

ORIGINAL ARTICLE

Assessment of Inappropriate Antibiotic Prescribing in Pediatric Febrile Illnesses

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ABSTRACT

Background: Fever is a common cause of pediatric consultations, but most febrile illnesses in children are viral and self-limiting.

Objective: To assess the frequency, pattern, and determinants of inappropriate antibiotic prescribing in pediatric patients presenting with febrile illnesses.

Methodology: This cross-sectional observational study was conducted at Mayo Hospital, Lahore from December 2022 to May 2023. It included 205 children aged 1 month to 12 years presenting with fever. Data on demographics, diagnosis, antibiotic type, route, duration, and rationale were collected using a structured proforma. Appropriateness of prescriptions was evaluated according to WHO and national pediatric treatment guidelines.

Results: The mean age of patients was 5.2 ± 3.1 years, with 57.1% males. Most patients (74.1%) were managed in the outpatient department. Upper respiratory tract infection (42%) was the most frequent diagnosis leading to antibiotic prescription. Cephalosporins (37.1%), penicillins (33.2%), and macrolides (16.1%) were the most prescribed classes. Inappropriate antibiotic use was found in 59% of prescriptions, significantly higher in outpatients ($p = 0.042$) and viral infections ($p < 0.001$). Children who received inappropriate antibiotics had slower fever resolution (65.3% vs 88.1%), higher readmission rates (11.6% vs 3.6%), and more adverse effects (19% vs 8.3%).

Conclusion: Inappropriate antibiotic prescribing is highly prevalent in pediatric febrile illnesses, especially in viral infections and outpatient encounters. Overuse of broad-spectrum antibiotics such as cephalosporins and macrolides leads to adverse outcomes and increased resistance.

Keywords: Fever, Febrile, Antibiotic, Treatment, Outcomes, Patients

INTRODUCTION

Fever is among the most common symptoms prompting medical consultation in children and accounts for a significant proportion of pediatric visits in both outpatient and inpatient settings. In developing countries, febrile illnesses constitute one of the major causes of morbidity and mortality among children under five years of age¹. However, while fever is a natural physiological response to infection, the majority of pediatric febrile episodes are viral and self-limiting, requiring only symptomatic care and observation². Despite this, antibiotics are often prescribed unnecessarily in febrile children, leading to the overuse and misuse of these essential drugs³. The global burden of inappropriate antibiotic prescribing has reached alarming levels and is now recognized as one of the major drivers of antimicrobial resistance (AMR). The World Health Organization (WHO) has declared AMR one of the top ten global public health threats. The misuse of antibiotics in pediatric populations accelerates the selection of resistant bacterial strains, reducing the effectiveness of standard treatments for common infections such as pneumonia, otitis media, and urinary tract infections⁴. This problem is particularly worrisome in low- and middle-income countries (LMICs), where antibiotics are often available without prescription and stewardship programs are still developing⁵.

Inappropriate prescribing in children often stems from diagnostic uncertainty and the absence of rapid, reliable tools to distinguish between bacterial and viral infections. Febrile illnesses caused by viruses such as influenza, respiratory syncytial virus (RSV), dengue, or other viral upper respiratory infections tend to mimic bacterial infections during the initial stages. Physicians, particularly in busy emergency and outpatient clinics, may err on the side of caution by prescribing antibiotics empirically to prevent possible bacterial complications⁶.

This practice, although well-intentioned, contributes to the unnecessary consumption of antibiotics in cases where they offer no clinical benefit. Several studies have shown that antibiotics are prescribed in up to 60–70% of pediatric febrile illness cases, even when bacterial infection is unlikely⁷. Common examples include upper respiratory tract infections, acute bronchitis, nonspecific febrile episodes, and viral pharyngitis, where supportive therapy is usually sufficient. The situation is exacerbated by parental pressure and misconceptions about the role of antibiotics. Many caregivers expect antibiotics as part of treatment, equating them with faster recovery, and physicians often comply with these expectations to maintain satisfaction and trust⁸.

