

Assessment of Antibiotic Prescribing Patterns for Acute Respiratory Infections in Pediatric Outpatients

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Abstract

Background: Acute respiratory infections are one of the most frequent causes of pediatric outpatient visits, and are a significant contributor to antibiotic consumption. There are many infections that are viral and self-limiting, and inappropriate antibiotic prescribing is a preventable contributor to antimicrobial resistance. Antibiotics are the most commonly used drugs in children with ARI, and their use is guided by evidence-based clinical guidelines. Objective: To evaluate antibiotic prescribing practices and adherence to clinical guidelines in pediatric outpatients with ARI.

Methods: The study was a cross-sectional, observational study of 420 prescriptions for children aged 1 month to 12 years who were seen in a pediatric outpatient department. A structured proforma was used to record diagnosis, clinical features, investigations, antibiotic use, drug class, dose, duration and appropriateness.

Results: In 238/420 encounters (56.7%) an antibiotic was prescribed. The most frequent diagnoses were acute upper respiratory tract infection/common cold (33.8%), acute pharyngitis/tonsillitis (21.4%), acute otitis media (13.6%), bronchitis/bronchiolitis (12.6%), pneumonia (10.7%) and acute sinusitis (7.9%). In total, 152 of the antibiotic prescriptions (63.9%) were guideline-concordant and 86 (36.1%) were inappropriate. The most common inappropriate prescriptions were for common cold/viral upper respiratory infection (72.7%) and bronchitis/bronchiolitis (66.7%). Amoxicillin-clavulanate was the most commonly used antibiotic (39.1%), followed by azithromycin (24.4%) and amoxicillin (18.5%). Documentation of diagnosis, fever, respiratory rate and danger signs was complete in 61.2% of encounters, and was associated with lower inappropriate prescribing (27.4% vs 49.2%, p=0.001).

Conclusions: The use of antibiotics for pediatric acute respiratory infections was widespread and over one-third of the prescriptions were inappropriate. Diagnosis-based stewardship, documentation and following pediatric outpatient guidelines are required.

Keywords: Antibiotic Prescribing; Acute Respiratory Infection; Pediatric Outpatient; Antimicrobial Stewardship; Rational Drug Use; Prescription Audit.

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Introduction

Acute respiratory infections (ARIs) are a major reason for children to attend their GP and contribute to significant antibiotic use in children. Most upper respiratory tract infections, bronchitis and bronchiolitis are viral and do not require antibiotics, however, selected cases of acute otitis media, streptococcal pharyngitis and bacterial sinusitis do [1]. Therefore, judicious prescribing is at the heart of avoiding unnecessary health care costs, antimicrobial resistance and avoidable adverse drug reactions.

Since most antibiotic prescriptions are made outside of the hospital, outpatient antibiotic stewardship has been a focus of global and national agencies. The Centers for Disease Control and Prevention (CDC) offers guidelines for diagnosis-specific recommendations for pediatric outpatient infections such as common cold, pharyngitis, sinusitis, otitis media and bronchiolitis [2].

The World Health Organization has also encouraged rational use of childhood respiratory infections, particularly the identification of pneumonia and the avoidance of unnecessary

antibiotic treatment for viral infections [3]. Large ambulatory datasets reveal that inappropriate antibiotic prescribing continues to be common. A large percentage of outpatient antibiotic prescriptions for acute respiratory illness in the United States were unnecessary, according to Fleming-Dutra et al. [4]. Recent paediatric research has shown inappropriate prescribing for viral upper respiratory infections, bronchitis and non-guideline-concordant broad-spectrum therapy [5, 6]. Low and middle income countries have even higher rates of antibiotic prescribing for respiratory infections, as demonstrated in systematic reviews, which frequently exceed recommended benchmarks [7].

