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Analysis of Antibiotics Prescribed in Pediatric Department of Civil Hospital Dharashiv (Maharashtra)

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Abstract

Background: The study examined the prescribing patterns of antibiotics in pediatric patients at the Civil Hospital, Dharashiv, Maharashtra. It aimed to understand the demographic and clinical factors influencing antibiotic use and assess adherence to Standard Treatment Guidelines (STG). **Objectives:** The objectives were to investigate the prescription practices for antibiotics in pediatric patients, evaluate the factors such as age, weight, and disease condition, and analyze compliance with the STG. **Methods:** This prospective observational study was conducted at the pediatric department of the Civil Hospital, Dharashiv, from August 2023 to March 2024. Data were collected from 120 pediatric patients through chart reviews, administrative database analysis, and interviews during ward rounds. The collected data were analyzed to identify trends and patterns in antibiotic prescription. **Results:** Among the 120 pediatric cases, the most prescribed antibiotic was Penicillin (45.23%), followed by Cephalosporins (23.36%), Aminoglycosides (16.35%), and Quinolones (7.47%). Viral infections were the most prevalent condition (41.66%), followed by upper respiratory tract infections (25.83%) and gastrointestinal tract infections (9.16%). Empiric treatment was the most common approach (77.5%), while definitive and prophylactic treatments were used in 16.66% and 5.83% of cases, respectively. The majority of patients were from rural areas (55%), and intravenous administration was the most frequent route (45.81%). **Conclusion:** The study highlighted the prescribing patterns of antibiotics in pediatric patients, emphasizing the need for rationalization of antibiotic use. The findings underscore the importance of adherence to STG to minimize resistance and ensure effective treatment outcomes.

Keywords: Antibiotics; Pediatrics; Rational Prescribing; Penicillin; Amoxicillin

1 Introduction

Antimicrobials, whether fully or partially synthetic, were categorized under this term according to contemporary definitions¹. While some antibiotics merely inhibited bacterial growth, others were capable of completely eradicating bacteria. Bacteriostatic agents impeded bacterial growth, whereas bactericidal agents destroyed bacteria. Drugs were defined as substances that produced biological effects on living organisms when administered to them. The term "antibiotic" originated from "antibiosis," which meant "against life." Initially, antibiotics were believed to be chemical substances produced by one microorganism that harmed other microorganisms by either killing them or preventing their growth².

Antibiotics functioned by disrupting the survival of bacteria through a specific Mode of Action (MOA). At therapeutic concentrations, they were strong enough to combat infections effectively while causing minimal harm³. Recent studies have highlighted concerns regarding antibiotic prescribing practices in pediatric patients. Inappropriate antibiotic prescriptions have been associated with increased risks of adverse drug events and higher healthcare expenditures.⁴ The specific MOA of an antibiotic disrupted bacterial survival, but, more importantly, at therapeutic doses, it was potent enough to fight infections effectively while posing little risk.

The antimicrobial efficacy of most classes of antibiotics targeted unique features of bacterial structures or their metabolic processes. The primary targets of antibiotics are illustrated in Figure 1 and included the following mechanisms of action:

1. Inhibition of cell wall synthesis.
2. Disruption of cell membrane structure or function.
3. Inhibition of the structure and function of nucleic acids.
4. Inhibition of protein synthesis.
5. Interference with key metabolic pathways.

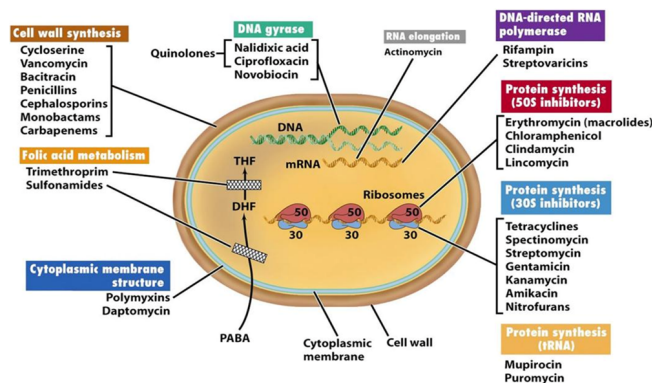


Fig 1. Action and resistance mechanisms of antibiotics⁵

2 Methodology

Several databases, including PubMed, DELNET, MEDLINE, Science Direct, and the National Library, were consulted during the development of this technique. Numerous national and international papers were reviewed to gather the necessary data and create a patient information form. Various factors were considered and included in the patient information form to address the antibiotic prescribing patterns in the eastern Marathwada region of Maharashtra, aiming to achieve positive outcomes.

