Research Article

Rational Use Of Antibiotics In Super Specialty Settings: Trends And Challenge

Sayed Hussain Mollah[1], Dr. Mahbubur Rahman[2]

[1]B.Pharm Graduate, Department of Pharmacy, J.B. Institute of Pharmacy, Guwahati, India
[2]Assistant Professor, Department of Pharmacy, J.B. Institute of Pharmacy, Guwahati, India

Corresponding Author:

Dr. Mahbubur Rahman
Assistant Professor, Department of Pharmacy Practice, J.B. Institute of Pharmacy, Guwahati, India.

A B S T R A C T

Background: Antibiotics usage has increased globally, the antibiotics are frequently prescribed to the patients, and it has been discovered that most of the antibiotics prescribed in healthcare settings are inappropriate. The misuse of these antibiotics leads to the rise of antimicrobial resistance, adverse drug reactions, and higher morbidity including high hospitalization costs.
Objective: This study aims to study the utilization of the antibiotics in super speciality hospital.
Methodology: It is a prospective observational study conducted over period of 3 months where the data of 50 patients hospitalized in the in-patient department were taken. All the data collected were designed in sheets and input in Microsoft Excel and the figures and tables are presented.
Results: Among those 50 patients studied it was found that the patient of age group 21-30 received most antibiotics among all age groups, the most prescribed antibiotic was Amikacin, and the patients were prescribed mostly with the antibiotics of "Orange" category.
Conclusion: Inappropriate antibiotic use is a major global health concern leading to antibiotic resistance and other negative consequences. While antibiotics are effective against bacterial infections, their misuse can lead to the emergence of resistant strains, making infections harder to treat and potentially spreading to others. Therefore, responsible antibiotic use, including proper dosage, duration, and indication, is crucial to combatting antimicrobial resistance and maintaining the effectiveness of these life-saving drugs.

Keywords: Antibiotic utilization, antibiotic resistance, antibiotic stewardship.

INTRODUCTION

Antibiotic utilization refers to the proper use of antibiotics in treating bacterial infections and preventing their spread [1]. It involves prescribing the correct antibiotic, in the right dosage, and for the appropriate duration to ensure effective treatment while minimizing side effects and resistance [2]. Responsible antibiotic use is essential to avoid overuse or misuse, which can lead to antibiotic resistance, making infections harder to treat [3]. Antibiotic stewardship programs and guidelines help promote optimal utilization in healthcare, agriculture, and veterinary settings [4].

Antibiotics have made a huge impact on modern medicines, reducing the morbidity rate to a greater extent [5]. Even though it has been helpful in most treatment, there remains a concern about the misuse and overdose of the antibiotics during the treatment phase [6].

Antibiotic stewardship programme is one that ensures responsible use of the antibiotics [7]. Multidisciplinary teamwork is necessary and helps to make sure the patients receive the appropriate antibiotics, and the proper dose required during treatment duration [8]. Properly managed antibiotic stewardship program (ASP) reduces the rates of resistance, treatment cost and enhances the outcomes [9].

METHODOLOGY

A prospective study was conducted on 50 patients over the period of 3 months on the inpatients of Super-speciality hospital, the hospital had various wards like the intensive care unit (ICU), burn ward, male ward, female ward and orthopaedic ward, all these were considered for study purpose. The data were collected from the patient's case notes, prescriptions, treatment charts and laboratory reports of the patients admitted in the hospital.

RESULTS

After conducting the observational study following data were collected

Table 1: Age wise patient distribution

Sl no	Age group	No. of patients	% of patients
1	0 to 10	4	8%
2	11 to 20	5	10%
3	21 to 30	15	30%
4	31 to 40	6	12%
5	41 to 50	8	16%
6	51 to 60	4	8%
7	61 to 70	2	4%
8	71 to 80	4	8%
9	above 81	2	4%

The patients observed in the study consisted of people from all age group. It included people from 0 to 90 years of age groups. The data mentioned above (Table 1) shows a demographic data of the patients from all the age groups. From the study it was found that the patients from age groups 0-10 was 12.50 %, 11-20 was 10 %, 21 -30 was 30 %, 31-40 was 12 %, 41-50 was 16 %, 51-60 was 8 %, 61-70 was 4 %, 71-80 was 8 % and 81-90 was 4 %.