In resource-limited settings such as Pakistan, the problem is further intensified by systemic challenges. Over-the-counter availability of antibiotics, lack of uniform prescribing guidelines, absence of microbiological diagnostic support, and limited awareness among healthcare providers all contribute to irrational antibiotic use⁹. Private practitioners, who constitute a large proportion of healthcare providers in the community, may also lack access to evidence-based guidelines, leading to empirical and repetitive use of broad-spectrum agents. Commonly misused antibiotics in pediatric practice include third-generation cephalosporins, macrolides, and fluoroquinolones, which are frequently prescribed even for uncomplicated viral illnesses¹⁰. The consequences of such prescribing behavior are far-reaching. On a population level, antibiotic misuse has contributed to the emergence and spread of multidrug-resistant bacteria, making infections more difficult and costlier to treat. On an individual level, unnecessary antibiotic exposure increases the risk of adverse drug reactions, gastrointestinal disturbances, and disruption of the normal gut microbiota¹¹. Emerging evidence has linked early-life antibiotic exposure with long-term health effects, including increased risks of obesity, asthma, inflammatory bowel disease, and allergic disorders. Moreover, inappropriate antibiotic use increases healthcare costs due to unnecessary medication

Received on 13-06-2023

Accepted on 21-11-2023

expenses and potential complications from resistant infections¹². Globally, antibiotic stewardship programs have been introduced to promote rational prescribing and curb resistance development. These programs emphasize evidence-based guidelines, diagnostic stewardship, and prescriber education¹³. In developed countries, electronic prescription audits, feedback systems, and rapid diagnostic tests have shown success in reducing inappropriate prescriptions. However, such interventions remain limited in LMICs, where antibiotic consumption continues to rise due to population growth, unregulated drug sales, and limited public health infrastructure¹⁴.

Objective: To assess the frequency and factors associated with inappropriate antibiotic prescribing in children presenting with febrile illnesses.

METHODOLOGY

This was a cross-sectional observational study conducted at Mayo Hospital, Lahore from December 2022 to May 2023. A total of 205 pediatric patients (n = 205) aged between 1 month and 12 years presenting with febrile illness were included in the study. Non-probability consecutive sampling was used.

Inclusion Criteria:

- Children aged 1 month to 12 years presenting with fever ($\geq 38^{\circ}\text{C}$).
- Patients who received at least one antibiotic prescription during evaluation or hospital stay.
- Both male and female children were included.

Exclusion Criteria:

- Children with confirmed bacterial infections (e.g., pneumonia, urinary tract infection, otitis media, meningitis).
- Patients on long-term antibiotic prophylaxis or with immunodeficiency disorders.
- Cases with incomplete medical records.

Data Collection: After ethical approval from the Institutional Review Board, data were collected using a structured proforma designed by the researcher. Information recorded included demographic characteristics, presenting symptoms, provisional diagnosis, antibiotic type, dose, route, duration, and whether the antibiotic choice adhered to established pediatric guidelines. The appropriateness of antibiotic prescribing was evaluated based on WHO and national pediatric treatment guidelines. Each prescription was reviewed by a clinical pharmacist and a pediatrician to determine if the antibiotic use was justified according to diagnosis and indication.

Data Analysis: All data were entered and analyzed using IBM SPSS Statistics version 26.0. Descriptive statistics were applied to summarize the data. Quantitative variables such as age and duration of therapy were expressed as mean \pm standard deviation (SD). Qualitative variables such as gender, diagnosis, antibiotic class, and appropriateness of prescription were presented as frequencies and percentages. Associations between inappropriate prescribing and categorical variables (e.g., diagnosis, age group, setting) were analyzed using the chi-square (χ^2) test. A p-value < 0.05 was considered statistically significant.

RESULTS

Data were collected from 205 patients, mean age was 5.2 ± 3.1 years, ranging from 1 month to 12 years. The majority of patients (41.5%) were between 6 and 12 years of age, followed by 38.0% in the 1–5 years age group, and 20.5% were infants less than 1 year old. Male patients comprised 57.1% of the cohort, while females accounted for 42.9%, giving a male-to-female ratio of approximately 1.3:1. Most cases (74.1%) were managed in the outpatient setting, whereas 25.9% were admitted as inpatients.

Upper respiratory tract infection (URTI) was the most frequent diagnosis associated with antibiotic prescription, observed in 42% of patients, followed by acute tonsillitis or pharyngitis (19%) and lower respiratory tract infections such as bronchitis (15.6%). Non-specific viral fevers accounted for 13.7% of antibiotic

prescriptions, while gastroenteritis (5.9%) and skin or soft-tissue infections (3.9%) were less frequent indications. Regarding antibiotic class, cephalosporins were prescribed most commonly (37.1%), followed by penicillins (33.2%) and macrolides (16.1%). Fluoroquinolones (4.4%), aminoglycosides (3.4%), and combination regimens (5.8%) were used less frequently. When prescriptions were evaluated for appropriateness, only 41% were deemed appropriate according to standard pediatric treatment guidelines, while 59% were considered inappropriate.

