

Drug Utilization Pattern of Antibiotics in Infectious Diseases Study in a Multi-Speciality Hospital at Erode

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ABSTRACT

Aim and Objective: The aim of our study is to assess the knowledge about the Drug Utilization Pattern of Antibiotics in Infectious Diseases. This study was conducted in a Multi - Speciality hospital.

Materials and Methods: The Prospective Observational Study was conducted at Sudha Multi – Speciality Hospital over 3 months from November 2022 – January 2023. A total of 110 patients were included in this study. All the data were analyzed by using Microsoft excel spreadsheet version 2021.

Results: The data were analyzed from 110 patients. Among them, about 30(24%) patients were prescribed with Cephalosporins class of antibiotics. The most commonly prescribed Antibiotic was found to be Ceftriaxone 38(24.2%). There were 4 antibiotics were prescribed for an individual in a single prescription and 73 patients have prescribed with only one antibiotic in a prescription. The ADR caused by the antibiotics were analyzed and Ceftriaxone (24%) causes highest number of ADR and most of the ADR level was found to be mild (53%) and the severity of drug interaction seems to be mostly having a Moderate (57%) reaction.

Conclusion: Clinical pharmacists and Clinicians need to play vital role in minimizing the antibiotic problems by conducting continual awareness programs regarding up-to-date prescribing guidelines in the hospital and the prescriber must need to focus and develop their knowledge about the drugs that they prescribe.

Keywords: Antibiotics, Prescription Pattern, Adverse Drug Reaction (ADR), Class of Antibiotics, Prospective Observational Study.

I. INTRODUCTION

Antibiotics are “magic bullets” and lifesaving drugs, especially in treating and combating severe infections, they are one of the major elements in modern pharmacotherapy. However, due to various reasons and different mechanisms, microbes developed resistance to antibiotics. Resistance to antibiotics is now a serious problem as indiscriminate and inappropriate use of these drugs and irrational prescribing of those drugs has been the major culprit for the development of resistance to various antibiotics [1] The Centers for Disease Control and Prevention (CDC) estimates that more than 100 million antibiotic prescriptions are written each year in the ambulatory care setting. [2] Antibiotics have been used effectively for the treatment of many diseases, which is why they were called miracle drugs. Unfortunately, widespread use and misuse worldwide have led to the emergence of ‘super bugs’ and other drug-resistant bacteria. [3-8] Microbial infections are most common types of infection which usually requires the use of antibiotics for treatment. [9,10] Natural substances with selective antibacterial activity produced from microorganisms are the traditional definition given for antibiotics. They either inhibit (bacteriostatic effect) or kill (bactericidal effect) bacteria. In 1926, Alexander Fleming discovered penicillin, a substance produced by fungi that appeared able to inhibit bacterial growth.

II. MATERIALS AND METHODS:

A Prospective Observational Study was conducted at Sudha Multi – Speciality Hospital at

Erode, Tamilnadu over a period of 3 months from November 2022 – January 2023. This study was conducted among a total of 110 patients who are all affected with various infectious diseases like UTI, COPD, etc, and prescribed with Antibiotics. All the required data are collected and analyzed using Microsoft excel spreadsheet version 2021.

III. OBSERVATION AND RESULT:

Class of Antibiotics Prescribed: A total of 110 case details were collected for the current study. The study reports that the major class of antibiotics prescribed among patients were Cephalosporins constituting about 30(24%) followed by Penicillin 26(20.8%).

Table 1: Class of Antibiotics Prescribed

| S.No. | Antibiotic Class | Number of Prescriptions (N=110) | Percentage (%) |
|-------|----------------------------|---------------------------------|----------------|
| 1 | Aminoglycoside | 13 | 10.4 |
| 2 | Antimycobacteriaes | 02 | 1.6 |
| 3 | B-Lactam | 06 | 4.8 |
| 4 | Cephalosporins | 30 | 24 |
| 5 | Glycopeptide | 01 | 0.8 |
| 6 | Lincomycin | 05 | 04 |
| 7 | Macrolide | 20 | 16 |
| 8 | Nicotinic Acid Derivatives | 02 | 1.6 |
| 9 | Nitrofurans | 02 | 1.6 |
| 10 | Nitroimidazole | 06 | 4.8 |
| 11 | Penicillin | 26 | 20.8 |
| 12 | Quinolone | 10 | 08 |
| 13 | Tetracycline | 02 | 1.6 |

The remaining class of Antibiotics were found to be Macrolide 20(16%), Aminoglycosides 13(10.4%), Quinolone 10(8%), Nitroimidazole 6(4.8%), B-Lactam 6(4.8%), Lincomycin 5(4%), Tetracycline 2(1.6%), Nitrofurans 2(1.6%), Nicotinic Acid Derivatives 2(1.6%),

Antimycobacterials 2(1.6%) and Glycopeptide 1(0.8%) in patients.

Commonly Prescribed Antibiotics: The study reports that 38(24.2%) of the prescriptions were prescribed with Ceftriaxone and 17(10.8%) with Amoxicillin.

