

EVALUATION OF ANTIBIOTIC PRESCRIBING PATTERN IN INPATIENT
PEDIATRIC DEPARTMENT OF GENERAL HOSPITAL IN ANAND

Pharmaceutical Science

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ABSTRACT

Introduction: Appropriate prescription of antibiotics for pediatric patients is a significant public health concern due to infections being the common cause of childhood illnesses. Inappropriate and frequent use of antibiotics can lead to antimicrobial resistance and escalate healthcare expenses. To address this issue, it is imperative to utilize antibiotics according to established guidelines and rational manner. So, the aim of the study to assess the antibiotic prescribing patterns based on the World Health Organization core prescribing indicators in the pediatric ward of Anand General Hospital, Anand. **Methods:** An analysis was conducted over 3 months in the pediatric ward of Anand General Hospital, Anand, Gujarat, India. The data collected underwent assessment using the core prescribing indicators established by the World Health Organization. **Results:** In the study, a total of 154 patient records were reviewed, revealing a male prevalence of 65%. Most patients fell within the age group of 1 month to 1 year, comprising 40.2% of the total study patients. Gastrointestinal infection more commonly found in our study patients. The most prescribed antibiotic was ceftriaxone. A total of 1216 drugs were prescribed, resulting an average of 7.8 drugs per prescription were prescribed. Antibiotics were present in 62.09% of the prescriptions and injectable antibiotics were administered in 82.46% of cases. 94.15% of the antibiotics were prescribed using their generic name and all medications were selected from the essential medicine list. **Conclusion:** The findings of the study indicate high rate of antibiotic prescription, frequent use of multiple medications and significant prevalence of injectable prescriptions. Most medications are prescribed by generic names and selected from the essential medicine list. The study underscores the necessity of promoting rational prescribing practices among healthcare providers in line with established guidelines to mitigate antibiotic resistance within the pediatric healthcare community.

KEYWORDS

Antibiotics, Pediatric, WHO core prescribing indicators

INTRODUCTION

Worldwide, there is a significant issue with the irrational use of medications, particularly antimicrobials (Sweileh, 2021). In developing nations like India with high infectious disease rates, there is a high demand for antibiotics, leading to frequent inappropriate use (Beg et al., 2016, Randad et al., 2017).

An antibiotic is most commonly prescribed medication in the pediatric age group, due to more susceptibility to infectious diseases compared to other age groups (Chai et al., 2012). According to several surveys, 50% to 85% of children in developed and developing nations receive doctor-prescribed antibiotics (Choudhury & Bezbaruah, 2013).

Pediatric patients require careful monitoring when using antibiotics due to higher risk of side effects and antimicrobial resistance (AMR) because of their underdeveloped pharmacokinetic and pharmacodynamic systems. The emergence of antibiotic resistance can be attributed to the excessive use of antibiotics in the absence of proper monitoring. Given that antibiotics are frequently administered in healthcare settings, the inappropriate utilization of these medications may lead to the development of resistance. Therefore, a thorough examination of prescribing patterns is essential in the realm of healthcare practice.

Annually 700000 individuals, succumb to the effects of Antimicrobial Resistance (AMR). Projections indicate that by the year 2050, this figure could surge to a staggering 10 million (O'Neill, 2016). In recent years, there has been a consistent increase in antibiotic utilization in India. The retail sale of antibiotics in the country escalated by 23 percent from 2000 to 2010. During the same period, the consumption of defined daily doses of antibiotics surged from 3.2 billion to 5.5 billion in 2015 (Klein et al., 2018, Van Boeckel et al., 2014).

The emergence of drug utilization studies as a research discipline has enabled the systematic and formal investigation of drug prescription and usage. While many countries routinely analyze outpatient drug consumption, there is a scarcity of research focusing on inpatient drug utilization. The current research was designed to evaluate antibiotic prescribing practices based on the WHO prescribing indicators in the pediatric inpatient department of Anand General Hospital, Anand.

