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Point Prevalence Study on Antibiotics Utilisation in the Department of Surgery in Southern Coastal Medical College Hospital of India

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Abstract

Background: Antibiotics are essential in surgical treatment, but their abuse has resulted in increasing antimicrobial resistance (AMR). This study examines the prevalence and trends of antibiotic use in a surgical department of a Southern Coastal Medical College Hospital in India.

Objectives: To assess the prevalence of antibiotic prescribing patterns and identify gaps in diagnostic practices contributing to AMR, And diagnosing pattern

Methodology: Our study was conducted in Government Medical College and Hospital, Nagapattinam, Tamil Nadu.

Study duration: 1Months(01 April 2024- 30 April 2024).

Result: The majority of patients (66.32%) were male. Diagnosis included diabetic foot ulcers (14.25%), appendicitis (9.5%), and cellulitis (8.55%). Comorbidities such as Type 2 diabetes (29.47%) were prevalent. Despite the need for culture testing in 25 patients, only 15 were cultured, revealing resistance to several antibiotic classes, including second-generation cephalosporins and ciprofloxacin. Pre-operative prescriptions were dominated by metronidazole (64.89%), cefotaxime (41.49%), and ciprofloxacin (32.98%). Post-operatively, antibiotic use shifted towards narrower-spectrum agents

Conclusion: The study focuses on excessive empiric antibiotic use, poor culture testing, and resistance to routinely administered antibiotics. Addressing AMR necessitates legislative changes for required diagnostics, antibiotic stewardship education, and focused therapies for common comorbidities such as diabetes. Long-term surveillance and adherence to evidence-based methods are critical for reducing resistance.

Keywords: Antibiotic resistance, antimicrobial stewardship, surgery, prevalence study, antibiotic prescribing

Introduction

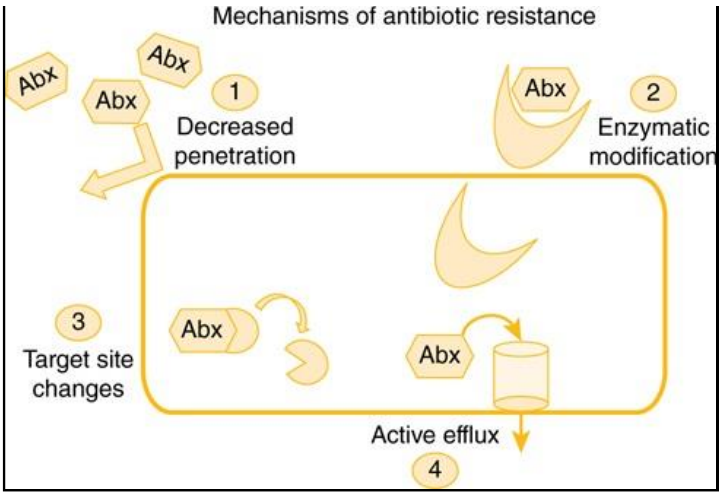
Antibiotics—the word sends terror coursing through the veins of students and makes many healthcare professionals uncomfortable. The category of antibiotics actually contains many different classes of drugs that differ in spectrum of activity, adverse effect, pharmacokinetics and pharmacodynamics, and clinical utility.We believe that taking a logical, stepwise approach to learning the pharmacotherapy of infectious diseases can help burn away the mental fog preventing optimal use and understanding of these drugs.Learning the characteristics of antibiotics greatly simplifies learning infectious disease pharmacotherapy.The pharmacotherapy of infectious diseases is unique. The use of antimicrobial chemotherapy—that is, the treatment of microorganisms with chemical agents—falls into one of three general categories: prophylaxis, empiric use, and definitive therapy.

The history of chemotherapy may be divided into 3 phases.

Prophylaxis—is treatment given to prevent an infection that has not yet developed. Use of prophylactic therapy should be limited to patients at high risk of developing an infection, such as those on immunosuppressive therapy, those with cancer, or patients who are having surgery. These patients have weakened natural defence's that render them susceptible to infection

Empiric therapy is given to patients who have a proven or suspected infection, but the responsible organism(s) has or have not yet been identified. It is the type of therapy most often initiated in both outpatient and inpatient settings. After the clinician assesses the likelihood of an infection based on physical exam, laboratory findings, and other signs and symptoms, he or she should generally collect samples for culture and Gram staining. For most types of cultures, the Gram stain is performed relatively quickly. However, this process takes several days, so empiric therapy is generally initiated before the clinician knows the exact identification and susceptibilities of the causative organism. Keep in mind that empiric therapy should not be directed against every known organism in nature—just those most likely to cause the infection in question.

