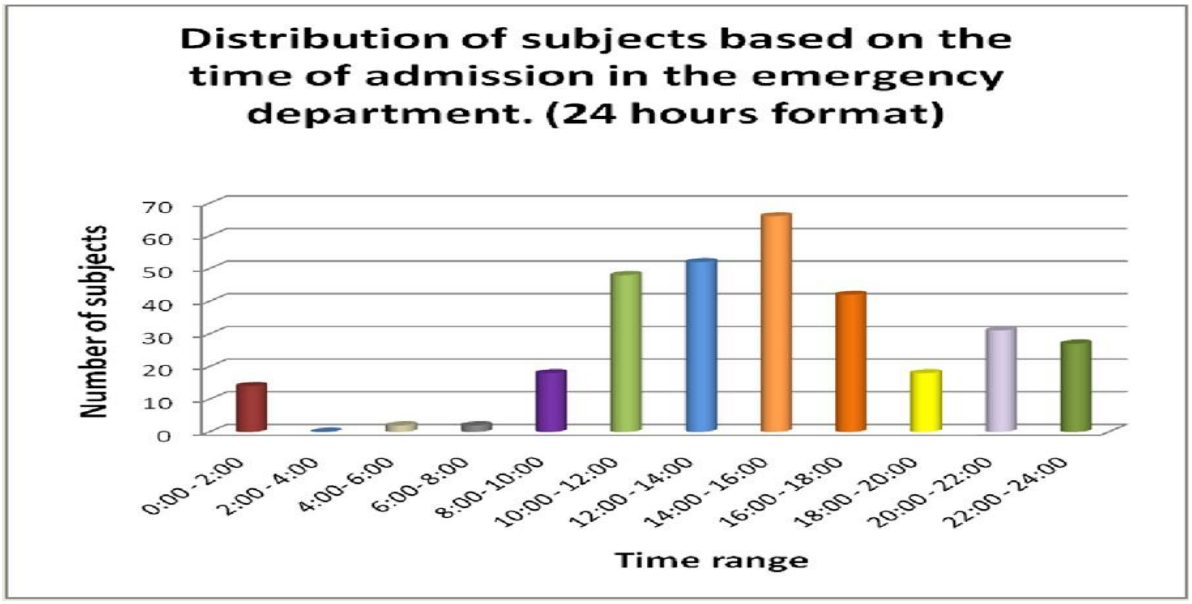
In our study total number of male patients was 186 (58.125%) and female was 134 (41.875%) total 320 patients included in the study.

Figure5. Distribution of subjects based on age



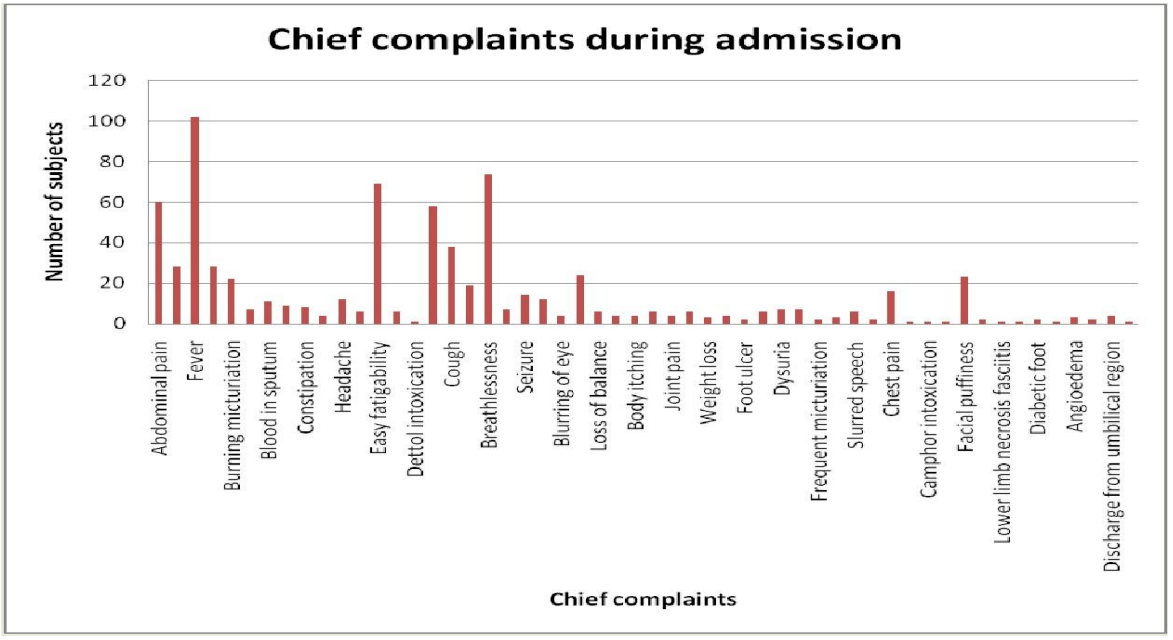
Most of the subjects presented to the ED fall between 45 to 54 years age (28.75%) and 55 to 64years age (26.25%). With a mean age of 50.53(SD=15.15).

Figure 6. Distribution of subjects based on the time of admission in the emergency department. (24 hours format)



The distribution of subjects based on the time of admission in the emergency department reveals variations in patient influx throughout the day. The highest percentage of admissions occurs between 14:00 - 16:00, constituting 20.63% of cases, indicating a peak period of healthcare utilization. In contrast, the early morning hours from 2:00 - 4:00 show no admissions, highlighting a period of reduced admission rate into ED. The data provides valuable insights for resource allocation and staffing strategies, ensuring that healthcare facilities are equipped to handle varying admission patterns and optimize patient car

Figure7. Chief complaints of subjects



In the study subjects 52 different types of chief complaints were observed with the highest prevalence of Fever: 102 (13.53%), Breathlessness: 74 (9.81%), Abdominal Pain: 60 (7.96%), Vomiting: 58 (7.69%). These four chief complaints constitute a significant portion of the cases during admission, with fever being the most prevalent.