MATERIALS & METHODS

A retrospective cross-sectional study lasting for three months was conducted from June 2023 to August 2023. Data was gathered from pediatric inpatients who were prescribed antibiotics at Anand General Hospital in Gujarat, India.

The study was approved by the ethical committee of Pramukhswami medical college, Bhaikaka University, Karamsad, Anand (Ref. No.; IEC/BU/2023/Ex.82/321/2023). Also taken permission from the Chief district medical officer of Anand General Hospital.

Pediatric patients (1 month to 18 years) admitted into the pediatric wards were assessed throughout the study. Patients who received a prescription for a minimum of one systemic antibacterial agent and spent at least 24 hours in the hospital were included. Patients referred to the higher facility, discharged against medical advice, insufficient medical records were excluded.

The demographic information of the patients (age, gender), medical condition and prescribed antibiotics were noted. The data collection form included information on the antibiotic class, dosage, route, frequency and length of treatment.

Based on this collected data and using World Health Organization (WHO) core prescribing indicators calculate the average number of drugs prescribed for each patient, an antibiotic prescribed for each patient, an antibiotic prescribed by generic name and from essential medicines formulary.

We entered the collected data into Microsoft Excel and used descriptive statistics like frequency and percentage for analysis.

RESULTS

A total of 154 patients were enrolled based on the predefined inclusion and exclusion criteria. In our study Table 1 shows that 95 (62%) of the 154 patients were male, and the remaining 59 (38%) were female.

Table 1: Distribution Of Patients According To Gender (n=154)

Gender	Frequency (%)
Male	95 (62%)
Female	59 (38%)

Data are presented as N (%).

In Table 2, it is shown that out of the total patients, 62 (40.3%) were between the ages of 1 month and 1 year, 36 (23.4%) were between 1 to 2 years old, 28 (18.2%) were aged 3 to 5 years, 13 (8.4%) were between 6 to 11 years, and 15 (9.7%) were between 12 to 18 years. The largest number of patients 62 (40.3%) fell into the 1-month to 1-year age group, while the fewest patients 13 (8.4%) were in the 6-to-11-year age group.

Table 2: Distribution Of Patients According To Age (n=154)

Age (Month/years)	Frequency (%)
1 month to 1 year	62 (40.3%)
1 to 2 years	36 (23.4%)
3 to 5 years	28 (18.2%)
6 to 11 years	13 (8.4%)
12 to 18 years	15 (9.7%)

Data are presented as N (%).

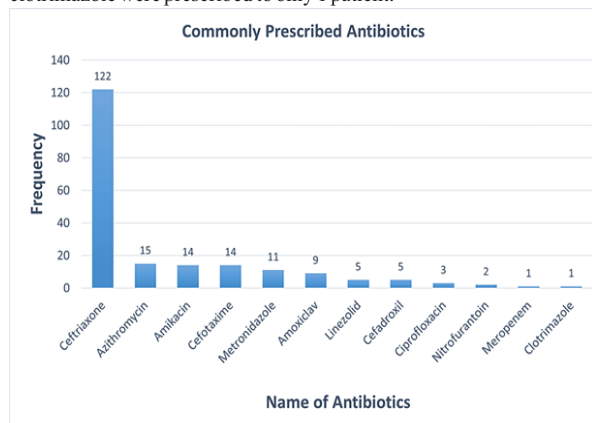
The medical conditions listed in Table 3 indicate antibiotics were prescribed to which medical conditions. In terms of medical conditions, 68 (44.2%) patients had a diagnosis of gastrointestinal infection, 42 (27.3%) had respiratory infection, 22 (14.3%) had pyrexia of unknown origin (PUO). While 11 (7.1%) patients prescribed antibiotics for surgical prophylaxis. 6 (3.9%) patients had a diagnosis of urinary tract infection and 5 (3.2%) had a skin infection.