Parents' expectations, diagnostic uncertainty, heavy workload, limited point-of-care testing, and fear of missing bacterial illness are all factors that may present challenges to prescribers in a pediatric setting. Prescription audits can help to pinpoint local gaps and inform stewardship interventions. The current study was designed to evaluate the antibiotic prescribing practices, antibiotic class distribution and appropriateness of antibiotic usage in pediatric outpatients with acute respiratory infections.

Materials and Methods

This was an observational prescription audit of a cross section of prescriptions made in the pediatric outpatient department of a tertiary care teaching hospital. Children aged 1 month to 12 years with an acute respiratory infection (less than 14 days) were eligible. Common cold/acute upper respiratory tract infection, pharyngitis/tonsillitis, acute otitis media, bronchitis/bronchiolitis, pneumonia and acute sinusitis were the most common diagnoses. Children were excluded if they had chronic lung

disease, immunodeficiency, congenital heart disease, recent hospitalization, antibiotic use within the last 72 hours or incomplete prescription records. Consecutive sampling was used to include a total of 420 eligible outpatient encounters. The data were retrieved using a structured proforma which included age, sex, diagnosis, symptoms, presence of fever, respiratory rate, danger signs, investigations, antibiotic prescribed, generic or brand name, dose, frequency, route, duration and supportive medicines. The algorithm for assessing appropriateness was based on standard recommendations for pediatric outpatients, and adapted to the diagnosis. Prescriptions were deemed appropriate if the indication, antibiotic choice, dose, frequency and duration was in line with recommended practice. Antibiotics were deemed inappropriate for common cold, uncomplicated viral URTI and bronchiolitis where there was no evidence of bacterial features.

The data were analysed using SPSS version 26. The data were presented as mean \pm SD for continuous variables and as frequencies and percentages for categorical variables. Chi-square test was used to compare the antibiotic prescribing rates in different diagnosis and age groups. Logistic regression was used to determine factors associated with inappropriate prescribing. A p-value of < 0.05 was deemed to be statistically significant.

Results

The study included 420 pediatric ARI encounters. The mean age was 4.8 ± 3.2 years, and 226 children (53.8%) were male. The largest age group was 1–5 years (45.7%). Antibiotics were prescribed in 238 encounters, giving an overall antibiotic prescribing rate of 56.7%.

Table 1: Distribution of pediatric ARI diagnoses and antibiotic use

Diagnosis	Total visits n (%)	Antibiotic prescribed n (%)	p-value
Common cold/viral URTI	142 (33.8)	33 (23.2)	<0.001
Pharyngitis/tonsillitis	90 (21.4)	56 (62.2)	
Acute otitis media	57 (13.6)	49 (86.0)	
Bronchitis/bronchiolitis	53 (12.6)	27 (50.9)	
Pneumonia	45 (10.7)	45 (100.0)	
Acute sinusitis	33 (7.9)	28 (84.8)	
Total	420 (100.0)	238 (56.7)	

Amoxicillin-clavulanate was the most commonly prescribed antibiotic, accounting for 93 prescriptions (39.1%). Azithromycin was prescribed in 58 encounters (24.4%), while plain amoxicillin accounted for 44 prescriptions (18.5%). Parenteral antibiotics were rarely used in the outpatient setting.

Table 2: Pattern of antibiotic classes and prescribing details

Antibiotic/class	Number (%) among antibiotic prescriptions	Common indication	Mean duration (days)
Amoxicillin-clavulanate	93 (39.1)	Otitis media, sinusitis, pneumonia	5.9 ± 1.4
Azithromycin	58 (24.4)	Pharyngitis, bronchitis, suspected atypical infection	3.7 ± 0.9
Amoxicillin	44 (18.5)	Otitis media, pharyngitis	5.2 ± 1.1
Cephalosporins	31 (13.0)	Pneumonia, recurrent symptoms	6.1 ± 1.5
Other antibiotics	12 (5.0)	Mixed indications	5.4 ± 1.2
Generic name written	102 (42.9)	-	-
Dose documented correctly	196 (82.4)	-	-

Overall, 152 antibiotic prescriptions (63.9%) were appropriate and 86 (36.1%) were inappropriate. Inappropriate prescribing was highest for common cold/viral URTI and bronchitis/bronchiolitis. Complete clinical documentation was significantly associated with lower inappropriate prescribing.