Figure8. Distribution of subjects presented with Central Nervous System related chief complaints

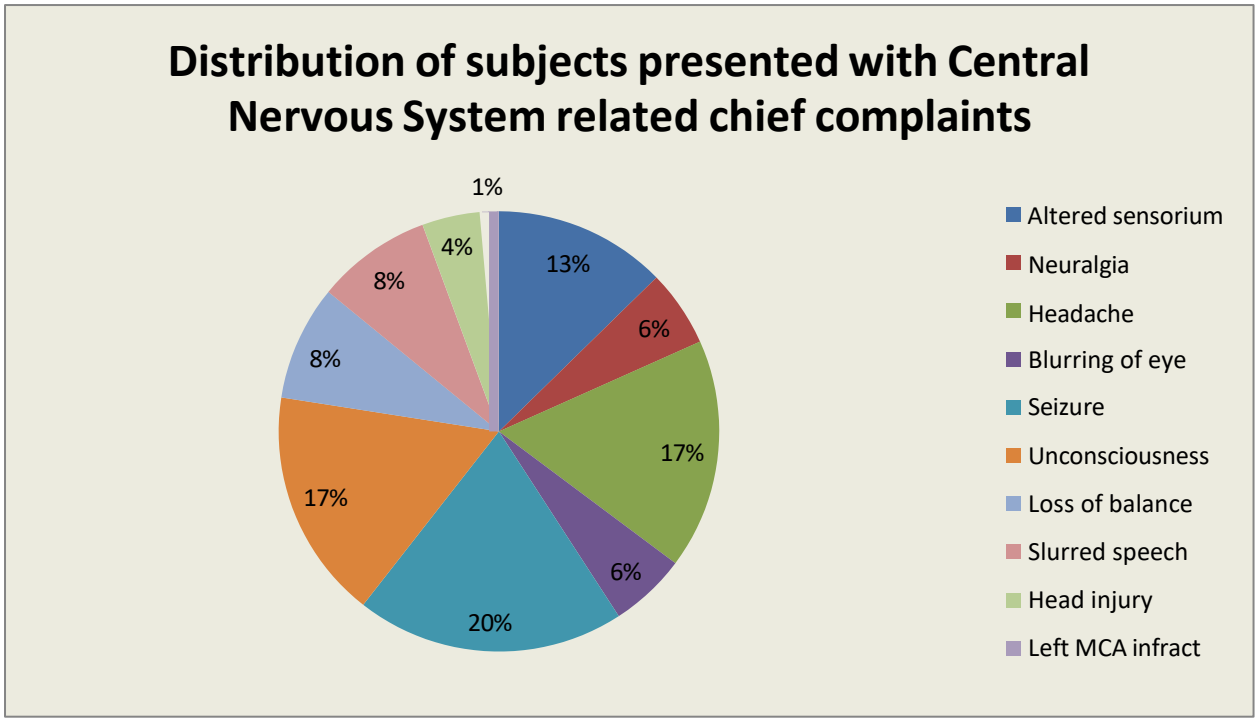


Figure 9. Distribution of subjects presented with *Gastrointestinal* related chief complaints.