Table 3: Medical Conditions Responsible For Prescribing Of Antibiotics In Pediatrics (n=154)

Medical Conditions	Frequency of patients (%)
Gastrointestinal infection	68 (44.2%)
Respiratory infection	42 (27.3%)
Pyrexia of unknown origin (PUO)	22 (14.3%)
Surgical prophylaxis	11 (7.1%)
Urinary tract infection	6 (3.9%)
Skin infection	5 (3.2%)

Data are presented as N (%).

As shown in Figure 1, which antimicrobial agent was prescribed to patients. The majority of prescribed antibiotics was ceftriaxone in 122 patients and the second most prescribed azithromycin in 15 patients. Amikacin and cefotaxime were prescribed in 14 patients. Metronidazole was prescribed in 11 patients. Amoxiclav (amoxicillin+ clavulanic acid) was prescribed in 9 patients. Linezolid and cefadroxil were prescribed in 5 patients. Ciprofloxacin and nitrofurantoin were prescribed in 3 and 2 patients respectively. Meropenem and clotrimazole were prescribed to only 1 patient.



Data on Y-Axis are presented as N.

Figure 1: Commonly Prescribed Antibiotics In Pediatric Patients

Table 4 shows an assessment of prescriptions by WHO core prescribing indicators. The present study reveals that a total of 248 patients were admitted during the study period out of them 154 (62.09%) had prescriptions found with antibiotics. A total of 1216 drugs were prescribed in 154 patients, resulting in an average of 7.8 drugs per prescription were prescribed. Among 154 antibiotic prescriptions, 127 (82.46%) prescriptions were injectable. Out of 154 prescriptions, 145 (94.15%) antibiotics were prescribed by generic name and all 154 (100%) of antibiotics prescribed from the essential medicine list.

Table 4: Assessment Of Prescription By World Health Organization Core Prescribing Indicators

WHO Core Prescribing indicators	Frequency (%)	Standard value (%)
Percent of prescriptions with antibiotics out of total prescriptions (n=248)	154 (62.09%)	20-26.8
Average number of drugs per encounter (n=154)	7.8 (NA)	1.6-1.8
Percent of prescriptions with injectable antibiotics (n=154)	127 (82.46%)	13.4-24.1
Percent of antibiotic prescriptions with a generic name (n=154)	145 (94.15%)	100
Percent of antibiotic prescriptions from the essential medicine list (n=154)	154 (100%)	100

Data are presented as N (%).

DISCUSSION

The analysis of 154 patient records for our study revealed that 62% of the patients were male. Reports from earlier studies conducted in India have shown a similar male prevalence of 65% (Mathew et al., 2021). Most patients were aged 1 month to 1 year, making up 40.2% of the total study patients. We found the same results (32%) in the study that was carried out in Maharashtra, India (Mathew et al., 2021). The statement suggests that the well-being of infants should be a paramount priority in the provision of medical care and may serve as an indication of heightened susceptibility to illnesses in children below the age of one.

Our study revealed a greater incidence of gastrointestinal tract infections, contrasting with previous research in India, which indicated a higher incidence of respiratory tract infections (Mathew et al., 2021; Jangra et al., 2019). Children's exposure to environmental pollutants and inadequate sanitation practices is likely to be a contributing factor, particularly in developing nations.

In this study, ceftriaxone most prescribed antibiotic, accounting for 122 prescriptions (79.2%), followed by Azithromycin with 15 prescriptions (9.7%), and Amikacin & Cefotaxime with 14 prescriptions (9%). An analysis of outpatient antibiotic prescription patterns in children in the United States indicated that cephalosporins, penicillins, and second-generation macrolides are the most prescribed antibiotics (Vaz et al., 2014). A systematic review conducted recently found that the commonly prescribed antibiotics for pediatric patients in China were third-generation cephalosporins, penicillin, and macrolides (Guo et al., 2021). Cephalosporins and penicillins serve as essential treatments for infectious diseases across all age groups. Their increased rates of prescription can be attributed to their broad range of effectiveness, demonstrated clinical success, and favourable tolerability.