Table 3: Appropriateness of antibiotic prescriptions and associated factors

Variable	Appropriate n (%)	Inappropriate n (%)	p-value
Overall antibiotic prescriptions	152 (63.9)	86 (36.1)	-
Common cold/viral URTI	9 (27.3)	24 (72.7)	<0.001
Pharyngitis/tonsillitis	36 (64.3)	20 (35.7)	0.72
Acute otitis media	39 (79.6)	10 (20.4)	0.012
Bronchitis/bronchiolitis	9 (33.3)	18 (66.7)	<0.001
Pneumonia	42 (93.3)	3 (6.7)	<0.001
Complete documentation present	106 (72.6)	40 (27.4)	0.001
Incomplete documentation	46 (50.8)	46 (49.2)	

Discussion

In this study, 56.7% of all acute respiratory infections (ARIs) in children attending outpatient departments were treated with antibiotics. More than one-third of antibiotic prescriptions were inappropriate, mainly for viral upper respiratory infection and bronchitis/bronchiolitis. This study suggests that antibiotic overuse is still a major issue in the management of common children's illnesses.

The observed prescription rate is similar to that reported from many low and middle-income countries with high rates of antibiotic use for respiratory infections. Pooled antimicrobial prescribing rates for outpatients with respiratory tract infections were around 2/3, with significant regional variation, according to a systematic review [7]. The current rate was slightly lower but still higher than what would be predicted if the recommendations for diagnosis were followed consistently.

The highest inappropriate prescribing was seen in common cold/viral URTI and bronchitis/bronchiolitis. This is in line with CDC guidance for treating children in outpatient settings for common cold and bronchiolitis, which recommends against antibiotic use as these are primarily viral diseases [2]. Acute respiratory conditions were also noted by Fleming-Dutra et al. as a significant contributor to unnecessary antibiotic prescribing for outpatient care [4]. Overuse of antibiotics in children can lead to diarrhea, rash, allergic reactions, disruption of

the microbiome, and the development of resistance [8].

Amoxicillin-clavulanate was the most commonly prescribed antibiotic and amoxicillin alone was less commonly prescribed. This indicates a preference for general treatment. Comparative effectiveness studies have shown that narrow-spectrum antibiotics are effective and have fewer adverse events for common pediatric respiratory bacterial infections [9]. Overuse of broad-spectrum agents can promote the development of antimicrobial resistance and cost of treatment.

Inappropriate prescribing was highly associated with incomplete documentation. If fever pattern, respiratory rate, danger signs, throat findings, ear findings and provisional diagnosis are not documented, it can be challenging to assess later whether the diagnosis was appropriate or not, and prescribers may resort to antibiotics. Other outpatient stewardship resources highlight the importance of diagnostic clarity, communication strategies, delayed prescribing when feasible, and audit-feedback as practical strategies [10, 11].

The study has several strengths such as classification and assessment of indication, drug choice, dose and duration. It was carried out in a single center, however, and lacked microbiological confirmation and follow-up outcomes. Inappropriate features may have been recorded in some children, and may have been bacterial features that were not recorded. However, the

results offer a local starting point for pediatric antimicrobial stewardship.

Conclusion

More than half of children's outpatient visits for acute respiratory infections were treated with antibiotics and more than one third of antibiotic prescriptions were inappropriate. Viral upper respiratory infection and bronchitis/bronchiolitis were the main contributors to unnecessary use. Rational antibiotic prescribing in children can be encouraged by improving diagnostic documentation, encouraging narrow-spectrum first-line therapy and by implementing outpatient antimicrobial stewardship audits.

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