Table 2: Commonly Prescribed Antibiotics

| S.No. | Commonly Prescribed Antibiotics | Number of prescriptions (N=110) | Percentage (%) |
|-------|---------------------------------|---------------------------------|----------------|
| 1 | Amikacin | 06 | 3.8 |
| 2 | Amoxicillin | 17 | 10.8 |
| 3 | Azithromycin | 14 | 8.9 |
| 4 | Cefoperazone | 15 | 9.5 |
| 5 | Ceftriaxone | 38 | 24.2 |
| 6 | Levofloxacin | 06 | 3.8 |
| 7 | Meropenem | 06 | 3.8 |

| | | | |
|---|--------------|----|-----|
| 8 | Piperacillin | 09 | 5.7 |
| 9 | Rifaximin | 07 | 5.7 |

Furthermore, the other commonly prescribed antibiotics were 15(9.5%) with Cefoperazone, 14(8.9%) with Azithromycin, 9(5.7%) with Piperacillin, 9(5.7%) with Rifaximin, 6(3.8%) with Amikacin, 6(3.8%) with

Levofloxacin, 6(3.8%) of the prescription were prescribed with Meropenem.

Number of Antibiotics Prescribed: During the hospital stay, most of the patients were prescribed with only one antibiotic i.e: 73(66.3%) patients.

Table 3: Number of Antibiotics Prescribed

| Number of Antibiotics Prescribed | Number of Prescription (N=110) | Percentage (%) |
|----------------------------------|--------------------------------|----------------|
| 1 | 73 | 66.3 |
| 2 | 26 | 23.6 |
| 3 | 09 | 8.1 |
| 4 | 02 | 1.8 |

It was followed up by 26(23.6%) patients with 2 antibiotics, 9(8.1%) patients with 3 antibiotics, 2(1.8%) patients with 4 antibiotics were prescribed.

Antibiotics Causing ADR: The major antibiotics causing adverse drug reactions in patients were found to be Ceftriaxone in 38(24%), followed by Amoxicillin in 17(11%).

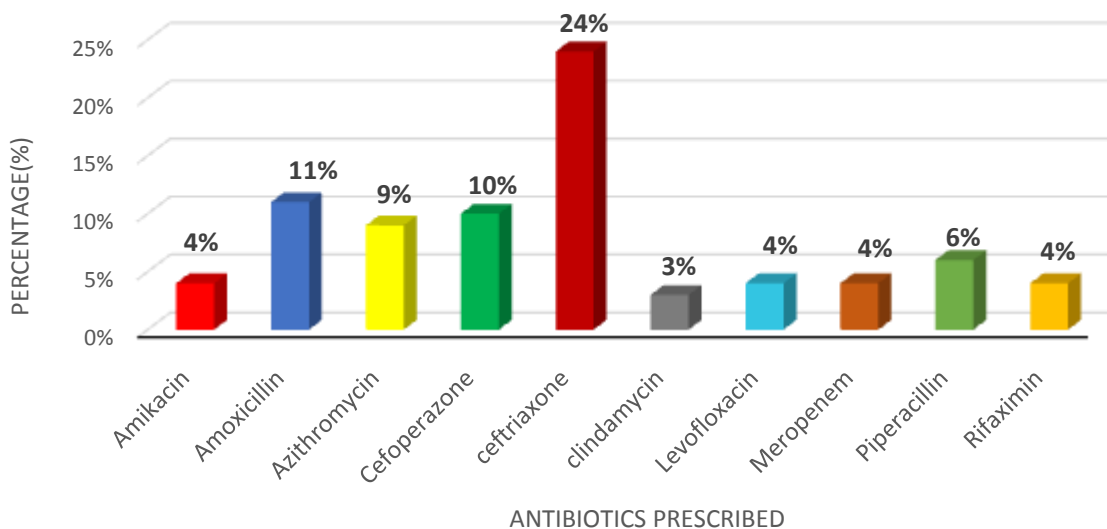


Figure 1: Antibiotics Causing ADR

The remaining Antibiotics that causing ADR were Cefoperazone in 15(10%), Azithromycin in 14(9%), Piperacillin in 9(6%), Amikacin in 6(4%), Levofloxacin in 6(4%), Meropenem in 6(4%), Rifaximin in 6(4%) and

Clindamycin in 5(3%) of the patients were being reported in the study.

ADR Based on Level of Severity: Based on the level of severity, Mild reactions constituted to about 56(51%).

Table 4: ADR Based on Level of Severity

| Level of Severity | No. of ADR (N=110) | Percentage (%) |
|-------------------|--------------------|----------------|
| Mild | 56 | 51% |
| Moderate | 40 | 36% |
| Severe | 14 | 13% |

Likewise, the Moderate reactions were about 40(36%) and Severe reactions were about 14(13%) were observed or reported in patients.

Drug – Drug Interactions: The severity of drug interactions was evaluated and categorized into

Minor, Moderate and Major type interactions. It was observed that 12(57%) of the interactions had moderate severity.