Prescriptions with antibiotics were 62.09% which was higher than the standard value of the WHO range of 20-26.8% (Ghei, 1995). A comparative analysis conducted in Nigeria indicated a lower percentage compared to our study, with figures at 28.2% (Joseph et al., 2015), while higher numbers were reported in Sudan (81.3%) (Ahmed & Awad, 2010). Variations in the outcomes across different nations can be attributed to disparities in the incidence rates of infectious diseases, as well as differences in socioeconomic and cultural backgrounds. Additionally, variations in outcomes may stem from disparities in the knowledge of antibiotic resistance patterns and the diagnostic capabilities of healthcare providers (Chai et al., 2012).

Polypharmacy has been identified in this study, as indicated by an average of 7.8 medications per patient encounter. Polypharmacy refers to the prescribing of more medications than clinically necessary or appropriate. The World Health Organization (WHO) suggests that the average medications per encounter should ideally fall between 1.6 and 1.8, highlighting the potential for excessive prescribing in this context (Ghei, 1995). The average number of medications in Nigeria was determined to be 2.6, which differs from our research (Joseph et al., 2015). Nonetheless, research carried out in India revealed corresponding results of 5.14 medication per patient encounter (Karande et al., 2005). The presence of diagnostic uncertainty or the prescription of medication by physicians for minor symptoms increases the likelihood of side effects, drug-drug interactions, dosage errors, emergence of antibiotic resistance and escalated costs.

The proportion of injectables used in our research was significantly above the recommended range of 13.4-24.1%, reaching 82.46%(Ghei, 1995). A different study conducted in India revealed a 2.6%, in contrast to ours(Karande et al., 2005). Our study's results were in line with the findings of an Ethiopian study (84.33%)(Girma et al., 2018). Excessive utilization of injectable medications can elevate the likelihood of blood-borne infections and increase healthcare costs. Nonetheless, the limited availability of pediatric oral formulations, patient nonadherence to oral regimens, and the necessity for injectables in urgent medical scenarios are the primary factors contributing to the escalating use of injectable prescriptions(Nduka et al., 2017).

The World Health Organization suggests that prescribing drugs by their generic name should be at 100%, but our research showed a rate of 94.15%(Ghei, 1995). In contrast to our study, optimal 100% in UAE(Sharif et al., 2015). Prescribing generic medications is simpler, reduces dispensing errors, improves patient-professional communication, and is generally less expensive than branded medications.

The Essential Drug List (EDL) accounted for 100% of the prescribed antimicrobials, which aligns with the WHO's recommended optimal value of 100%(Ghei, 1995). A study conducted in the UAE revealed a striking similarity (100%), but a study conducted in Nigeria showed a distinct result (60.4%)(Nduka et al., 2017, Sharif et al., 2015). In rational prescription, medications are chosen from the hospital formulary or essential drug list (EDL) for being more established, less costly, and having undergone extensive clinical trials compared to newer medications. In our study area, the government hospital's drug supply mainly consists of essential drugs as per the National List of Essential Medicines (NLEM).

This study constraint lies in its purely observational nature. The assessment of the appropriateness of prescription medications lacked qualitative factors. There was a failure to consider justifying the recommended medication based on laboratory test results and specific diagnoses. Consequently, further research is warranted to address these gaps.

CONCLUSIONS

The high prescribing rate of antibiotics poses a significant challenge in successfully implementing an antibiotic stewardship program at the general hospital. Key obstacles to rational prescribing include polypharmacy and frequent use of injectable medications. Nevertheless, the prescriptions comply with the drug formulary. Limiting the use of injections and promoting the use of generic names align with the objectives of rational prescribing. It is recommended that physicians engage in ongoing education and training regarding the prescription of injectable and generic medications. Furthermore, the assignment of clinical pharmacists to every ward to oversee prescribing practices and offer appropriate recommendations is encouraged.

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