Section: Pharmacology

Original Research Article

RECENT TRENDS AND PRESCRIBING PATTERNS OF ANTIMICROBIAL AGENTS IN PATIENTS ADMITTED IN HOSPITAL DURING COVID-19 PERIOD

K. Hima Bindu[1], P. Srujana[2], Souris Kondaveti[3], M. Saritha[4]

[1]Professor, Department of Pharmacology, Andhra Medical College, Visakhapatnam, Andhra Pradesh, India
[2]Associate Professor, Department of Pharmacology, Osmania Medical College, Hyderabad, Telangana, India
[3]Associate Professor, Department of Pharmacology, Osmania Medical College, Hyderabad, Telangana, India
[4]Associate Professor, Department of Pharmacology, Narayana Medical College, Nellore, Andhra Pradesh, India

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Corresponding Author:
Dr. M. Saritha,
Email: sarithamanem@yahoo.com

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Abstract:

Background: Antimicrobial resistance (AMR) is a global health concern that is mostly caused by the overuse of antibiotics that are often provided when they are either not the best course of therapy or are not necessary. Increased prescription rates, a lack of antimicrobial stewardship, patient noncompliance, and the use of antibiotics in industry and the food chain including farming and agriculture have all been linked to a rise in antimicrobial resistance (AMR). **Materials and Methods:** This is a cross-sectional study conducted in the departments of Pharmacology, and 4 other major departments (Departments of General Medicine, General Surgery, Obstetrics & Gynaecology and Paediatrics) at a tertiary care hospital from January 2021 - December 2021 after approval from the Review board and institutional ethical committee. A total of 312 in-patients' treatment sheets were collected from the medical records section / room of the tertiary care hospital who were admitted in the above-mentioned departments after permission from appropriate authority. Demographic data and clinical information regarding prescribing pattern and trends of antibiotic prescriptions were noted. The data was analyzed by using SPSS and Microsoft excel version 2007. All the multiple responses were presented in terms of number and percentage. **Results:** It reveals that Cephalosporins were the most frequently (48.1%) prescribed group of antibiotics followed by Penicillins (44.3%), Macrolides (26.9%), Nitroimidazoles (11%), Fluoroquinolones (10.1%), Lincosamides (8.9%), Tetracyclines (4%), Carbapenems (2.8%), Oxazolidinones (2.2%), Glycopeptides (1.4%), Nitrofurantoins (0.8%) and Aminoglycosides (0.2%) in the decreasing order in General Medicine department. In the General Surgery department, Cephalosporins were the most frequently (58.8%) prescribed group followed by Nitroimidazoles (21.6%), Fluoroquinolones (13.7%), Penicillins (11.8%) and Lincosamides (3.9%) in the decreasing order. In Obs/Gynae department, Cephalosporins were the most frequently (76.5%) prescribed group followed by Penicillins (29.4%), Nitroimidazoles (21.6%), Aminoglycosides (7.8%), Macrolides (5.9%) and Tetracyclines (5.9%) in the decreasing order. However, in Paediatric department, Glycopeptides were the most frequently (61.1%) prescribed group followed by Carbapenems (38.9%), Cephalosporins (33.3%), Aminoglycosides (11.1%), Penicillins (5.5%) and Nitroimidazoles (5.5%) in the decreasing order. **Conclusion:** Cephalosporins were the most frequently prescribed group of antibiotics followed by Penicillins and Macrolides. Most of these antibiotics were prescribed without culture & sensitivity testing which must be made mandatory in the hospital prior to antibiotic prescription. All antibiotics were prescribed by generic names and all those were available in hospital pharmacy. Results of our study indicate urgent need to increase awareness and understanding; communication and training among healthcare professionals to reduce unnecessary use & to promote rational therapy of antibiotics which can further reduce the antimicrobial resistance and drug interactions.

INTRODUCTION

Antimicrobial resistance (AMR) is a global health concern that is mostly caused by the overuse of antibiotics that are often provided when they are either not the best course of therapy or are not necessary.[1] Increased prescription rates, a lack of antimicrobial stewardship, patient noncompliance, and the use of antibiotics in industry and the food chain including farming and agriculture have all been linked to a rise in antimicrobial resistance (AMR). Since many harmful microorganisms have become resistant to once-effective medicines, those treatments are no longer effective. AMR is believed to have cost the world economy $3 trillion in lost GDP.[2]

Antibiotics are not the recommended treatment for viral infections, but they are frequently used in viral infections as a prophylactic measure to stop secondary bacterial infections. Antibiotics were also administered as a prophylactic measure for high-risk patients during COVID-19 pandemic, particularly those who were brought to the intensive care unit and required mechanical ventilation. According to reports, 86% of hospital-acquired pneumonia cases that require antibiotic intervention are linked to mechanical ventilation.[3]

The clinical guidelines recommend the prophylactic use of antibiotics against nosocomial bacterial infections that are opportunistic. Early in the COVID-19 outbreak, preventive use of antibiotics such as azithromycin was frequently recommended. Additionally, throughout the pandemic, antibiotics have been used inappropriately because of a lack of awareness regarding COVID-19 treatment. Therefore, it is expected that the misuse of antibiotics during that period might have significantly added to the growing burden of antimicrobial resistance (AMR) globally.[4]