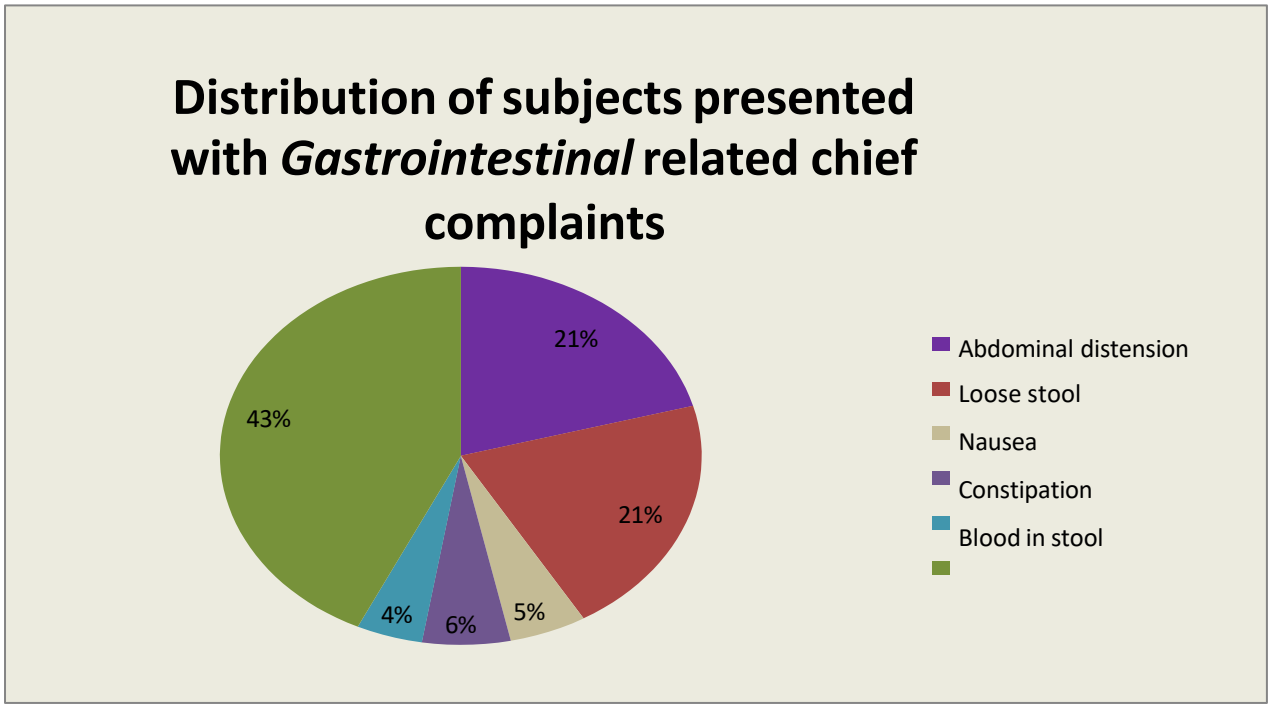
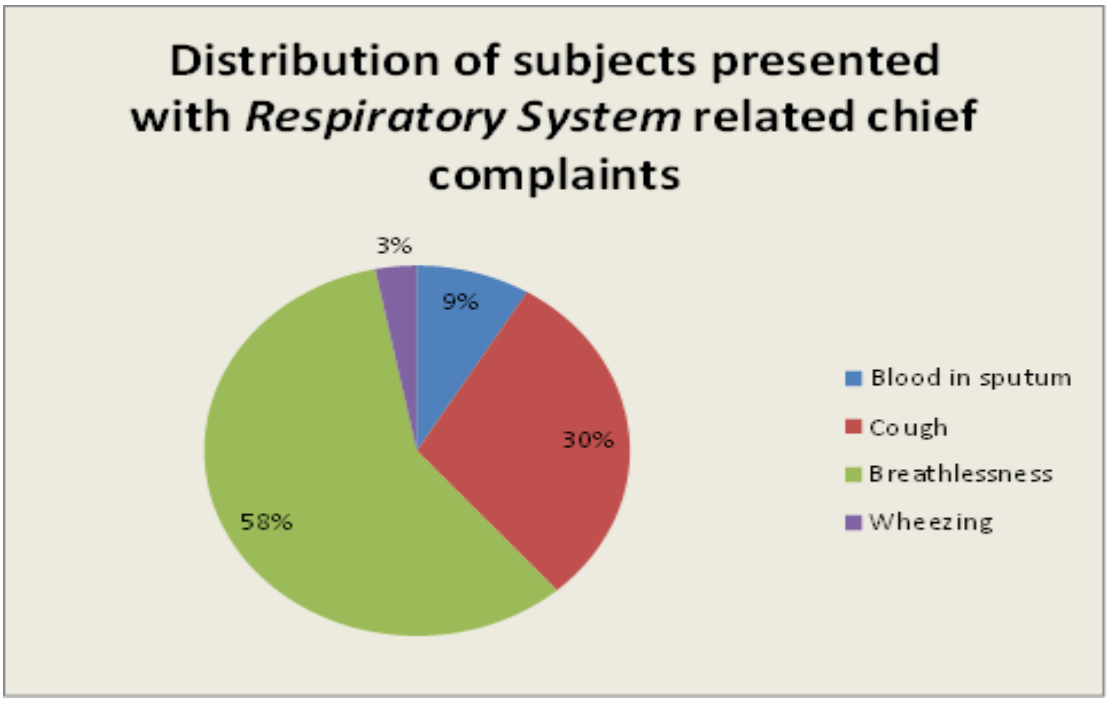
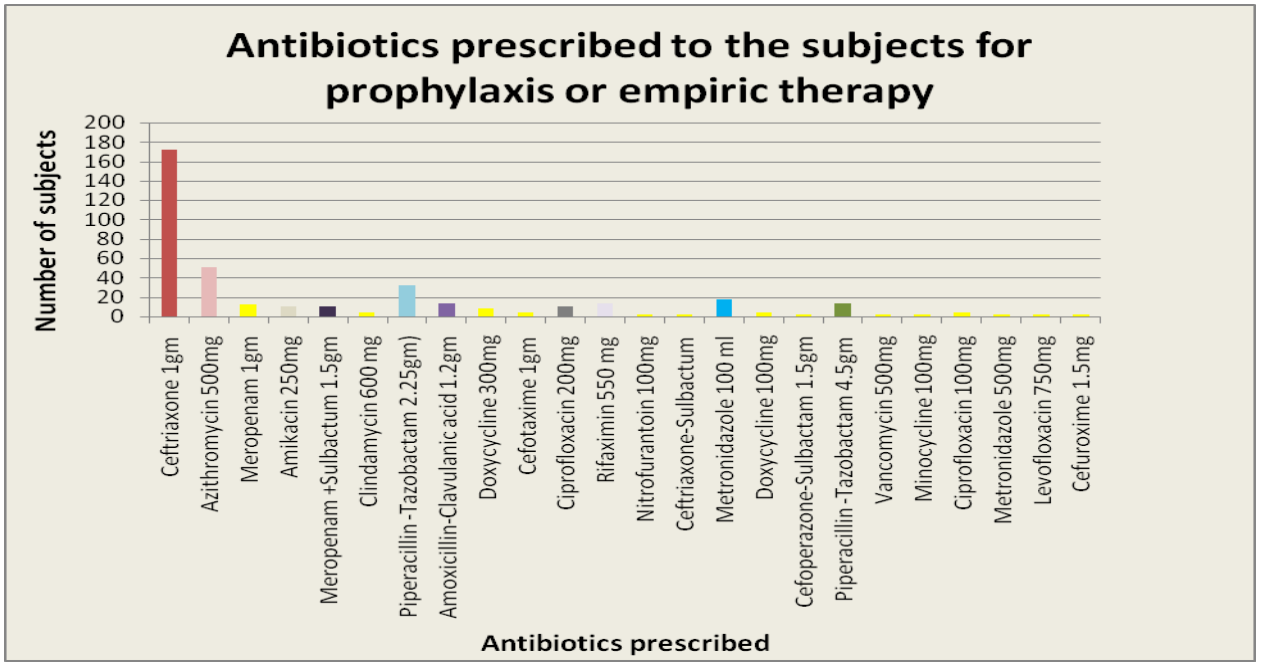


Figure 10. Distribution of subjects presented with Respiratory *system* related chief complaints.



The figures on the distribution of subjects based on provisional diagnosis provides a comprehensive overview of the health conditions encountered during admission. Among the various provisional diagnoses, Chronic Obstructive Pulmonary Disease (C.O.P.D.) emerges as the most common, constituting 7.37% of cases. Following closely are Type 2 Diabetes Mellitus (T2 D.M.) at 6.67%, Sepsis at 5.26%, and Hypertension at 4.56%. These four diagnoses collectively represent a substantial portion of the cases, highlighting the prevalence of respiratory and chronic conditions in the admitted subjects.