Table 2: Number of antibiotics used

sl no.	name of antibiotic	no. of antibiotic used	% of antibiotic
1	Amikacin	44	88%
2	Ceftriaxone	33	66%
3	Piperacillin	12	24%
4	Tazobactam	11	22%
5	Clindamycin	10	20%
6	Metronidazole	7	14%
7	Meropenum	4	8%
8	Cefuroxime	4	8%
9	Doxycycline	2	4%
10	Azithomycin	2	4%
11	Cefixime	1	2%
12	Moxifloxacin	1	2%
13	Amoxycillin&clavulanic acid	1	2%

Table 2 shows the demographic data of total number of times the antibiotics have been used among those 50 patients observed in the study. From the study it was found that the antibiotic *amikacin*has been frequently used among the patients.

Table 3. Gender wise patient distribution

Sl no.	Gender	Percentage of Gender
1	Male	94%
2	Female	6%

Table 3Consists of the demographic data of the patient's distribution according to the gender of the patient.

Table 4. Category of antibiotics used

Category of antibiotics used	No. of Antibiotic used
Red	4
Orange	5
Green	3

Table 4Consist of the demographic data of the categories of restricted antibiotics used for the patients. From the observation it was found that, most of the patients were provided with 2° (*Orange*) restricted antibiotics and the least used was 1° (*Green)* restricted antibiotics.

Table 5. Percentage of antibiotics used

Sl no.	No. of antibiotics used	Number of patients	% of antibiotic used
1	1	5	10
2	2	32	64
3	3	12	24

Table 5Consists of the demographic data providing an overview of the antibiotics used according to the category of the restricted antibiotics and the total percentage of the antibiotics used in patients. It also indicates the total number of patients on which the antibiotics were used accordingly.

Table 6. Percentage of antibiotics used per patient

Number of antibiotics per patient	Percentage of antibiotic used
1	10
2	64
3	24

Table No. 6 Consists of the demographic data providing an overview of the percentage of antibiotics used per person according to the data collected. It indicates that most of the patients were administered with two antibiotics with the overall percentage of 64% and the other patients were administered with one and three antibiotics with percentage of 10% and 24% respectively.

DISCUSSION

The utilization of antibiotics is a significant concern, particularly considering the escalating global challenge of antibiotic resistance. Misuse or excessive use of antibiotics, such as administering them for viral infections or for situations where they are unnecessary, fosters the emergence of resistant pathogens, complicating treatment strategies and extending hospitalizations. Keeping track of antibiotic usage through organized protocols guarantees that these medications are prescribed only when essential, at the correct dosage, and for the suitable time frame. A 1996 study indicated that approximately **47.9%** of children aged 0-4 received at least one oral antibiotic prescription. By the year 2000, this figure decreased to **38.1%** [10]. As compared to our study the antibiotics given to the children of 0-10 years of age were about 12.50 %. The antibiotic most prescribed to the patients was *Azithromycin* [11]whereas in our study it was found that the most prescribed antibiotic to the children was ceftriaxone. According to a 2016/17 study, antibiotic prescribing rates for adults stood at 89.2 prescriptions per 1,000 registered patients[12], and the most prescribed antibiotics were *Amoxicillin, Azithromycin.* In our study it found that the most prescribed antibiotics to the adult patients was*Amikacin (***88%).** A study on older adults found that 71-year-old individuals had an antibiotic usage rate of 80.3% [13]. Whereas in our study it was found that most of the antibiotics were administered to the adults of age group if 21-30 years. A study published in **BMC Medicine** observed that antibiotic misuse is high in outpatient settings, especially among adults. Among older adults, inappropriate prescribing has been linked to lack of awareness about antibiotic resistance [14] On investigating the patient's cases in our study, the results were like the previous research, there was lack of awareness about the antibiotics resistance among people. Antibiotics consumption has increased with time among the adults in the middle-income countries and high-income countries.[15][16]

CONCLUSION

Inappropriate antibiotic use is a major global health concern leading to antibiotic resistance and other negative consequences. While antibiotics are effective against bacterial infections, their misuse can lead to the emergence of resistant strains, making infections harder to treat and potentially spreading to others. Therefore, responsible antibiotic use, including proper dosage, duration, and indication, is crucial to combatting antimicrobial resistance and maintaining the effectiveness of these life-saving drugs.

REFERENCE

1. Rahman MM, AlamTumpa MA, Zehravi M, Sarker MT, Yamin MD, Islam MR, Harun-Or-Rashid M, Ahmed M, Ramproshad S, Mondal B, Dey A. An overview of antimicrobial stewardship optimization: the use of antibiotics in humans and animals to prevent resistance. Antibiotics. 2022 May 16;11(5):667.