Table 1: Demographic and Baseline Characteristics of the Study Population (n = 205)

Variable	Category	n	%
Age (years)	Mean \pm SD	5.2 ± 3.1	—
Gender	Male	117	57.1
	Female	88	42.9
Age Group	< 1 year	42	20.5
	1–5 years	78	38.0
	6–12 years	85	41.5
Clinical Setting	Outpatient	152	74.1
	Inpatient	53	25.9

Table 2: Common Diagnoses Associated with Antibiotic Prescription (n = 205)

Diagnosis	n	%
Upper respiratory tract infection (URTI)	86	42.0
Acute tonsillitis / pharyngitis	39	19.0
Lower respiratory tract infection (LRTI / bronchitis)	32	15.6
Non-specific febrile illness / viral fever	28	13.7
Gastroenteritis	12	5.9
Skin / soft-tissue infection	8	3.9
Antibiotic Class		
Cephalosporins	76	37.1
Penicillins	68	33.2
Macrolides	33	16.1
Fluoroquinolones	9	4.4
Aminoglycosides	7	3.4
Others / combination	12	5.8
Prescription Type		
Appropriate	84	41.0
Inappropriate	121	59.0

A significant association was found between inappropriate prescribing and the clinical setting ($p = 0.042$). Inappropriate prescriptions were more frequent in outpatients (64%) than in inpatients (45.3%). No statistically significant association was found between age group and appropriateness of prescribing ($p = 0.511$), suggesting that misuse occurred across all pediatric age groups. However, the type of diagnosis showed a strong relationship with inappropriate prescribing ($p < 0.001$).

Table 3: Factors Associated with Inappropriate Antibiotic Prescribing

Variable	Inappropriate (n = 121)	Appropriate (n = 84)	p-value
Clinical Setting			
Outpatient	97 (64.0%)	55 (36.0%)	0.042
Inpatient	24 (45.3%)	29 (54.7%)	
Age Group			
< 1 year	23 (55%)	19 (45%)	0.511
1–5 years	47 (60%)	31 (40%)	
6–12 years	51 (60%)	34 (40%)	
Diagnosis			
URTI / viral fever	94 (68%)	45 (32%)	< 0.001
Confirmed bacterial focus	27 (38%)	39 (62%)	

Diagnostic uncertainty was the leading reason, cited in 46 cases (38.0%), followed by parental pressure or expectations in 31 (25.6%) cases. Empirical “cover” for possible bacterial infection accounted for 27 (22.3%) cases, habitual or empirical prescribing for 11 (9.1%), and fear of secondary infection for 6 (5.0%).

Fever resolution within 72 hours was achieved in 74 of 84 (88.1%) appropriately treated patients, compared to 79 of 121

(65.3%) in the inappropriate group ($p = 0.001$). Hospital readmission within 7 days occurred in 14 (11.6%) of the inappropriate group and only 3 (3.6%) of the appropriate group ($p = 0.031$). Antibiotic-associated diarrhea was more frequent among children who received inappropriate antibiotics (17; 14.0%) than those who received appropriate treatment (5; 6.0%), with a p -value of 0.048. Rash or allergic reactions occurred in 9 (7.4%) of the inappropriate group and 2 (2.4%) of the appropriate group ($p = 0.091$), which was not statistically significant.

Table 4: Clinician-Reported Reasons for Inappropriate Antibiotic Use ($n = 121$)

Reason	n	%
Diagnostic uncertainty	46	38.0
Parental pressure / expectation	31	25.6
Empirical "cover" for possible bacterial infection	27	22.3
Habitual or empirical prescribing	11	9.1
Fear of secondary infection	6	5.0

Table 5: Clinical Outcomes and Complications Related to Antibiotic Use ($n = 205$)

Outcome / Complication	Appropriate ($n = 84$)	Inappropriate ($n = 121$)	p-value
Fever resolution within 72 hours	74 (88.1%)	79 (65.3%)	0.001
Hospital readmission within 7 days	3 (3.6%)	14 (11.6%)	0.031
Antibiotic-associated diarrhea	5 (6.0%)	17 (14.0%)	0.048
Rash / allergic reaction	2 (2.4%)	9 (7.4%)	0.091
Total adverse events	7 (8.3%)	23 (19.0%)	0.024

DISCUSSION

This study assessed antibiotic prescribing patterns in pediatric patients presenting with febrile illnesses and revealed a high rate of inappropriate antibiotic use. Out of 205 cases, nearly six in ten prescriptions were unjustified, reflecting a concerning trend of empirical and irrational antimicrobial therapy in children. These findings underscore a widespread issue in clinical practice, where antibiotics are frequently prescribed for viral or self-limiting infections, particularly in resource-limited healthcare settings. The demographic data in this study show that febrile illnesses predominantly affected children between one and twelve years of age, with a slight male predominance. The outpatient setting accounted for the majority of prescriptions, suggesting that much of the misuse occurs at the first point of healthcare contact. In busy outpatient clinics, physicians often face time constraints, limited diagnostic resources, and strong parental expectations factors that collectively contribute to the over prescription of antibiotics. The relatively lower rate of inappropriate prescribing among inpatients likely reflects closer clinical monitoring, availability of diagnostic investigations, and supervision by senior physicians in hospital wards¹⁵.

