Analysis of Prescription of medications used in Lower Respiratory tract infections in children

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Abstract

Background: Acute respiratory infections (ARI) contribute a major burden to child health in Low Middle-Income Countries (LMIC) countries like India. Inadvertent use of Anti-microbial agents for non-bacterial and self-limiting infections remains a key concern. This study was done to analyze the prescription pattern of medications in respiratory tract infections in children.

Objectives: To analyze the prescription patterns of medications in respiratory tract infections in children aged 1 month to 18 years of age and to analyze the rationality of treatment using the Modified Kunin's rationality criteria.

Methodology: The study was a Prospective observational study in which children aged 1 month to 18 years who satisfied the inclusion criteria were enrolled. The demographic details, diagnosis and treatment details were recorded. This was analyzed and evaluated with the help of the rational use of drugs indicators, and drug prescribing indicators. Modified Kunin's criteria was used to assess the appropriateness of the prescribed antibacterial agent.

Results: A total of 100 children were enrolled into the study. 59% were males and the rest were females. The mean age of the children was 3.8 years ±3.98 SD. Among the common drugs in infancy, Amoxycillin-clavulanic acid was used the most. Ceftriaxone was the most prescribed antimicrobial agent in children beyond infancy. According to the modified Kunin's criteria, appropriate therapy was given in 93% of patients.

Conclusion: This study has shown a wide array of drugs being used and its effectiveness in improving clinical outcomes in lower respiratory tract infections in children.

Keywords: Prescription, antimicrobials, respiratory infections.

Introduction

Children are the forthcoming generations; it should be our priority to keep their health and wellbeing at the best. On the contrary, pediatric age group is often inflicted by malnutrition and infectious diseases. Infections concerning the respiratory tract are more common in children and are the most common cause of clinician consultations in pediatric age group. Children smitten with respiratory infections are often found sniveling for a long time despite their socio-economic category. Acute respiratory infections (ARI) interpose major encumbrance to child health in LMICs like India[1,2]. The lower respiratory tract infections are the steering cause of death among children under the age of five in such countries[3,4,5]. This results in nearly 1.9 million childhood deaths per year, of which approximately 20% are from India[6,7,8].

Lower respiratory tract infections (LRTI) include acute bronchitis, bronchiolitis, and pneumonia. Majority of these infections has underlying viral etiology, which hardly needs an antibiotic prescription. Despite this, antibiotics are prescribed irrationally for even non-specific symptoms such as sore throat, common cold, and rhinitis for which therapeutic benefit is meagre. But these unfounded antibiotic prescriptions can lead to emergence of resistance patterns which threatens effective therapy[9,10,11].

With this background, this study was done to analyze the prescription patterns of medications in respiratory tract infections in children and to analyze the rationality of treatment using the Modified Kunin's rationality criteria[12].

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Methodology:

This Prospective, observational study was conducted after obtaining institutional ethical committee clearance. It was conducted in the in-patient wards of the Department of Pediatrics in a tertiary care referral centre in South India. Patients, aged 1 month to 18 years, whose primary diagnosis was lower respiratory tract infection (LRTI), as confirmed by a pediatrician, were enrolled, after obtaining an informed and written consent from their parents/ guardians. The demographic details and information about diagnosis and treatment were recorded. Data from the case sheet was analyzed and evaluated with the help of the World Health Organizations (WHO) rational use of drugs indicators, and drugs prescribing indicators[13].

Statistical methods:

Percentage prevalence rate of prescription patterns of medication in respiratory tract infections with 95% confidence interval was computed. The rationality of treatment using the modified Kunin's rationality criteria[12] was also represented as percentage with 95% confidence interval.

Results:

In this study, 100 children were enrolled of which 59% were males and the rest were females (Figure 1).

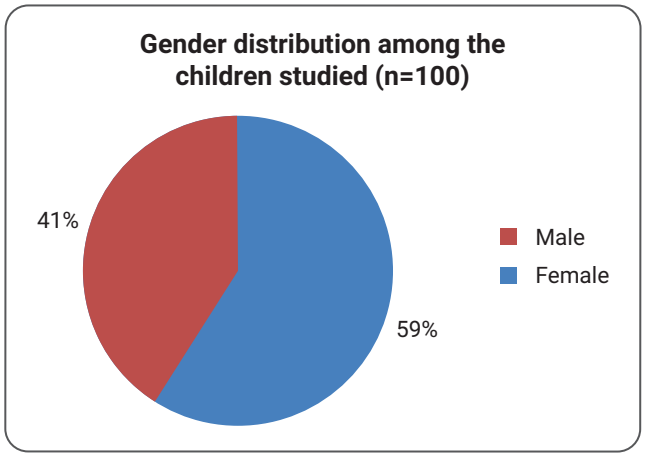

Figure 1: Gender distribution among the children studied

Children were further sub-divided based on age groups. It was seen that 41% were in the age group of 1-5 years of age, 28% were in the less than 1 year age group and the rest were above 5 years of age (Figure 2). The immunization status showed that 99% (n=99) patients were adequately immunized as per their age.

