



STUDY OF ANTIBIOTIC PRESCRIPTION PATTERN AMONG INPATIENTS OF A TERTIARY CARE HOSPITAL

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ABSTRACT

Antibiotics are considered to be one of the most important discoveries in the field of medicine. Overuse of antibiotics is a common problem observed in healthcare settings which progress to unnecessary expenditure on drugs, increased medication errors, increased risk of adverse drug reactions and most importantly, development of antimicrobial resistance. Antimicrobial resistance is the greatest threat to our future healthcare system due to increased number of resistant microbial strains being reported each year in human populations. Health organisations and research institutes are focussing on the antibiotic prescribers and dispensers. Antibiotic stewardship program if implemented properly can bring new antibiotic policies that helps in preventing unnecessary use of antibiotics and in their optimal management. While focussing on the above-mentioned scenario, it is important to analyse the information regarding antibiotic prescription pattern in patients for developing a rational antibiotic policy for the optimal management of infections in the present as well as in the upcoming human populations. This study was conducted with aforementioned relevance presenting the patients referred from the inpatient ward of the tertiary care hospital.

KEYWORDS: Antibiotic, Antimicrobial resistance, Antimicrobial stewardship program, Standard treatment guideline (STG), Adverse drug reaction (ADR), Respiratory tract infection (RTI), Urinary tract infection (UTI).

INTRODUCTION

An antibiotic can be defined as an agent or substance that is produced or derived from a microorganism having the ability to kill or inhibit the growth of another living microorganism. An antimicrobial agent can be defined as an agent or substance which is derived from any source like microorganisms, plants, animals, synthetic or semi-synthetic that acts primarily against any type of microorganism, such as bacteria (antibacterial), mycobacteria (mycobacterial), fungi (antifungal), parasite (anti-parasitic) and viruses (antiviral). In general, all antibiotics are antimicrobials, but not all antimicrobials are antibiotics. In our document "antibiotic" refers to an antimicrobial agent which has the ability to kill or inhibit the bacterial growth.

The primary use of antimicrobial therapy falls into one of the following three general categories

a) Prophylactic therapy

Antibiotic prophylaxis is the method of using antibiotics primarily before a surgery or dental procedure in order to prevent a bacterial infection. According to the professional guidelines, we use antibiotics before

procedures that have a high risk of bacterial infection. These includes:

- Surgeries for head
- Gastrointestinal surgeries
- Surgeries for implanting a device, such as pacemaker
- Cardiac procedures such as coronary artery bypass grafts, valve replacements and heart replacements
- Caesarean delivery

b) Empirical therapy

The empirical antibiotic therapy is defined as applying the antibiotic agent which matches with the *in vitro* susceptibility of the isolated bacteria, but was initially provided without the evidence of the causative pathogen or its antibiogram. Initiating targeted antibiotic therapy in the emergency department is very important in patients with a suspected bacterial infection. It could be possible only when the causative pathogen is finally proven by the isolated bacterial cultures along with the determination of the antibiogram. This process normally takes over 24-48 hours and therefore empirical therapy of antibiotics is initiated in the emergency department.

c) Definitive therapy

After culture and sensitivity results are known, we begin the definitive therapy. Unlike empirical therapy, with the definitive therapy we clearly know about the causative microorganism and which drugs will act effectively against them. At this phase, it is crucial to choose the antimicrobial agents that are safe, effective, narrow in spectrum of activity and cost-effective. This will help in avoiding unnecessary toxicity, therapeutic failures and the costs of therapy.^[1]

Antimicrobial resistance

Antimicrobial resistance (AMR) can be explained in simple terms as when microorganisms like bacteria, fungi, virus and parasites change when they are exposed to antimicrobial drugs like antibiotics (= antibacterial), antifungals, antimalarials and anthelmintic. As a result, these drugs become ineffective.^[2] Nowadays, antimicrobial resistance possess a major threat to the future of human health, thus compromising the need for treatment of basic infections and the routine medical procedures.^[3] For many years, focusing the prescribing as well as the dispensing practice has become the focal point of strategies to reduce the antimicrobial usage, but the implementers lack the relevant data on the current status of health care professionals, in order to understand and identify the antimicrobial resistance that could guide to interventions.^[4,5]