Additionally, during the COVID-19 pandemic, the burden of additional community-acquired respiratory illnesses has decreased because of public health actions such as enforced lockdowns, social distancing measures, and mask mandates. According to the reports, the introduction of lockdown procedures along with infection control strategies including social distancing and mask wearing resulted in a decrease in the spread of seasonal influenza. Paediatric cases of otitis media, pharyngitis, and meningitis also declined. Antibiotic therapy is typically necessary for many of these infections.[5]

MATERIALS AND METHODS

This is a cross-sectional study conducted in the departments of Pharmacology, and 4 other major departments (Departments of General Medicine, General Surgery, Obstetrics & Gynaecology and Paediatrics) at a tertiary care hospital from January 2021 - December 2021 after approval from the Review board and institutional ethical committee.

A total of 312 in-patients' treatment sheets were collected from the medical records section / room of the tertiary care hospital who were admitted in the above-mentioned departments after permission from appropriate authority.

Demographic data and clinical information regarding prescribing pattern and trends of antibiotic prescriptions were noted.

The data was analyzed by using SPSS and Microsoft excel version 2007. All the multiple responses were presented in terms of number and percentage.

RESULTS

A total of 312 in-patients' treatment sheets were collected from four major clinical departments and analyzed, and the following observations were made. In this study, maximum patients (20.8%) belonged to geriatric age group > 68 years and minimum patients (0.8%) belonged to <1year (up to 12 months) of age group. Among these patients, 50.4% were females and the rest 49.6% were males. Most of the cases belonged to General Medicine department (80.8%) followed by General Surgery (8.2%), Obs & Gynae (8.2%) and least cases (2.8%) belonged to Paediatric department.

Table 1: Age-wise distribution

S. No.	Age	Number (%)
1	Up to 12 months	2 (0.8)
2	1-9 years	3 (1.1)
3	10-18 years	11 (3.5)
4	19-28 years	51 (16.5)
5	29-38 years	41 (13)
6	39-48 years	41 (13)
7	49-58 years	43 (13.9)
8	59-68 years	54 (17.3)
9	>68 years	65 (20.8)

Table 2: Gender-wise distribution

S. No.	Gender	Number (%)
1	Male	155 (49.6)
2	Female	157 (50.4)

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Table 3: Department-wise distribution

S. No.	Ward	Number (%)
1	General Medicine	257 (80.8)
2	General Surgery	25 (8.2)
3	Gynaecology	25 (8.2)
4	Paediatrics	9 (2.8)

Table 4: Department-wise distribution of cases based on frequency of prescribed antimicrobials from various classes of antimicrobial agents

S. No.	Class of Antimicrobial Agent	General Medicine (n=202)		General Surgery (n=25)		Gynaec (n=25)		Paediatrics (n=9)	
		N	%	N	%	N	%	N	%
1	Cephalosporins	121	48	15	58	20	76	3	33
2	Penicillins	112	44	3	11	7	29	1	5
3	Macrolides	68	26	0	0	1	6	0	0
4	Tetracyclines	10	4	0	0	2	7.8	1	11
5	Fluoroquinolones	25	10	03	13.7	0	0	0	0
6	Aminoglycosides	1	0.2	0	0	2	7.8	01	11
7	Lincosamides	22	8.9	01	3.9	0	0	0	0
8	Nitroimidazoles	28	11	6	21.6	6	21.6	1	5.5
9	Oxazolidinones	6	2.2	0	0	0	0	0	0
10	Nitrofurantoins	2	0.8	0	0	0	0	0	0
11	Glycopeptides	6	1.4	0	0	0	0	6	61
12	Carbapenems	7	2.8	0	0	0	0	3	38

Table 5: Department-wise distribution of cases based on frequency of prescribed antimicrobials agents

S. No.	Antimicrobial Agent	General Medicine (n=202)		General Surgery (n=25)		Gynae (n=25)		Paediatrics (n=9)	
		N	%	N	%	N	%	N	%
1	Pipracillin+tazobactam (P/T)	36	14.2	2	9	0	0	5	5.5
2	Amoxicillin+clavulanic acid (AMC)	72	28	5	19.6	3	11.8	0	0
3	Clindamycin (CD)	22	8.9	0	0	1	3.9	0	0
4	Ceftriaxone (CTR)	107	42.6	0	0	0	0	3	33
5	Azithromycin (AZM)	68	26	0	0	1	6	0	0
6	Levofloxacin (LE)	18	7	3	13	0	0	0	0
7	Cefoperazone (CPZ)	13	5	0	0	0	0	0	0
8	Metronidazole (MT)	28	11	6	21	6	21	1	5.5
9	Benzylpenicillin (BP)	2	1	0	0	0	0	0	0
10	Doxycycline (DO)	10	4	0	0	1	6	0	0
11	Ciprofloxacin (CIP)	6	2.2	0	0	0	0	0	0
12	Linezolid (LZ)	6	2.2	0	0	0	0	0	0
13	Vancomycin (VA)	3	1.4	0	0	0	0	6	61
14	Ceftriaxone+sulbactam (CIS)	0	0	10	41	19	76	0	0
15	Amikacin (AK)	1	0.2	0	0	2	7.8	1	11
16	Cefixime (CFM)	1	2.6	4	15.7	0	0	0	0
17	Meropenem (MRP)	7	2.8	0	0	0	0	3	38
18	Nitrofurantoin (NIT)	2	0.8	0	0	0	0	0	0
19	Ofloxacin+ornidazole (OFO)	0	0	1	5.9	0	0	0	0
20	Norfloxacin (NX)	1	0.2	0	0	0	0	0	0