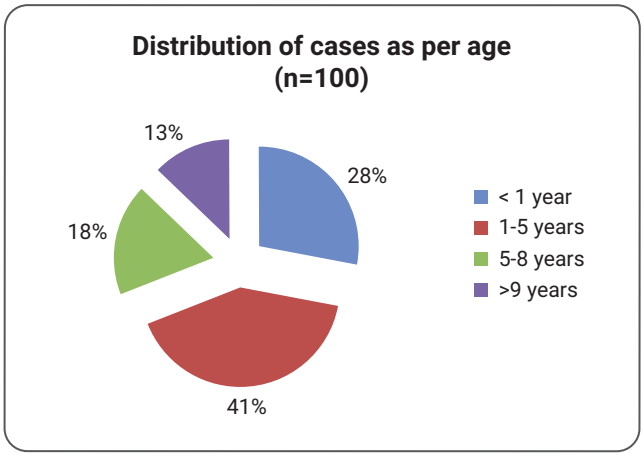

Figure 2: Distribution of cases as per age

Oral forms of therapy were given to 26.4% of the children, Injectable form of medications was administered in 25.8% of the children, 20.5% were given syrup form of medications, 19.4% were given inhalation route of medications, 4.2% were managed with dry powder medications and 3.4% were given gel forms of medications (Figure 3).

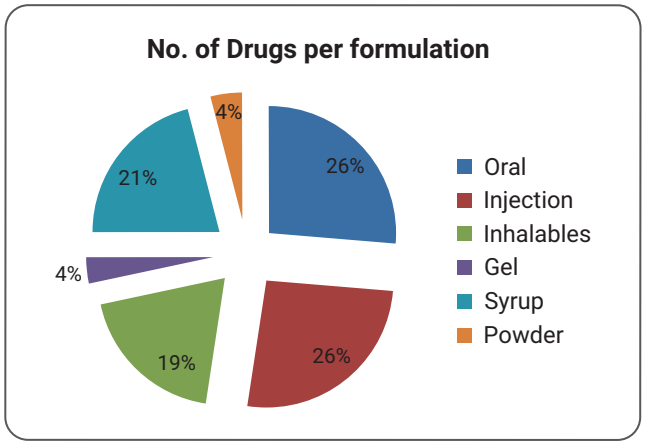

Figure 3: Number of drugs per formulation

In our study, according to the antibiotics prescribed, Ceftriaxone was the most common antibiotic given in cases of Bronchopneumonia (Table 1). The Piperacillin and tazobactam combination were commonly used in the other cases (Table 1).

TABLE 1					
Drugs	Age Groups (In Years)				Total
	<1 Year	1-5 Years	5-8 Years	9-12 Years	
I- Antimicrobials					
Ceftriaxone	2	12	4	4	22
Piperacillin-Tazobactam	4	7	1	4	16
Amoxicillin +Clavulanic Acid	2	6	1	1	11
Clarithromycin	3	1	1	1	6
Ceftriaxone+ Oseltamivir	2	4	0	0	6
Azithromycin	1	1	1	2	5
Oseltamivir	1	1	1	1	4
Levofloxacin	0	1	1	1	3
Ceftriaxone + Cefpodoxime	1	0	1	1	3
Levofloxacin + Vancomycin + Cefepime	0	1	2	0	3
Cefpodoxime	0	1	1	0	2
Fluconazole + Meropenem + Colistin	1	1	0	0	2
Amikacin	1	0	0	1	2
Cefotaxim	1	1	0	0	2
Sulphamethoxazole + Trimethoprim	1	0	1	0	2
Tobramycin	0	2	0	0	2
Meropenem + Vancomycin + Clindamycin	2	0	0	0	2
Flucloxacillin Sodium	0	1	0	0	1
Flucloxacillin Sodium + Clarithromycin	0	0	1	0	1
Penicillin	1	0	0	0	1
Itraconazole	1	0	0	0	1
Remdesivir	0	0	0	1	1
Amikacin+ Cefotaxime	1	0	0	0	1
Amoxicillin Clavulanic Acid+ Clarithromycin	1	0	0	0	1

The most common drugs used other than antimicrobial agents were Salbutamol, Ipratropium and Paracetamol (Table 2).

Table 2					
Drugs	Age Groups (in Years)				Total
	<1 Year	1-5 Years	5-8 Years	9-12 Years	
II- Respiratory System					
a. Nasal preparation					
Ipratropium Bromide	15.0	22	6	7	49
b. Corticosteroids					
Hydrocortisone	10	5	5	3	23
Budesonide	8	5	2	4	19
Dexamethasone	1	0	0	0	1
c. Drugs for OAD					
Ipratropium+ levo-salbutamol	17	30	9	8	74
Salbutamol	8	8	6	5	29
Aminophylline	4	0	0	0	4
d. Cough and cold preparations					
Anti-histamine+ antitussive + decongestant	8	13	4	2	27
III- Antipyretics					
Paracetamol	15	17	8	5	45

According to Kunin's criteria, appropriate therapy was given in 93% (n=93) of patients (Table 3).