Table 5: Severity of Drug Interactions

| Level of Severity | No. of ADR (N=110) | Percentage (%) |
|-------------------|--------------------|----------------|
| Minor | 08 | 38% |
| Moderate | 12 | 57% |
| Major | 01 | 05% |

Then it is observed as 8(38%) of the interactions had minor severity and 1(5%) come under major interactions. In the total of 110 cases, DDI was reported only in 21 cases.

IV. DISCUSSION

Antibiotics are some of the most commonly prescribed drugs around the world, especially in developing countries like India, Mongolia, etc., India tops the list of countries with most numbers of antibiotic prescription. This situation may lead to Antibiotic Resistance. So, the Prescription and administration of Antibiotics must be monitored and regulated. The prescriber must possess adequate knowledge about the Antibiotics and prescribe them only if they are necessary. Thus, the use of Antibiotics can be regulated. The Antibiotics should not be delivered as OTC drugs since they can cause severe reactions.

There are various classes of Antibiotics are currently in use. Basically, the class of Antibiotics are classified into two types as Broad-Spectrum Antibiotics and Narrow-Spectrum Antibiotics. In our study, Cephalosporins class of Antibiotics were prescribed mostly 30(24%). Cephalosporins comes under the Broad-Spectrum Antibiotics and thus this result agrees with the

previous study ^[11,12,13] which also produced the similar result.

The Antibiotics are prescribed based on their requirement. In some cases, if required, more than one Antibiotic is prescribed due to the severity of the case. In this study, 73(66.36%) of patients were prescribed with only one antibiotic. This result is comparatively greater than the results of the study conducted in Ethiopia ^[14]. This disparity could be explained by the fact that the Ethiopian study was conducted only on outpatients who only received oral antibiotics in the community, whereas our study was conducted on hospitalized patients who received both oral and parenteral antibiotics.

Adverse Drug Reactions [ADR] are unintended and undesired effects of drugs used for prevention, diagnosis, or treatment of disease. In light of the ever-increasing number of medications available, it should come as no surprise that such reactions are extremely common. ADRs are important data that must be recorded in any research or study. In present study, a total of 12 ADR was reported or observed. The class of Antibiotics causing ADR was analyzed and Cephalosporins (19%) were found to produce more ADR reactions followed by Penicillin (17%). On further analyzing, the specific antibiotic drug that causes highest number of ADR was found to be

Ceftriaxone (24%) which comes under the class of Cephalosporins. This study result was supported by another study^[15] that reported similar results.

Adverse reactions are recognized hazards of drug therapy. Adverse Drug Reactions (ADRS) are important causes of mortality and morbidity in both hospitalized and ambulatory patients. In many countries ADRs rank among the top 10 leading causes of mortality. So, there is a need to study ADRs seriously to create awareness about ADRs among patients to motivate health care professionals in the hospital to report ADRs to minimize the risk. Early detection, evaluation and monitoring of ADR are essential to reduce harm to patients and thus improve public health. In present study, the severity level of ADR was noted observed and analyzed. Here, the Mild reactions were 53%, Moderate reactions were 36% and severe reactions were 15%. Drug rechallenge was not done in any of the cases. Some of the Healthcare providers were not much aware of the importance of reporting and follow up of those reactions and they were not willing to change the drug or alter the dose. Vast majority of the patients were recovered from the ADR because none of the reported reactions was fatal. In present study, the severity level of ADR was noted observed and analyzed. Here, the Mild reactions were 53%, Moderate reactions were 36% and severe reactions were 15%. Relatively, Jimmy Jose et al.^[16] also found that mild and moderate reactions were more but some severe reactions also reported.

Potential drug–drug interactions (PDDIs) are among the leading preventable causes of ADEs. In hospitalized patients, it was estimated that 17% of all preventable ADEs were caused by DDI and that approximately 1% of hospitalized patients experienced an ADE due to DDI^[17]. PDDIs may also cause treatment failure besides the ADE, which is an important cause of morbidity, mortality, and high health care costs^[18,19]. The study on the drug interactions shows that about 57% of prescriptions exhibit Moderate drug interactions followed by 38% of Minor and 5% of severe drug interactions. This was less in comparison with the findings of a study which was conducted in Costa, Mexico^[20].

V. CONCLUSION

The current study could assess the prescribing pattern of antibiotics, adverse effects of antibiotics prescribed and the drug interaction levels. Most commonly prescribed antibiotic in the study population was Ceftriaxone followed by

Amoxicillin. The commonly observed ADR in the study population were Difficult to Breathing, Diarrhea, Macubpapular rash, Heart problem, Abdominal pain, Kidney damage, Shallow Breathing, Blood in Urine, Insomnia and Muscle spasm. These ADR's can be prevented by proper monitoring during drug administration and through educating the healthcare professionals regarding commonly occurring ADR'S.

Clinical pharmacists and Clinicians need to play vital role in minimizing the antibiotic problems by conducting continual awareness programs regarding up-to-date prescribing guidelines in the hospital and also minimizing the antibiotic resistance. The active participation of clinical Pharmacists in the clinical ward rounds and documentation of Pharmacist observation on prescription in patient folder is highly recommended for safety and drug monitoring.

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