Unlike empiric therapy, with definitive therapy we know on what organisms to base our treatment and which drugs should work against them. At this phase, it is prudent to choose antimicrobial agents that are safe, effective, narrow in spectrum, and cost effective. This helps us avoid unneeded toxicity, treatment failures, and the possible emergence of antimicrobial resistance, and it also helps manage costs.



Antibiotic Resistance: causes

The basic cause of antibiotic resistance is simple: antibiotic use. Some organisms are notorious for an intrinsic ability to express multiple types of resistance, such as Acinetobacter baumannii or Pseudomonas aeruginosa. Others have been generally treatable for many years and are only recently becoming highly drug-resistant through acquiring new resistance elements, such as Klebsiella pneumoniae. And some have remained highly susceptible to "old" antibiotics ever since their introduction, such as Streptococcus pyogenes and penicillin.

The multiple mechanisms by which resistance occurs can be confusing, but here we are going to—wait for it—simplify it into four basic mechanisms, Decreased permeability prevents the antibiotic from penetrating the bacterial cell, decreasing the intracellular concentration of the antibiotic. Enzymatic modification due to an enzyme produced by the bacteria destroys the antibiotic before it has a chance to reach its site of activity or even enter the cell. Target site changes can occur, leading to an elimination or modification of the antibiotic's site of activity such that it cannot work. Active efflux occurs when efflux pumps in the bacteria pump out antibiotics, decreasing intracellular concentrations.

METHODOLOGY

Study type: Cross Sectional Observational Point prevalence study

Sample size: 95 Patients

Place of study : Government Medical College and Hospital, Nagapattinam, Tamil Nadu.

Study duration: 1 April 2024- 30 April 2024.

Data collection

All the patients who were all admitted in the department of surgery were screened for the study following the inclusion and exclusion criteria. The data of the patient was collected and analysed using the KOBO toolbox software.

Inclusion criteria

All patients who have been admitted in the 1-month period (01 April 2024 to 30 April 2024) were included in the study. The data was collected according to the WHO guideline criteria for Point prevalence study, i.e., patients above 18 years of age of both genders admitted for surgery.

RESULT

Table-1 Demographic Data

Sex	No. Of Patients	Percentage %
Male	63	66.32
Female	32	33.68

A total number of 95 prescription data was collected and analysed for the study in that 63 (66.32%)were male and 32(33.68%) were female patient.

The patients was classified into age group and explained in table 2

Table-2 Age Wise Distribution		
Age Group	**No. Of Patients**	**Percentage %**
18-24	13	13.68
25-34	11	11.58
35-40	17	17.89
41-50	21	22.11
51-60	17	17.89
61-70	10	10.53
70 Above	6	6.32

The 95 cases were diagnosed with various diseases, with the highest number of patients diagnosed with Diabetic foot ulcer (DFU), which was 15(14.25%) patients, followed by Appendicitis, which was 10(9.5%) patients, Cellulitis, which was 9(8.55%) patients, Pancreatitis, which was 6(5.7%) patients, anal fissure, Ureteric calculi, and Renal calculi, which were 5(4.75%) patients, Hernia, which was 4(3.8%) patients, and Lymphadenitis, which was 4(3.8%) pat.

Table 3 : Diagnosis Pattern		
Diagnosis	**Numbers**	**Percentage %**
Diabetic Foot Ulcer (Dfu)	15	14.25
Appendicitis	10	9.5
Cellulitis	9	8.55
Pancreatitis	6	5.7
Anal Fissure	6	5.7
Ureteric Calculi	6	5.7
Renal Calculi	5	4.75
Hernia	4	3.8
Lymphadenitis	4	3.8
Epididymoorchitis	4	3.8
Cystitis	3	2.85
Cholesthiasis	3	2.85

Table 3 : Diagnosis Pattern		
Road Traffic Accident	3	2.85
Urinary Tract Infection	3	2.85
Others	14	13.3

In the study population of 95 patients, 28(29.47%) had Type 2 diabetes mellitus, followed by Hypertension with 19(20%) patients, 5(5.26%) were anaemic, and 2(2.11%) had acute kidney injury, cardiovascular disease, and hypothyroidism of each patient, which is 1(1.05%), and over time, 57(60%) of our total study population had no co morbidity (Table 4).