Figure11. Antibiotics prescribed to the subjects



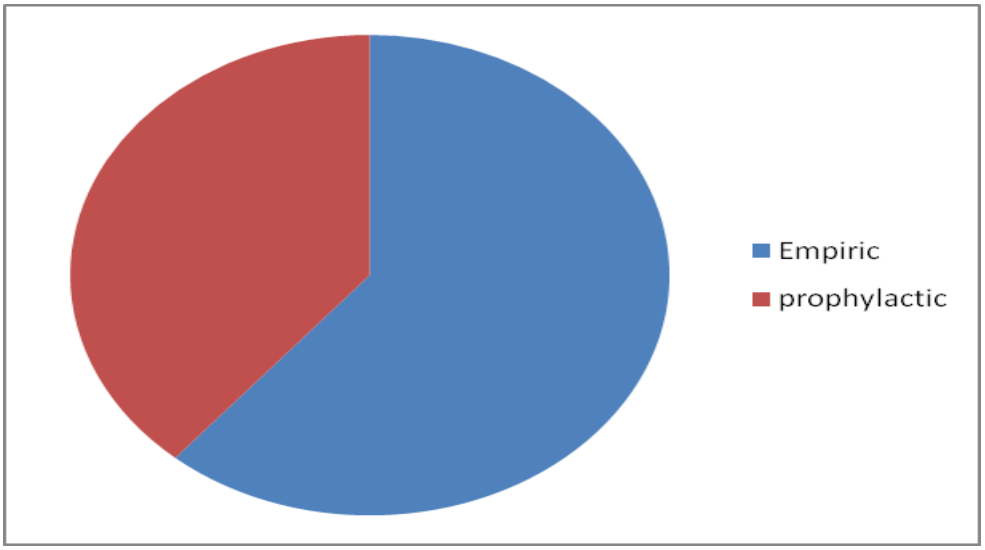
The data on antibiotic usage reveals notable patterns in prescribing behavior within the studied population. Ceftriaxone 1gm emerges as the predominant antibiotic, prescribed in 172 cases, constituting a substantial

43.32% of the total antibiotic usage. This numerical prominence emphasizes the widespread applicability and potential efficacy of Ceftriaxone in various clinical scenarios.

Azithromycin 500mg follows closely, with 51 instances, representing 12.85% of antibiotic prescriptions. The combination of a substantial numerical count and a considerable percentage indicates its significant role in clinical practice, possibly reflecting its effectiveness against specific infections.

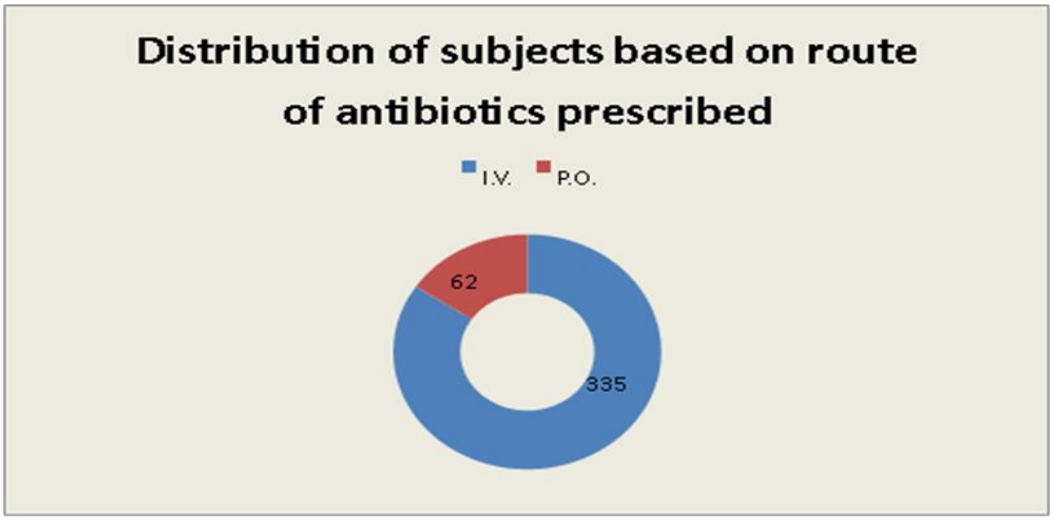
Meropenam 1gm, Amikacin 250mg, and Meropenam + Sulbactum 1.5gm each contribute around 2.5% of the total cases, with 12, 10, and 10 instances, respectively. These antibiotics, while less frequent, still play a notable role in the overall antibiotic prescription landscape. Piperacillin-Tazobactam 2.25gm is another noteworthy antibiotic, prescribed in 32 cases and representing 8.06% of antibiotic usage. This suggests a preference for this combination, possibly due to its broader spectrum of activity in the cases studied.

Figure 12. Distribution of subjects based on type of antibiotic therapy received



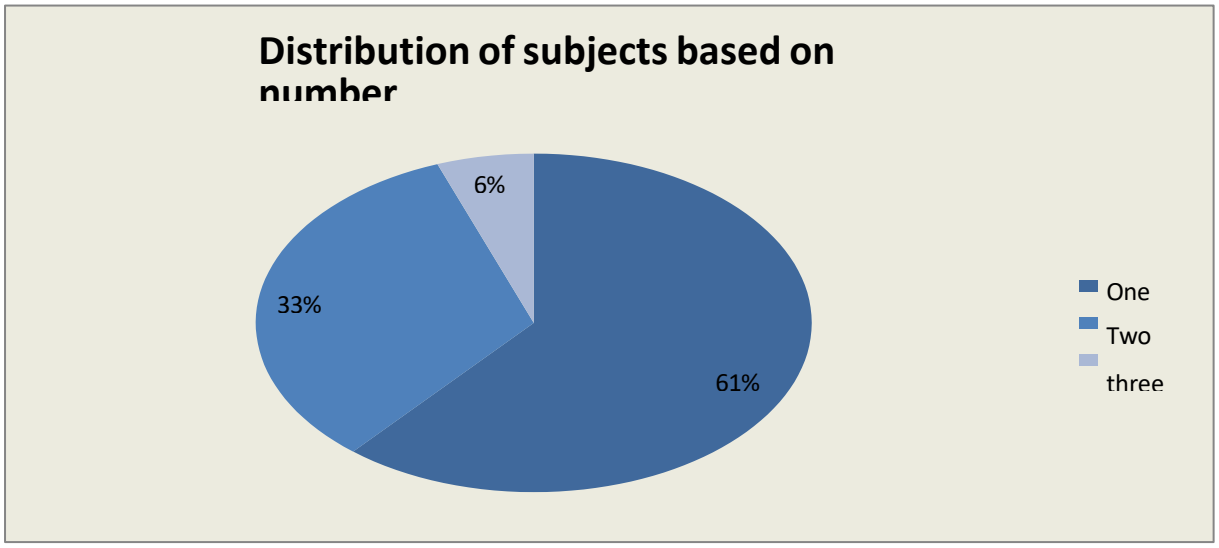
The distribution of therapy types indicates a predominant use of empiric therapy, with 61.25% of cases (196 instances) relying on broad-spectrum treatments initiated based on clinical judgment before specific pathogens are identified. Prophylactic therapy accounts for the remaining 38.75% (124 instances), underscoring the importance of preventative measures in clinical management.