Health care-associated infections, or “nosocomial” infections affect primarily the patients in a hospital or other health care facility. These infections are acquired from the health-care settings which are not present or incubated at the time of admission. They also include infections which are acquired by the patients from the hospital or facility appearing after the discharge of the patient and also, occupational infections among the health-care staffs.^[6]

The establishment of an antibiotic policy depends heavily on surveillance of antimicrobial resistance and consumption of antibiotics in any clinical setting. Surveillance is the systematic collection, and analysis of healthcare data which are essential for the planning, implementation, and evaluation of public healthcare practice. Antimicrobial surveillance data helps in monitoring and identifying the existing and emerging problems.^[7,8] The fundamental aim of the hospital antimicrobial policy is to reduce the morbidity and mortality rate which are caused due to antimicrobial resistant infections, and to preserve the safety and efficacy of these drugs for the treatment and prevention of communicable diseases.^[9,10]

The practice of an effective standard treatment guideline (STG) can effectively improve the patient clinical status while enhancing cost savings. It reflects the data regarding the antimicrobial resistance, with the recognition that the local resistance pattern differs according to different geographical regions.^[11] The

appropriate use of STG could be considered as a very effective method for changing the professional clinical behaviour. Therefore, the STG must be readily available in the healthcare settings.^[12]

MATERIALS AND METHODS

This was an observational prospective cohort study done for a period of six months in a tertiary care hospital, Kerala. The aim of the study was to analyse the antibiotic prescription pattern among inpatients of the hospital. The study included the objectives like identification of the commonly prescribed antibiotics, analysing the indication for which the antibiotics has been prescribed and finally the evaluation of antimicrobial therapy. Approval from the Institutional Ethical Committee was obtained prior to the study. A minimum of 150 samples were analysed during the time period June 2020 to November 2020.

Inclusion criteria

- Patient's case records including antimicrobial prescriptions.
- Patients of age above 18 years.
- Both male and female patients.

Exclusion criteria

- Patients who are on cancer therapy.
- All immunocompromised patients.
- Pregnant and lactating mothers.
- Paediatric patients.

Patients prescribed with the antimicrobial agent were identified from the inpatient ward and relevant data were collected. Case records were prospectively reviewed and documented in a structured data entry form. Descriptive statistics was done using Microsoft Excel 2010 program.

RESULTS AND DISCUSSION

This observational prospective cohort study was carried out for a period of six months in the IP ward of the tertiary care hospital, Kerala. The study was conducted to identify the commonly prescribed antibiotics, indication for use and to evaluate the antimicrobial therapy. A total of 150 patients were selected for our study satisfying the inclusion and exclusion criteria.

Out of 150 samples analysed, majority of the antibiotics were prescribed from the class of cephalosporins (88.6%) followed by fluoroquinolones (16%) and penicillins (8.6%) respectively. Ceftriaxone (36.6%) was the most commonly prescribed antibiotic. It was then followed by cefoperazone sulbactam (30%) and ceftriaxone sulbactam (11.3%). The other antibiotics commonly prescribed were ciprofloxacin (10.6%), linezolid, (7.3%) and amoxicillin (6.66%) respectively (Table -1, Figure-1).

In accordance with our study, majority of the antibiotics were given for surgery (36%) followed by RTI (20%) and UTI (13.3%) respectively. Out of the total samples

analysed, 5 prescriptions contained antibiotic given without medical condition (Table-2, Figure-2).

93.3% prescriptions were found to be irrational, only 6.6% prescriptions were found to be rational (Table-3, Figure-3). The underlying reason that contributed for the irrationality in antimicrobial use was the problem in medicine regimen (66.6%). It included drug interactions

(39.3%), ADR (12.6%), inappropriate course or length of therapy (8.6%), antibiotic given without medical condition (3.3%) and administration of contraindicated medicine (2.6%) respectively. 84 samples contained prescriptions with suspected antibiotic agent being inactive in terms of efficiency (19.3%), toxicity (15.3%), broadness of spectrum (14%), cost (6.6%) and allergy (0.6%) respectively (Table-4, Figure-4).

Table 1: Commonly prescribed antibiotics.