Table 4 Co Morbidities

Co Morbidities	No. Of Patients	Percentage %
Type 2 Diabetes mellitus	28	29.47
Hypertension	19	20
Anemia	5	5.26
Acute Kidney Injury	2	2.11
Cardiovascular Disease	1	1.05
Hypothyroidism	1	1.05
Seizure	1	1.05
Sepsis	1	1.05
None	57	60

Table-5 Culture Test

Total patients	Culture Essential	Culture Done
95	25	15

Over 95 patients are present. Culture testing was required for 25 patients, but only 15 were cultured, revealing organisms such as Klebsiella pneumoniae, Klebsiella oxytoca, Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus, Proteus vugalis, Proteus mirabilis, Cytobacter species, MRSA, and MSSA.

The culture results show that the organisms are already resistant to second-generation cephalosporins, aminogycosides, and ciprofloxacin, as well as macrolides and penicillin. In addition, combinational medications such as sulfamethoxazole+Trimethoprim and piperacillin+Tazobactum are resistant in a minrity of patients.

Furthermore, our Pre-Operative study reveals that nearly 62(64.89%) were prescribed with Nitroimidazoles, followed by 3rd generation cephalosporins, Cefotaxime 39(41.49%) and Ceftriaxone 17(18.09%) on the upcoming the Flouroquinolones, which is Ciprofloxacin 31(32.98%) and the other following drugs which are below 10 on intervals are explained in the (Table-6)

Table 6 : Antibiotics prescribing pattern

Antibiotics prescribed	Pre-operative	% of Pre-operative	Post-operative	% of Post-operative
Metronidazole	62	65.27	30	31.63
Cefotaxime	39	42.11	26	28.42
Ceftriaxone	17	18.95	10	10.53
Cephalaxine	6	6.32	8	9.47
Ciprofloxacin	31	32.63	14	14.74
Amikacin	6	6.32	9	9.47
Gentamicin	4	4.21	4	4.21
Amoxicillin	2	2.11	-	-
Penicillin(V)	1	1.05	-	-
Meropenem	3	3.16	-	-
Imipenam	2	2.10	3	3.16
Erythromycin	1	1.05	-	-
Azithromycin	1	1.05	-	-
Doxycycline	3	3.16	5	5.26
Linezolid	-	-	4	4.21
Clindamycin	1	1.05	-	-
Cefaparazone+Sulbactum	6	6.32	9	9.47
Sulfamethoxazole+Trimethoprim	5	5.27	6	6.32
Piperacillin+Tazobactum	8	8.42	10	10.53
Amoxicillin+Clavulanic acid	-	-	2	2.11

On the other hand, the most usually prescribed combinational medications are Piperacillin+Tazobactum 8 (8.51%), followed by Cefaparazone+Sulbactum 6 (6.38%), Sulfamethoxazole+Trimethoprim 5 (5.31%), and Amoxicillin+Clavulanic Acid 2 (2.13%).