Figure 13. Distribution of subjects based on route of antibiotics prescribed



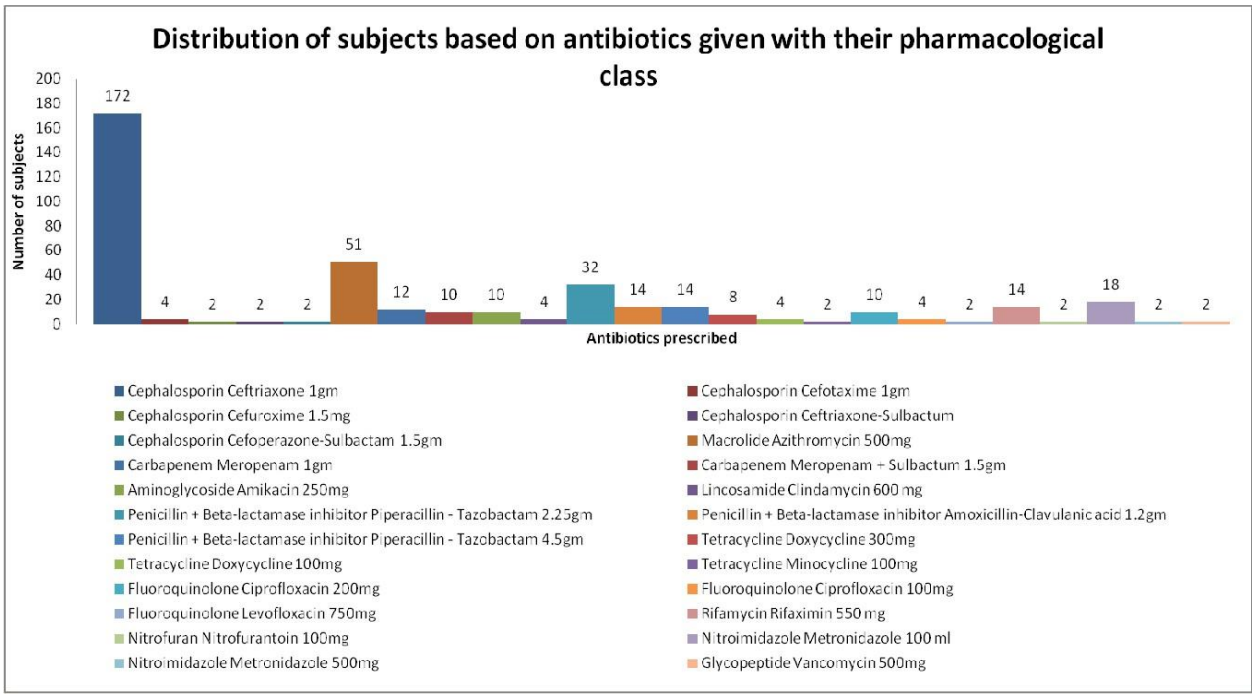
The majority of therapies administered in the studied population are intravenous (I.V.), comprising 84.38% of cases (335 instances). This prevalence suggests a reliance on intravenous routes, possibly indicating the severity of conditions or the need for rapid and direct drug delivery. Oral administration (P.O.) accounts for the remaining 15.62% (62 instances), underscoring the varied routes of drug administration in the clinical management of the subjects.

Figure 14. Distribution of subjects based on number of antibiotics prescribed as initial therapy



The distribution of the number of antibiotics prescribed highlights a predominant use of single-agent therapy, with 61.25% of subjects receiving only one antibiotic. Dual therapy is employed in 33.13% of cases, while a smaller percentage, 5.63%, involves the administration of three antibiotics. This nuanced breakdown underscores the varied approaches to antibiotic management, with a significant majority favoring a simpler, single-agent strategy.

Figure15. Distribution of antibiotic prescribed based on their pharmacology class



The data reveals a diverse landscape of prescribed antibiotics, with cephalosporins emerging as the most frequently prescribed class, representing almost half of the total antibiotics at 49.37%. Beta-lactams, including cephalosporins, contribute significantly with 15.11%, showcasing their widespread use. Macrolides are also prevalent, constituting 12.85% of the antibiotics and serving as a notable alternative to cephalosporins. Among the most frequently prescribed antibiotics, specific standout numbers include 196 for cephalosporins, 60 for beta-lactams, and 51 for macrolides. The lower percentages for Nitrofurantoin, Nitroimidazoles, glycopeptides, and fluoroquinolones suggest their more specialized and targeted use in specific clinical scenarios. The comprehensive data reflects a balanced approach in antibiotic prescription practices, emphasizing the importance of tailored treatment strategies.