Sl. No.	Antibiotic class (%)	Antibiotic, n (%)
1	Cephalosporins (88.6%)	Ceftriaxone, 55(36.6%) Cefoperazone sulbactam, 45(30%) Ceftriaxone sulbactam, 17(11.3%) Cefuroxime axetil, 10(6.6%) Cefixime, 2(1.3%) Cefotaxime, 2(1.3%) Cefpodoxime proxetil, 1(0.6%) Cephalexin, 1(0.6%)
2	Fluoroquinolones (16%)	Ciprofloxacin, 16(10.6%) Levofloxacin, 6(4%) Moxifloxacin, 1(0.6%) Ofloxacin, 1(0.6%)
3	Penicillin (8.6%)	Amoxicillin, 10(6.6%) Benzyl penicillin, 3(2%)
4	Oxazolidinones (8%)	Linezolid, 11(7.3%) Mupirocin, 1(0.6%)
5	Nitroimidazole (4%)	Metronidazole, 5(3.3%) Tinidazole, 1(0.6%)
6	Macrolide (3.3%)	Azithromycin, 5(3.3%)
7	Carbapenems (2%)	Meropenem, 2(1.3%) Faropenem, 1(0.6%)
8	Tetracyclines (1.3%)	Doxycycline, 2(1.3%)
9	Aminoglycoside (1.3%)	Amikacin, 1(0.6%) Gentamicin, 1(0.6%)
10	Glycopeptide (1.3%)	Vancomycin, 2(1.3%)
11	Lincosamide (1.3%)	Clindamycin, 2(1.3%)
12	Nitrofurantoin (1.3%)	Nitrofurantoin, 2(1.3%)
13	Others (1.3%)	Clotrimazole, 2(1.3%)

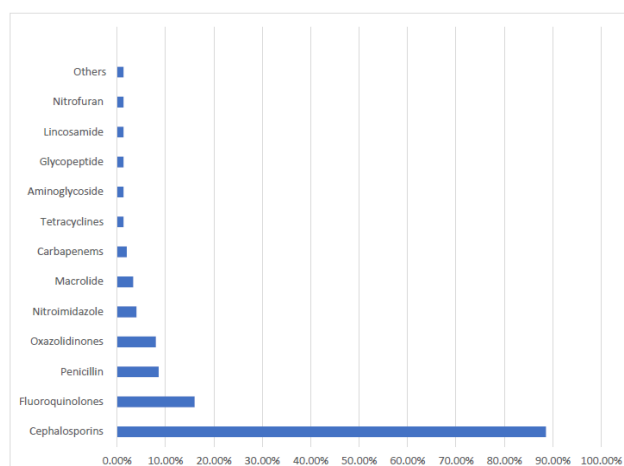


Figure 1: List of commonly prescribed antibiotic class.

Table 2: Indication for antibiotic use.

Indication	Frequency (n)	Percentage (%)
Surgery	54	36
RTI	30	20
UTI	20	13.3
Heart infection	12	8
GIT infection	9	6
Cutaneous infection	5	3.3
Antibiotic given without medical condition	5	3.3
Diabetic foot infection	4	2.6
Bloodstream infection	4	2.6
CNS infection	4	2.6
Ocular infection	2	1.3
Fever	1	0.6

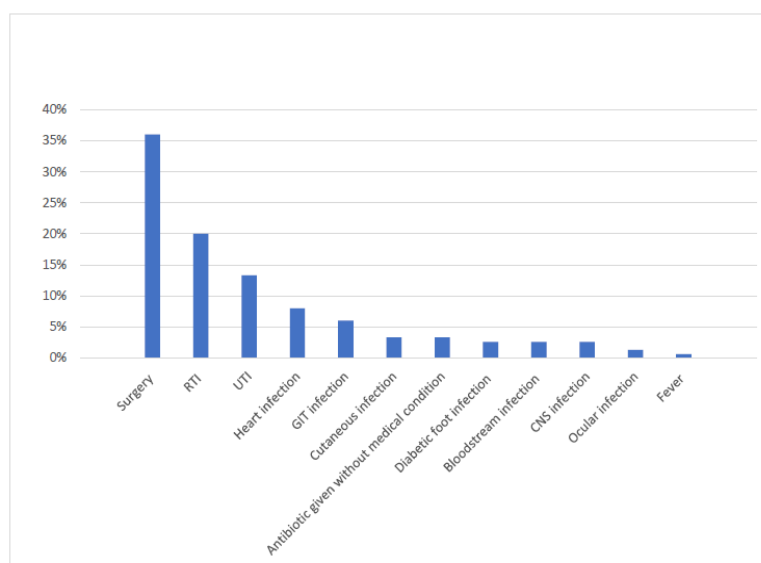


Figure 2: Indication for antibiotic use.