2. Bassetti S, Tschudin-Sutter S, Egli A, Osthoff M. Optimizing antibiotic therapies to reduce the risk of bacterial resistance. European journal of internal medicine. 2022 May 1;99:7-12.

3. Lee CR, Cho IH, Jeong BC, Lee SH. Strategies to minimize antibiotic resistance. International journal of environmental research and public health. 2013 Sep;10(9):4274-305.

4. Patel SJ, Wellington M, Shah RM, Ferreira MJ. Antibiotic stewardship in food-producing animals: challenges, progress, and opportunities. Clinical therapeutics. 2020 Sep 1;42(9):1649-58.

5. Cook MA, Wright GD. The past, present, and future of antibiotics. Science translational medicine. 2022 Aug 10;14(657):eabo7793.

6. Tarrant C, Krockow EM. Antibiotic overuse: managing uncertainty and mitigating against overtreatment. BMJ quality & safety. 2022 Mar 1;31(3):163-7.

7. Glasziou P, Dartnell J, Biezen R, Morgan M, Manski-Nankervis JA. Antibiotic stewardship. Australian Journal of General Practice. 2022 Jan;51(1/2):15-20.

8. Janssen RM, Oerlemans AJ, van der Hoeven JG, Oostdijk EA, Derde LP, Ten Oever J, Wertheim HF, Hulscher ME, Schouten JA. Decision-making regarding antibiotic therapy duration: An observational study of multidisciplinary meetings in the intensive care unit. Journal of Critical Care. 2023 Dec 1;78:154363.

9. Ya KZ, Win PT, Bielicki J, Lambiris M, Fink G. Association between antimicrobial stewardship programs and antibiotic use globally: a systematic review and meta-analysis. JAMA network open. 2023 Feb 1;6(2):e2253806-

10. Suaya JA, Gessner BD, Fung S, Vuocolo S, Scaife J, Swerdlow DL, Isturiz RE, Arguedas AG. Acute otitis media, antimicrobial prescriptions, and medical expenses among children in the United States during 2011–2016. Vaccine. 2018 Nov 26;36(49):7479-86.https://meps.ahrq.gov/data_files/publications/st35/stat35.shtml

11. Huynh CV, Gouin KA, Hicks LA, Kabbani S, Neuburger M, McDonald E. Outpatient antibiotic prescribing by general dentists in the United States from 2018 through 2022. The Journal of the American Dental Association. 2025 May 1;156(5):382-9.

12. Saatchi A, Morris AM, Patrick DM, Mccormack J, Reyes RC, Morehouse P, Reid J, Shariff S, Povitz M, Silverman M, Marra F. Outpatient antibiotic use in British Columbia, Canada: reviewing major trends since 2000. JAC-Antimicrobial Resistance. 2021 Sep 1;3(3):dlab116.

13. Charani E, Dlamini S, Koch A, Singh S, Hodes R, Laxminarayan R, Batheja D, Ramugondo E, Mukherjee AS, Mendelson M. Power Relations in Optimisation of Therapies and Equity in Access to Antibiotics (PROTEA) Study: investigating the intersection of socio-economic and cultural drivers on antimicrobial resistance (AMR) and its influence on healthcare access and health-providing behaviours in India and South Africa. Wellcome Open Research. 2024 Jul 24;9:400.

14. Orlando V, Monetti VM, Moreno Juste A, Russo V, Mucherino S, Trama U, Guida A, Menditto E. Drug utilization pattern of antibiotics: the role of age, sex and municipalities in determining variation. Risk management and healthcare policy. 2020 Jan 29:63-71

15. Lee GC, Reveles KR, Attridge RT, Lawson KA, Mansi IA, Lewis JS, Frei CR. Outpatient antibiotic prescribing in the United States: 2000 to 2010. BMC medicine. 2014 Dec;12:1-8.

16. Klein EY, Impalli I, Poleon S, Denoel P, Cipriano M, Van Boeckel TP, Pecetta S, Bloom DE, Nandi A. Global trends in antibiotic consumption during 2016–2023 and future projections through 2030. Proceedings of the National Academy of Sciences. 2024 Dec 3;121(49):e2411919121.https://www.pnas.org/doi/10.1073/pnas.2411919121