In the antibiotic prescription data, diverse antibiotics have been prescribed to address a range of diseases being diagnosed, reflecting the complexity of medical cases in the hospital's emergency department. Notably, Ceftriaxone 1gm stands out as a versatile antibiotic prescribed for a multitude of conditions such as Lower Respiratory Tract Infections (L.R.T.I.), Urinary Tract Infections (U.T.I.), Chronic Obstructive Pulmonary Disease (C.O.P.D.), Stroke, Sepsis, Pneumothorax, Diabetic Ketoacidosis (D.K.A.), Dengue fever, Pyelonephritis, and Respiratory failure, indicating its broad-spectrum efficacy. Azithromycin 500mg is administered for conditions like viral fever and respiratory failure. Both of these are widely used for prophylactic purposes as well. Meropenam 1gm and Amikacin 250mg are targeted specifically at cases of sepsis and respiratory failure. Additionally, a combination of Meropenam and Sulbactam 1.5gm is employed for sepsis and respiratory failure. The antibiotic choices are predominantly empiric, emphasizing the urgency and immediate response required in the emergency setting. Some antibiotics, like Nitrofurantoin 100mg, are employed for Urinary Tract Infections. The numbers associated with each antibiotic highlight the prevalence and significance of these medications in managing a spectrum of critical medical conditions, underscoring the need for a well-rounded and strategic approach to antibiotic therapy in emergency care.

Analyzing the time difference between admission to the Emergency Department (ED) and the administration of the first antibiotic reveals important patterns in medical response in the cases required emergency response. The **mean time, averaging 2 hours and 13 minutes**, signifies the typical duration for patients to initiate antibiotic treatment after ED admission. The **standard deviation of 2 hours and 11 minutes** points to the extent of variability around this mean, indicating that the timing of antibiotic administration can exhibit significant fluctuations among patients mainly due to no antibiotic was administered from mid night (2:00) to early morning (6:00). The consistency is emphasized by the **median time of 2 hours**, underlining that half of the patients receive antibiotics within this timeframe.

Discussion

An observational prospective study was done to study the prescription pattern of antibiotics in the emergency medicine department of ESIC-PGIMSR, hospital, Bengaluru over 3 months.

Within the specified study period encompassing 452 Emergency Department admissions, a focused exploration targeted 320 patients, constituting 70.79% of the total, who were subjected to antibiotic prescriptions (N=320). This chosen subset unravels a narrative of prevalent antibiotic use in the emergency setting, shedding light on the clinical landscape and the challenges posed by antibiotic resistance. The calculated mean age of 50.53, coupled with a median age of 53.

The distribution of subjects based on age provides a comprehensive glimpse into the demographics of the studied population, unveiling patterns that are crucial for understanding the health dynamics within the

Emergency Department. Out of the total 320 patients across different age brackets, a notable concentration of subjects falls within the 45-54 years range, constituting 28.75% of the total. This highlights a demographic where individuals are more prone to emergency health issues, inviting further exploration into the specific health challenges prevalent in this age group. Moreover, the distribution across gender within each age category introduces nuances in health patterns. For instance, the 55-64 years age group exhibits a higher percentage of males (31.18%) compared to females (19.40%), prompting inquiries into potential gender-specific health concerns or healthcare- seeking behaviors. Additionally, the representation of subjects aged 75-84 years shows a gender discrepancy, with a slightly higher percentage of females (7.46%) than males (2.15%). These age- gender intersections offer valuable insights into the varied health profiles and considerations that healthcare professionals in the Emergency Department mustnavigate during the specified study period.

Examining the distribution of subjects based on the time of admission to the Emergency Department, intriguing patterns emerge, offering insights into the temporal dynamics of patient influx. The data, presented in a 24-hour format, indicates that the highest percentage of admissions occurred between 14:00 and 16:00, constituting a substantial 20.63% of the total subjects. This afternoon peak suggests a potential correlation with daily activities, lifestyles, or specific health conditions that prompt individuals to seek emergency care during these hours. Additionally, the time bracket of 10:00 to 12:00 and 12:00 to 14:00 also exhibited notable admission rates, at 15% and 16.25%, respectively, indicating a consistent flow of patients during the late morning and early afternoon. Surprisingly, the early morning hours, specifically between 2:00 and 4:00, registered no admissions, possibly reflecting a null in medical emergencies during this period. Overall, this temporal analysis contributes valuable context to the Emergency Department's functioning, aiding in resource allocation and optimizing patient care based on admission trends throughout the day.

The detailed analysis of chief complaints during admission in the Emergency Department offers a nuanced perspective on the varied health issues that prompted patients to seek immediate medical attention. Fever, identified in 13.53% of cases, underscores the significance of infectious or inflammatory conditions as a primary driver for emergency care. The high prevalence of breathlessness at 9.81% suggests the substantial impact of respiratory distress on the admitted population, possibly indicating acute respiratory conditions or exacerbations of chronic respiratory diseases.

Abdominal pain, with a prevalence of 7.96%, emerges as a common issue, pointing towards the importance of gastrointestinal concerns in the emergency setting. Similarly, vomiting at 7.69% highlights the frequency of cases involving gastrointestinal distress. These findings collectively emphasize the critical role of the Emergency Department in managing a wide array of medical issues, ranging from infectious diseases to respiratory and gastrointestinal emergencies.

The presence of chief complaints such as easy fatigability, cough, and seizures further adds to the complexity of cases encountered. Easy fatigability, noted in 9.15% of instances, might be indicative of systemic issues or underlying chronic conditions. Cough, at 5.04%, could signify respiratory infections or other pulmonary concerns, while seizures, observed in 1.86% of cases, highlight the importance of managing neurological emergencies in the emergency setting.

The subjects also include less common accidental cases, such as Dettol intoxication, hanging (attempted suicide), and camphor intoxication, each representing a minimal percentage. While these cases are infrequent, their inclusion underscores the diverse range of emergencies that healthcare professionals must be prepared to address. Facial puffiness, recorded in 3.05% of cases, may be indicative of systemic

conditions affecting multiple organ systems, further emphasizing the need for a comprehensive and multi-disciplinary approach in emergency care.