DISCUSSION

Resistance to multiple classes of antibiotics, including commonly used drugs like cephalosporins, aminogycosides, ciprofloxacin and piperacillin+tazobactam, reflects a worrying trend in antimicrobial resistance (AMR). This growing resistance indicates a critical failure in both global prescribing practices and diagnostic infrastructure. Over-prescription, often driven by inadequate training and the convenience of empiric therapy, has fuelled the evolution of drug-resistant pathogens. The widespread reliance on broad-spectrum antibiotics without culture confirmation exacerbates this problem. It necessitates policy-level interventions to curtail unnecessary antibiotic use, enforce rational prescribing protocols, and promote adherence to evidence-based guidelines.The low rate of culture testing (15 of 25 indicated patients) severely hampers the implementation of targeted therapies. The lack of comprehensive diagnostic work-ups means clinicians often resort to empiric antibiotic prescriptions, which can be broad and non-specific. This diagnostic gap directly contributes to the proliferation of resistance as pathogens evolve defences against commonly used drugs. Institutional protocols must prioritise mandatory culture testing where clinically indicated, backed by adequate funding and laboratory infrastructure. Ensuring timely and accurate identification of pathogens will pave the way for effective, targeted therapy, improving patient outcomes and preserving the efficacy of antibiotics Educational deficiencies among junior doctors often lead to an over-reliance on broad-spectrum antibiotics.These gaps stem from inadequate training in pharmacology, microbiology, and antibiotic stewardship principles. Structured stewardship programs can mitigate this issue by Integrating AMR-specific training into medical education and clinical internships Focusing on WHO prescribing indicators to instill evidence-based prescribing habits Reinforcing the importance of diagnostic support (e.g., culture results) in antibiotic selection By addressing these educational deficiencies, healthcare systems can empower clinicians to make informed, precise decisions, reducing the misuse of antibiotics The high prevalence of diabetic foot ulcers (DFU) and their associated resistance patterns underscores a dual burden of chronic and infectious diseases. Conditions like diabetes weaken immunity and increase susceptibility to infections, creating a breeding ground for resistant pathogens. In order to effectively address this dual burden, AMR interventions must Encouraging preventative measures to avoid diabetic complications, such as improved glucose management, regular foot exams, and patient education Promoting interdisciplinary methods that combine infection control techniques with the therapy of chronic diseases By doing this, the cycle of chronic sickness increasing the chance of infection and vice versa will be broken. It is essential to teach junior physicians about AMR, antibiotic pharmacology, and sensible prescribing techniques. The reasons why misuse results in resistance can be clarified by taking modules on the mechanics of resistance. When possible, using narrow-spectrum antibiotics helps highlight tailored treatment. Theory and practice can be connected through case-based learning about common infection management.Enhancing Diagnostic Resources: Even highly qualified physicians will find it difficult to apply tailored treatments in the absence of adequate lab capabilities. Investing in the expansion of lab infrastructure to enable prompt culture testing, Provide diagnostic equipment handling training to staff and make sure that testing procedures are followed throughout the facility. Creating local antibiograms is a crucial but neglected method for directing empirical treatment. These antibiograms give hospitals or areas specific information on common diseases and patterns of resistance. Clinicians can prescribe empirical antibiotics based on data from their patient population by routinely updating antibiograms., Reduce AMR by reducing the use of unsuitable broad-spectrum medications. Although it will take time, including AMR awareness into public health initiatives is essential. Campaigns can: Inform the public about the proper use of antibiotics, including following prescription regimens and refraining from self-medication, Indirectly lowering the need for antibiotics can be achieved by promoting immunisations to prevent bacterial illnesses and by emphasising good hygiene practices to prevent the spread of diseases.Strong research and surveillance mechanisms are necessary for long-term AMR solutions. Among the specific suggestions are longitudinal studies: Monitor resistance patterns over time to gauge how well stewardship efforts are working. Compare the clinical results of individuals receiving broad-spectrum versus narrow-spectrum antibiotic treatment. Broader Surveys: Regional variations in AMR trends and prescribing practices can be found through multi-centric surveys; this information can help influence national strategies and the distribution of resources.

CONCLUSION

Antimicrobial resistance (AMR) is a serious problem due to overprescribing, inadequate diagnostics, and insufficient medical training. The study identifies widespread resistance to routinely used antibiotics such as ciprofloxacin and piperacillin+tazobactam, which is compounded by a poor rate of culture testing and an overreliance on empiric therapy. Educational inequalities among junior doctors contribute to inappropriate prescribing behaviors. Addressing AMR requires a diverse approach, including the implementation of robust antibiotic stewardship programs. Improving diagnostic methods by required culture testing, developing local antibiograms to guide targeted therapy, Promoting public health programs to treat chronic illnesses like diabetes and lower infection risks, Long-term studies are conducted to track resistance trends and intervention outcomes. These approaches are critical for reducing AMR, maintaining antibiotic efficacy, and protecting global health systems.

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