Clinically, upper respiratory tract infections and viral fevers were the most common diagnoses associated with antibiotic use, even though most of these illnesses are viral and self-limiting. The predominance of antibiotics in these conditions points to a diagnostic and behavioral problem rather than a purely clinical one. The antibiotic class distribution in this study shows that third-generation cephalosporins were the most frequently prescribed agents, followed by penicillins and macrolides. This finding highlights a preference for broad-spectrum antibiotics over narrow-spectrum first-line drugs¹⁶. Such overuse accelerates the development of antimicrobial resistance and diminishes the efficacy of commonly used antibiotics in pediatric practice. The frequent use of cephalosporins and macrolides for mild infections or suspected viral illnesses indicates a gap between existing prescribing practices and recommended treatment guidelines¹⁷. The analysis of appropriateness reveals that 59% of antibiotic prescriptions were inappropriate. The majority of these cases involved children with upper respiratory or non-specific febrile

illnesses where antibiotics were unnecessary. This suggests that nearly two out of three children received antibiotics with no proven bacterial indication. The finding aligns with the high prevalence of unnecessary antibiotic use reported in similar pediatric studies, underscoring the urgent need for educational and institutional interventions to improve prescribing behavior. The absence of rapid diagnostic tools and the lack of pediatric-specific clinical pathways likely contribute to this trend, as clinicians often rely solely on clinical judgment without microbiological confirmation¹⁸.

The statistical analysis demonstrated a significant association between inappropriate prescribing and outpatient encounters, as well as viral or upper respiratory tract infections. This pattern indicates that inappropriate use is context-dependent and influenced by external pressures rather than clinical severity. In contrast, inpatient care showed better adherence to guidelines, possibly due to multidisciplinary input and structured antibiotic review practices. Such findings emphasize that stewardship programs should prioritize outpatient departments, where empirical prescriptions are most common and least monitored. The reasons reported by clinicians further reinforce these findings¹⁹. Diagnostic uncertainty emerged as the most frequently cited reason for inappropriate use, followed by parental pressure and the desire to provide empirical coverage. These factors highlight both systemic and behavioral contributors. Physicians often prescribe antibiotics to maintain parental trust or avoid potential complaints, especially when diagnostic clarity is lacking. This "defensive prescribing" mindset leads to overuse of broad-spectrum antibiotics, inadvertently increasing the risk of resistance and adverse effects²⁰. Parental demand also reflects a lack of awareness about the limited role of antibiotics in viral illnesses, suggesting that community-level health education campaigns could be an effective tool to address this gap. From a public health perspective, inappropriate antibiotic prescribing in childhood has far-reaching consequences. It accelerates antimicrobial resistance, increases treatment costs, and undermines the future effectiveness of antibiotics. In developing countries such as Pakistan, where antibiotics are readily available over the counter, this problem becomes even more critical. Unregulated access, limited enforcement of prescription laws, and lack of physician training contribute to a cycle of resistance and recurrent infections. Addressing this issue requires a multifaceted approach that includes policy-level regulation, community education, and improved diagnostic infrastructure.

CONCLUSION

It is concluded that inappropriate antibiotic prescribing remains a major issue in the management of pediatric febrile illnesses. In this study, nearly sixty percent of antibiotics were prescribed without valid bacterial indication, with the majority of misuse occurring in outpatient settings and for viral upper respiratory infections. Broad-spectrum agents such as cephalosporins and macrolides were frequently used unnecessarily, reflecting a gap between clinical practice and evidence-based guidelines. Inappropriate antibiotic use was linked to slower recovery, higher readmission rates, and a greater incidence of adverse drug reactions, demonstrating that such prescribing not only fails to improve outcomes but can directly harm patients.

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This article may be cited as: Naseem R, Abbas W, Imdad N, Mushtaq T, Ashraf M, Ahsan Idrees, Afzal A, Usama AR: Assessment of Inappropriate Antibiotic Prescribing in Pediatric Febrile Illnesses. *Pak J Med Health Sci*, 2023;17(12):713-716.