It reveals that Cephalosporins were the most frequently prescribed group (48.1%) followed by Penicillins (44.3%), Macrolides (26.9%), Nitroimidazoles (11%), Fluoroquinolones (10.1%), Lincosamides (8.9%), Tetracyclines (4%), Carbapenems (2.8%), Oxazolidinones (2.2%), Glycopeptides (1.4%), Nitrofurantoins (0.8%) and Aminoglycosides (0.2%) in the decreasing order in General Medicine department. In the General Surgery department, Cephalosporins were the most frequently prescribed group (58.8%) followed by Nitroimidazoles (21.6%), Fluoroquinolones (13.7%), Penicillins (11.8%) and Lincosamides (3.9%) in the decreasing order. In Obs/Gynae department, Cephalosporins were the most frequently prescribed group (76.5%) followed by Penicillins (29.4%), Nitroimidazoles (21.6%), Aminoglycosides (7.8%), Macrolides (5.9%) and Tetracyclines (5.9%) in the decreasing order. However, in Paediatric department, Glycopeptides were the most frequently prescribed group (61.1%) followed by Carbapenems (38.9%), Cephalosporins (33.3%), Aminoglycosides (11.1%), Penicillins (5.5%) and Nitroimidazoles (5.5%) in the decreasing order.

DISCUSSION

According to the current study's patient demographics, of the 312 patients who were admitted, the majority (20.8%) belonged to the geriatric age group of patients over 68 years old, and the minimum (0.8%) belonged to the age group of

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< 1 year (up to 12 months). These findings were consistent with studies conducted by Mirza Beg et al. (2017) and Mahazan H.M et al. (2014), which found that the majority of patients belonged to the age group of > 60 years old. Our current study's findings, however, differed from those of Ambika VJ et al (2016),[6] where the majority of patients were between the ages of 33 and 42; Amritpal Kaur et al. (2018), where the majority of patients were between the ages of 30 and 70; and PR Shankar et al. (2002), where the majority of patients (54%) were between the ages of 20 and 39 years of age. The reasons for maximum patients of geriatric age group in our study might be due to poor immunity and compromised organ functions.[7]

Of the 312 enrolled patients in the current study, the majority (50.4%) were females, while the remaining cases (49.6%) were males. This was in contrast to the research by Amritpal Kaur et al. (2018) and De Bont EG et al. (2012), which found that 60% of patients were males and 40% were females, respectively, and similar to a study by Ambika VJ et al. (2016), in which the largest number of patients were females 59.29% and 40.7% were males. The department of General Medicine accounted for 80.8% of the patients, General Surgery 8.16%, Gynaecology 8.16%, and Paediatrics 2.9% having the fewest patients.[8] This might be because the General Medicine department has more inflow of patients compared to other departments. In the present study, Cephalosporins were the most commonly prescribed group (50.6%) followed by Penicillins (39.7%); Macrolides (22.2%); Nitroimidazoles (12.6) and Fluroquinolones (9.3%) in the decreasing order in admitted patients. This result is similar to Devesh K Joshi et al, (2017) and Venkateswarlu B et al, (2015) in which cephalosporins prescribed were 86% and 80.5% respectively.[9]

Ceftriaxone was the most frequently prescribed medication among cephalosporins in our study (22.7%), followed by Amoxycillin + Clavulanic acid (16.6%), Azithromycin (14.3%), Metronidazole (8.1%), Piperacillin + Tazobactam (8%), Ceftriaxone + Sulbactam (6.2%), Clindamycin (4.8%), Levofloxacin (4.4%), Cefoperazone (2.7%), and Doxycycline (2.4%). This was comparable to Sviestina I et al. (2015), in which 38% of prescriptions were cephalosporins, followed by 18% prescriptions of Amoxycillin + Clavulanic acid and Azithromycin.[10]

CONCLUSION

In the present study, Cephalosporins were the most frequently prescribed group of antibiotics followed by Penicillins and Macrolides. Most of these antibiotics were prescribed without culture & sensitivity testing which must be made mandatory in the hospital prior to antibiotic prescription. All antibiotics were prescribed by generic names and all those were available in hospital pharmacy. Results of our study indicate urgent need to increase awareness and understanding; communication and training among healthcare professionals to reduce unnecessary use & to promote rational therapy of antibiotics which can further reduce the antimicrobial resistance and drug interactions.

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