In summary, the detailed breakdown of chief complaints not only highlights the prevalence of specific health issues but also provides a deeper understanding of the spectrum of medical emergencies encountered in the Emergency Department. This information is crucial for healthcare professionals in tailoring their approach to patient care, ensuring effective and timely interventions based on the diverse clinical presentations observed in the studied population.

The provisional diagnoses recorded provide a comprehensive overview of the diverse medical conditions encountered in the Emergency Department during the specified study period. Chronic obstructive pulmonary disease (C.O.P.D.) stands out as a prevalent diagnosis, accounting for 7.37% of cases, underlining the significant burden of respiratory conditions on emergency healthcare services. Other respiratory conditions such as bronchitis, aspiration pneumonia, and bronchial asthma further contribute to the complexity of cases related to pulmonary health. Antibiotic prescriptions for non-bacterial respiratory tract infections (e.g. bronchitis, sinusitis, otitis media, non-specific URI) represent the most frequent source of unnecessary antibiotic prescribing in ambulatory care settings.[27]

Cardiovascular health is prominently represented, with diagnoses like hypertension, stroke, and cor pulmonale collectively making up a substantial portion of cases (13.77%). Additionally,cardiac issues such as congestive cardiac failure (C.C.F.) and acute decompensated heart failure (A.D.H.F.) are recorded, emphasizing the need for expertise in managing cardiovascular emergencies in the Emergency Department.

Infectious diseases are well-represented, with sepsis, viral fever, and dengue fever collectively constituting 9.82% of cases. These findings underscore the role of the Emergency Department in addressing a wide range of infectious conditions, each requiring tailored interventions and rapid response. There is a prominent research emphasis dedicated to identifying sepsis in the ED with a focus on targeting early initiation of antibiotics.[28] In septic shock, delays in antibiotic administration in the ED have been associated with increased mortality.[14]

Diabetes-related diagnoses, including diabetic foot ulcer and diabetic ketoacidosis (D.K.A.), highlight the challenges posed by metabolic conditions in emergency care. Similarly, acute kidney injury (A.K.I.), urosepsis, and non-obstructive renal calculi contribute to the understanding of renal health challenges encountered in the emergency setting.

The study also includes cases of intentional self-harm, with hanging (attempt to suicide) and analgesic overdose noted. These instances underscore the importance of addressing mental health concerns and providing comprehensive care for patients with suicidal ideation.

Less frequent but critical diagnoses include cases such as Leptospirosis, hypothyroidism, and hypersensitivity pneumonia, each requiring specialized attention. The inclusion of diverse diagnoses, from respiratory failure to bone fractures due to road traffic accidents (R.T.A.), reflects the multifaceted nature of emergencies handled in the Emergency Department.

In summary, the provisional diagnoses data illuminates the wide spectrum of medical conditions encountered in the Emergency Department, highlighting the need for a multidisciplinary approach, rapid diagnostics, and tailored interventions to address the diverse health challenges presented by the admitted patient population.

Analyzing the data related to the initial antibiotic therapy given to patients in the first 24 hours of admission, we observe distinct patterns in the number of antibiotics prescribed. The majority,

encompassing 61.25% of the total subjects (196 out of 320), received a singular antibiotic similar to the study result of *Nahyan Almansoori et al*[8] where majority of the patients having received single anti-microbial therapy (87.18%). This implies a prevalent medical strategy of commencing treatment with a focused and specific antibiotic, potentially based on a clear diagnosis or a preference for a targeted therapeutic approach. Conversely, a substantial portion, constituting 33.13% (106 out of 320), were administered two antibiotics, suggesting a more comprehensive or broad-spectrum treatment approach for specific medical scenarios. A smaller yet noteworthy percentage of patients, 5.625% (18 out of 320), received three antibiotics, indicating situations where a multidimensional strategy was deemed essential. This nuanced breakdown sheds light on the diverse antibiotic prescription practices within the Emergency Department, reflecting the complexity of medical decision-making and the array of conditions encountered during the study period.

Analyzing the data on antibiotics prescribed within the initial 24 hours of admission to the Emergency Department unveils a nuanced picture of the treatment landscape. The predominant antibiotic choice is Ceftriaxone 1gm, encompassing a substantial 43.32% of cases. This prevalence underscores its broad-spectrum efficacy, often making it a frontline option for diverse bacterial infections. Following closely is Azithromycin 500mg at 12.85%, indicating its particular relevance, especially in respiratory and related conditions. Prescribing broad-spectrum regimens to all patients may increase de novo resistance, C. difficile infection, antibiotic-related toxicities, and costs.[29]

Piperacillin-Tazobactam 2.25gm emerges as a notable choice, constituting 8.06% of prescriptions. This combination's inclusion aligns with its efficacy against a wide range of bacteria, emphasizing its role in managing complex infections. Meropenam 1gm and Meropenam + Sulbactum 1.5gm, at 3.02% and 2.52%, respectively, spotlight the significance of Carbapenems in severe infections where their potency is crucial.

The data underscores diversity with antibiotics like Amoxicillin-Clavulanic acid 1.2gm (3.53%), Clindamycin 600mg, Doxycycline 300mg, and Rifaximin 550mg. Each serves a specific purpose, demonstrating the need for tailored approaches to different clinical scenarios.

Metronidazole appears in both 100ml and 500mg forms, collectively representing 4.53% of cases, emphasizing its pivotal role in anaerobic infection management. Additionally, the practice hints at a thoughtful use of combination antibiotics, such as Ceftriaxone-Sulbactum, Cefoperazone- Sulbactam, and Piperacillin-Tazobactam 4.5gm, each contributing to a smaller percentage but reflecting a strategic consideration of combination therapy when warranted.

Less frequently prescribed antibiotics, including Vancomycin 500mg, Minocycline 100mg, and Levofloxacin 750mg, still play a vital role in specific contexts, reinforcing the importance of tailoring treatments to individual cases. The need for AMS regimens tailored to the ED environment to reduce unnecessary antibiotic exposure. This is particularly important given that the majority of antibiotic regimens prescribed in the ED continue unchanged by inpatient teams after 48 hours. It thus follows that antibiotic prescribing in the ED impacts the patterns of antibiotic use across the hospital.[14]

In essence, the antibiotic prescription patterns reveal a nuanced and adaptable approach in the Emergency Department, emphasizing the need for a diverse toolkit to effectively combat the spectrum of bacterial infections while maintaining a judicious and intentional use of antibiotics.