A prospective observational study was designed to collect information using the hospital administrative database, reviewing patient charts, and conducting interviews during ward rounds in the pediatric department of the District Civil Hospital, Dharashiv. This population-based, randomized prospective observational study was conducted at the Government District Hospital, Dharashiv (Maharashtra), India, from August 2023 to March 2024. The case sheets of pediatric patients required for the study were collected during ward rounds with proper permissions from the hospital authorities.

The study included 120 pediatric patients, both male and female, from various departments such as male pediatric and female pediatric wards at the Government District Hospital, Dharashiv. The case sheets of these 120 pediatric patients were followed up weekly, three times, by Doctor of Pharmacy students from the institution until the patients were discharged. Subjective evidence, objective evidence, and treatment plans were collected from the randomly selected case sheets. Demographic factors such as age, gender, disease prevalence, and drug treatment, particularly antibiotic usage, were considered essential for this study. The collected data were organized into spreadsheets and analyzed for assessment and interpretation.

3 Result

3.1 Incidence of antibiotic concerning age groups

From August 2023 to March 2024, a total of 120 children were admitted to the Dharashiv district government hospital. It was discovered that the age of occurrence was 30 years on average, with a standard deviation of 19.84, of the 120 children, 46.66 (54N) were male and 53.33% (64N) were female. The age groups of 0–01 years (16.66%, N = 15) and 02–05 years (29.16%, N = 35) had the highest number of children (46.66%, N = 56), while the age group of >12 years (11.66%, N = 14) had the lowest number of children.

3.2 Weight of patients

Among the 120 children, their weights varied, ranging from less than 10 kg to over 40 kg, with an average weight of 30

kg and a standard deviation of 12.83. Of these children, 54 were boys and 64 were girls. The weight group with the most children, around 36%, fell between 31 to 40 kg, while the group with the fewest children, about 13%, had weights less than 10 kg. Additionally, about 32% of the children weighed between 21 to 30 kg, and approximately 20% weighed over 40 kg.

3.3 Geographical location

The geographical location of patients after birth was as follows: Out of 120 patients 55% belong to rural areas, 30% belong to semi-urban areas and 15% belong to urban areas.

3.4 Comorbidity

In our study out of 120 cases 8.33% of patients were suffering from comorbidity, 91.66% were not suffering from comorbidity.

3.5 Route of Administration

The mean Route of administration was 67.66 and standard deviation was 41.30. Out of 120 cases 45.81% had IV route of administration, 44.33% had oral route of administration, and 9.84% had parenteral route of administration.

3.6 Types of treatment

In our study, 77.5% of patients were empiric, 16.66% patients were definitive and 5.83% were prophylactic.

3.7 Disease conditions where antibiotics are given

In our study out of 120 cases, 41.66% of babies were suffering from viral infection, 25.83% were suffering from URTI, 9.16% were suffering from gastrointestinal tract infection 8.33% were suffering for both URTI and cardiovascular disorder, 4.16% were suffering from blood disorder and 2.5% were suffering for epileptic seizures with a mean of 16.87 and a standard deviation of 14.27.

3.8 Used antibiotics (treatment)

The patients having the disease condition are treated with antibiotics, with a mean of 30.57 and a standard deviation of 33.16. The following antibiotics, and the corresponding number of patients fall into these categories: in class of Penicillin the majorly used antibiotic is Amoxicillin (45.23%), in Aminoglycosides class the mainly used drug is Amikacin (16.35%), in Cephalosporin class majorly used antibiotic is Ceftriaxone (23.36%), and Doxycycline drug that belongs to class Tetracycline is mainly used (4.67%). The drug like Ciprofloxacin under the class Quinolones is rarely used to treat a patient (7.47%). In rare conditions of gastrointestinal

and respiratory tract infection, drug Sulfamethazine which belongs to class Sulfonamides (2.33%), other antibiotics like Glycopeptide (Vancomycin) (1.40%) are used.