Table 3: Evaluation of antimicrobial therapy.

Evaluation of antimicrobial therapy	Frequency(n)	Percentage (%)
Rational	10	6.6
Irrational	140	93.3

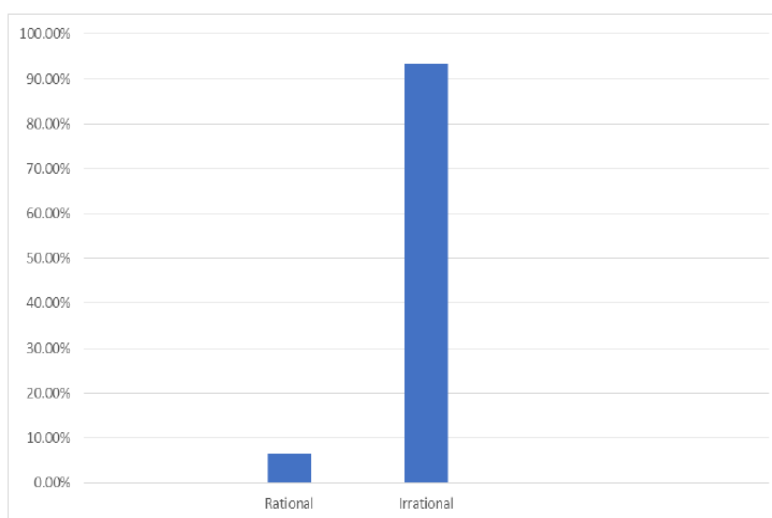


Figure 3: Evaluation of antimicrobial therapy.

Table 4: Type of inappropriate antibiotic use in prescription.

Type of inappropriate antibiotic use in prescription	Frequency(n)	Percentage (%)
Dose not mentioned	14	9.3
Frequency not mentioned	15	10
Duration not mentioned	9	6
Culture tests not performed	56	37.3
Susceptibility pattern in cases not defined	1	0.6%
Suspected antibiotic agent was not active in terms of:	84	56
a) Efficiency	29	19.3
b) Toxicity	23	15.3
c) Allergy	1	0.6
d) Cost	10	6.6
e) Broadness of spectrum	21	14
Incorrect dosage	40	26.6
Problem in medicine regimen	100	66.6
a) Adr	19	12.6
b) Inappropriate course/length of therapy	13	8.6
c) Drug interaction	59	39.3
d) Administration of contraindicated medicine	4	2.6
e) Antibiotic given without medical condition	5	3.3
Therapeutic duplication	10	6.6
Other reasons: -	49	32.6
▪ Renal function was not monitored cautiously after administration of nephrotoxic drugs	12	8
▪ Lack of relevant blood routine examination	21	14
▪ Lack of relevant urine routine examination	11	7.3
▪ Lack of proper final diagnosis	4	2.6
▪ Failure on successful completion of therapy	1	0.6

CONCLUSION

The foremost challenges in prescriptions are thus to achieve a rational choice and appropriate use of antibiotics and to recognize their potential problems. On evaluating the antimicrobial therapy, majority of the prescriptions were found to be irrational. The strength of our study is that it highlighted several irrational prescribing practices and newer trends in the administration of antimicrobial agents. Irrational use of antibiotics is the major cause of rising antibiotic resistance. The consequences of irrational use of antibiotics can range from increased morbidity to mortality with enhanced medication errors and unnecessary costs. Thus, detailed studies are required to be conducted in order to rule out more potential cases of irrational use of antimicrobial agents.

Limitations of the study

The following limitations were encountered in our study:

- The study was conducted in a limited time frame.
- Small sample size.
- Single-centred study.
- The study does not include outpatients as well as other types of healthcare settings and populations.
- The study could be followed up later for a detailed assessment by including detailed analysis like WHO prescribing indicators.
- Study was interrupted due to covid-19 pandemic.

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