The distribution of prescribed antibiotics, categorized by their pharmacological classes, provides insights into the preferred therapeutic agents within the Emergency Department. Cephalosporins emerge as the predominant class, constituting 196 cases or 49.37% of the total antibiotics administered. This prominence

underscores the efficacy and versatility of cephalosporins in managing a diverse range of infections. Macrolides, comprising 51 cases or 12.85%, represent another significant category, highlighting their utility in specific clinical scenarios. Carbapenems and aminoglycosides, with 22 and 10 cases, respectively, contribute 5.54% and 2.52% to the overall distribution, underlining their niche roles in treating severe infections. The diversity of antibiotic classes is further emphasized by the presence of Lincosamides, beta-lactams, Tetracyclines, Rifamycins, Nitrofurantoin, Nitroimidazoles, Glycopeptides, and Fluoroquinolones, each occupying varying proportions. This comprehensive analysis aids in understanding the prescribing patterns, facilitating informed decisions for optimal antibiotic use tailored to the specific microbial landscape encountered in the Emergency Department.

The breakdown of therapeutic approaches in the Emergency Department during the study period provides valuable insights into the medical management strategies employed. Notably, 61.25% of patients received empiric therapy, reflecting a proactive stance in addressing potential infections. This approach indicates a willingness to swiftly initiate treatment based on clinical assessment and the immediate needs of the patients. Empirical antibiotic therapy (EAT) is unavoidable, especially for the first 24 to 48 hours, because of the absence of evidence (or laboratory test results) on the causative pathogen or its susceptibilities.[30] Conversely, 38.75% of cases involved prophylactic therapy, emphasizing a preventive aspect of medical care. Prophylactic interventions are often strategic, employed to mitigate the risk of infections, particularly in scenarios where patients may be vulnerable, such as before surgical procedures. The equilibrium between empiric and prophylactic therapies showcases a nuanced and patient-centric decision-making process within the Emergency Department, where therapeutic choices are tailored to the unique circumstances of each case.

In understanding how antibiotics were given to patients, it was observed that the majority, constituting 84.38% of the cases (335 out of 397), received antibiotics through intravenous (IV) administration. This indicates that a significant proportion of patients required immediate and direct delivery of antibiotics into their bloodstream, which is often crucial for swift and effective treatment. On the other hand, a smaller yet notable percentage, 15.62% (62 out of 397), received antibiotics through the oral (P.O.) route. This suggests that some patients were able to take antibiotics by mouth, which is a less invasive method compared to intravenous administration. The distribution of antibiotic administration routes provides insights into the medical practices employed, highlighting the preference for intravenous delivery, possibly driven by the need for rapid and targeted intervention in the Emergency Department setting.

The time difference between admission to the Emergency Department (ED) and the administration of the first antibiotic is a crucial aspect of emergency medical response. Early antibiotic administration is considered critical for certain infectious clinical syndromes, particularly septic shock and bacterial meningitis. However, unnecessary empirical broad-spectrum antibiotic therapy is associated with side effects and entails an ecological cost through the selection of resistant pathogens.[15] In our study, the mean time for initiating antibiotic treatment after ED admission is 2 hours and 13 minutes, with a standard deviation of 2 hours and 11 minutes, indicating notable variability. This variability is particularly influenced by the absence of antibiotic administration from midnight (2:00) to early morning (6:00). The median time of 2hours underscores the consistency, with half of the patients receiving antibiotics within this time frame.

Comparing this with the findings from the study by *Vincent X Liu et al.*[19] our data aligns closely with the overall median time to antibiotic administration reported in their research, which is 2.1 hours. This suggests a general similarity in the time taken to initiate antibiotic treatment in emergency situations.

The study by Liu et al.[19] highlights variations in median times based on different conditions, with the shortest time observed in patients with septic shock (1.7 hours) and the longest in patients with sepsis (2.3 hours). While our dataset lacks condition-specific breakdowns, the consistency in median time emphasizes a common trend.

Furthermore, *Liu et al.*[19] note that patients receiving earlier antibiotics had greater severity of illness and higher unadjusted mortality rates. This aligns with our observation that the timing of antibiotic administration can fluctuate significantly, potentially impacting patient outcomes. The study also provides insights into the frequency of antibiotic prescriptions, variations in antibiotic choices based on conditions, and the association between the number of antibiotics and sepsis severity, enriching our understanding of emergency antibiotic administration practices.

Conclusion

This observational prospective study, conducted over three months at ESIC-PGIMSR Hospital, Bengaluru, examines antibiotic prescription patterns in the Emergency Medicine Department. It highlights a high prevalence of antibiotic use in emergency cases, emphasizing the challenges of antibiotic resistance. The age group most commonly represented is 45–54 years, with gender-specific variations. Peak admissions occur in the afternoon, potentially linked to daily activities or health conditions.

Chief complaints include fever, breathlessness, abdominal pain, vomiting, fatigue, cough, and seizures, showcasing the Emergency Department's critical role in addressing infectious, respiratory, gastrointestinal, and neurological emergencies. Diagnoses range from Chronic Obstructive Pulmonary Disease (C.O.P.D.) and cardiovascular issues like hypertension and stroke to infectious diseases such as sepsis, viral fever, and dengue, alongside cases of intentional self-harm, reflecting the department’s broad scope.

Ceftriaxone 1gm emerges as the most commonly prescribed antibiotic (43.32%), followed by Azithromycin 500mg, Piperacillin-Tazobactam 2.25gm, and Meropenem 1gm, each tailored to specific bacterial infections. The study highlights the prevalent use of empiric therapy, intravenous administration, and an average time of two hours to initiate antibiotic treatment after admission.

This analysis provides critical insights for optimizing emergency healthcare, enhancing clinical decisions, and addressing challenges in antibiotic use, thereby laying the groundwork for improved patient care and resource management.

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