3.9 Combined regimen

In our study, 72.72% of patients were treated with Amoxycylav, 14.28% of patients were treated with Quinine sulphate .

4 Discussion

In our study conducted at the Dharashiv district government hospital between August 2023 and March 2024, observed that 46.66% (N = 56) of the 120 admitted children were in the 0–5 years age group. This finding aligns with trends reported in various studies across different regions.

For instance, a study analyzing pediatric emergency department visits in the United States in 2009 found that children under 1 year of age accounted for 72% of hospital stays, while those aged 1–4 years comprised nearly 9%.⁶

This research investigates the prevalence and associated risk factors of overweight and obesity among children aged 0–59 months in India. The study found that the prevalence of overweight/obesity among children in this age group was 2.6%. Factors such as child sex, age, birth weight, birth rank, maternal education, number of children, age at marriage, mother's BMI, media exposure, social group, and dietary diversity score were significantly correlated with childhood overweight and obesity.⁷

In the current study, around 36% fell between 31 to 40 kg, while the group with the fewest children, about 13%, had weights less than 10 kg. The majority of the participants in this study are from rural areas, that is 55% (N=66), the patients taking the antibiotic at a higher level is more in rural areas as compared to semiurban 30%(N=36) and urban areas 15% (N=18). This is similar to the study conducted, by Gebre Teklemariam Demoz et al, 2020. This study concludes that the consumption of antibiotics is higher in rural areas because of misinformation about antibiotic prescriptions.⁸ The average score for the route of administration was calculated to be 67.66, with a standard deviation of 41.30. Among the 120 cases examined, approximately 46% of patients received treatment via the intravenous (IV) route, while around 44% were administered medication orally. A smaller proportion, approximately 10% of cases, involved parenteral route administration. This distribution suggests a notable reliance on intravenous administration, followed closely by oral administration, in the treatment of pediatric patients at the Dharashiv district hospital. The relatively high percentage of IV administration may indicate the severity or urgency of cases requiring rapid and direct drug delivery into the bloodstream. Oral administration, being a common and convenient method, is understandably prevalent as well. The lower percentage of parenteral administration suggests that it is less frequently

utilized, possibly due to factors such as the specific nature of the conditions being treated, patient age and condition, or hospital protocols. Overall, understanding the patterns of route administration provides valuable insights into treatment practices in pediatric care, aiding in the optimization of therapeutic approaches and resource allocation to ensure the best possible outcomes for young patients. Our study found that the majority of patients, around 77.5%, received empiric treatment, initiated based on clinical judgment. Definitive treatment, targeting specific pathogens, was administered to about 16.66% of patients, while prophylactic treatment was given to 5.83% of patients. This indicates a preference for proactive, symptom-based treatment, with a smaller proportion receiving targeted therapy based on confirmed diagnoses or preventive measures. This data provides insight into the antibiotic choices made in treating pediatric patients, highlighting the diverse range of antibiotics utilized in clinical practice. In our investigation, we observed that the majority of patients, around 72.72%, were treated with Amoxyclav. Additionally, 14.28% of patients received treatment with Quinine sulfate. This distribution indicates a notable preference for Amoxyclav (Amoxicillin and clavulanic acid) as the primary treatment choice among the patients included in our study, with a smaller proportion opting for Quinine sulfate.

5 Conclusion

This distribution underscores the variety of conditions affecting pediatric patients, with viral infections being the most common. The data provides insight into the antibiotic choices made in treating pediatric patients, highlighting the diverse range of antibiotics utilized in clinical practice.

The study on the prescribing patterns of antibiotics in pediatric patients at the Civil Hospital, Dharashiv, highlighted crucial insights into antibiotic use in the region. The findings revealed a predominant reliance on empiric treatment (77.5%) and significant use of antibiotics such as Penicillin (45.23%) and Cephalosporins (23.36%). Viral infections were the most common condition treated, emphasizing the need for careful evaluation to avoid unnecessary antibiotic prescriptions.

Moreover, the study underscores the necessity of adhering to Standard Treatment Guidelines (STG) to ensure the rational use of antibiotics, minimize resistance, and optimize patient outcomes. With rural areas representing a majority of the patients, targeted awareness campaigns and enhanced clinical practices are essential to improve antibiotic stewardship and safeguard public health.

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