Table 3	
Kunin's Criteria (n=100)	**n(%)**
Criteria I: Agree with the use of antimicrobial therapy, the protocol is appropriate	93 (93%)
Criteria II: Agree with the use of antimicrobial therapy, the protocol is probably appropriate, but a microbiology report is missing to classify the protocol in another category	1 (1%)
Criteria III: Agree with the use of antimicrobial therapy, but a different antimicrobial is preferred.	2 (2%)
Criteria IV: Agree with the use of antimicrobial therapy, but in modified dose, interval, duration, or route of administration as preferred.	3 (3%)
Criteria V: Disagree with the use of antimicrobial therapy, administration is unjustified.	1 (1%)

There was no difference in gender distribution in receiving drugs (Table 4).

Table 4: Number of Drugs per gender

Gender	Mean±SD
Male	12.5±9.07
Female	11.8±7.28

Children below 1 year had maximum number of drugs received (Table 5)

Table 5: Number of drugs as per age group

Age group	Mean±SD
<1year	15.82±10.06
1-5 years	10.76±7.479
5-8 years	11±7.763
>9 years	10.86±6.037

Discussion:

The investigators explored the frequency of usage of drugs in lower respiratory tract infection in children in a prospective manner. A total number of 100 children were included in the study. The male to female ratio was 3:2. (vide figure no 1). In a study done by Badar V et al, they found that the mean age of pediatric patient was 1 year, and 10 months and the range was from birth to 12 years[11]. In our study, the mean age was 3.8 years ± 3.98 SD. In the study done by Badar V et al[11], they found that the number of males (64%) were more than that of females (36%) and the ratio being 2:1. In our study, it is found that the total number of males were 59 % (n=59) and females were 41% and the ratio being 3:2.

Bronchopneumonia was the most common diagnosis in our study and in the study by Badar V et al[11], it was observed that bronchopneumonia was the most common diagnosis followed by bronchiolitis. Contrary to Badar V et al[11], where average number of drugs prescribed per case was 4.39±2.21 SD, in our study it was found that the average number of drugs prescribed per case was 12.23±8.3 SD. Since our study population was from the tertiary care referral center for whom needed Intensive Care management, the higher prescription rate is justified to some extent. Need for initiatives to reduce prescription rate is identified.

The average of total number of drugs prescribed exclusively for LRTI per patient was 6.31±3.83 SD while the number of other drugs used concomitantly per patient was 5.94±5.713 SD. The average number of antibiotics per prescription was 2.46± 2.11SD. This indicates the presence of polypharmacy. The ideal WHO standard value for average drugs per encounter is 1.6-1.8[12]. As per WHO, recommended antibiotics percentage is 20% to 27%, and injectable medicines is 13.4% to 24.1%, whereas the standard accepted value for generic prescription is 100%[12].

Most of the drugs were prescribed by generic name (100%) which is inconsistent with the study done by Kumar et al, where encounters with brand name was 100%[14]. Salbutamol, Ipratropium Bromide and Budesonide were the most common drugs given by the inhalational route.

Table 1 shows the drugs given according to the ATC classification which revealed that Piperacillin-tazobactum, Amoxicillin- clavulanic acid, clarithromycin, ceftriaxone were the most prescribed antimicrobial agents in infants and Ceftriaxone was the most commonly prescribed antimicrobial agent used in children beyond infancy.

The appropriateness of AMA's (Anti-Microbial Agents) prescribed was assessed by modified Kunin's criteria (Vide Table 3). Appropriate therapy was given in 93% (n=93) of patients and they were categorized under Criteria I. Among the cases under Criteria II, 1% (n=1) received empirical therapy with right antimicrobial agent, but culture sensitivity testing was not done to confirm the diagnosis. The cases under Criteria III were 2% (n=2) and they received more than one antimicrobial agent which is not preferred. Among the cases, 3% (n=3) were categorized under the Criteria IV as the antibiotics were swapped from Inj Ceftriaxone to Augmentin, Inj Piperacillin -tazobactam to Meropenem and Inj. Ceftriaxone to Cloxacillin. This shift in antimicrobial agents was needed as the patients

were not responding to the prescribed treatment. One case was included in the Criteria V, as the patient with the diagnosis of viral infection received antimicrobial agents. All patients were prescribed with drugs from the essential medication list (100%).

This study had limitations due to small sample size. This study recommends frequent auditing for prescriptions to optimize and minimize drugs so that the dictum of "right pill for right patient" is fulfilled .

Conclusion:

This study has shown that polypharmacy is rampant in treating lower respiratory tract infections in children. Frequent prescription auditing will inculcate awareness and can bring down the quantum of drugs prescribed. Effective and judicious use of antibiotics and other supportive medications are necessary in tackling common respiratory tract infections in children.

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