

## Prescribing pattern of antibiotics in lower respiratory tract infection among children aged less than 5 years

Hemamalini MB<sup>1,\*</sup>, Rekha MB<sup>2</sup>, Basavaraj Bhandare<sup>3</sup>, Adarsh E<sup>4</sup>

<sup>1,2</sup>Assistant Professor, <sup>3,4</sup>Professor & Head, <sup>1,2,3</sup>Dept. of Pharmacology, <sup>3</sup>Dept. of Paediatrics, Rajarajeswari Medical College & Hospital, Bangalore, Karnataka

**\*Corresponding Author:**

Email: hemashankarmb@gmail.com

### Abstract

**Introduction:** Acute respiratory infection (ARI) is the largest cause of morbidity across the world in children under five years of age. Antibiotics are the most commonly prescribed medications for Lower respiratory tract infection [LRTI]. Rational use of antibiotic is very necessary to avoid resistance.

**Objective:** To evaluate the pattern of antibiotic use among children under 5yrs of age.

**Methods:** A hospital based, non-interventional, prospective, observational study was carried out between April 2014 to September 2014 in the department of Pediatrics in collaboration with pharmacology department, Rajarajeswari Medical College and Hospital, a tertiary care hospital, Bangalore. The demographic data, diagnosis, type of drug, dosage duration of treatment and hospital stay was collected from inpatients admitted to pediatric ward over a period of 6 months. The descriptive analysis was done and was presented as mean and percentage.

**Results:** A total of 250 in patient case records of children with LRTI were analyzed. In this study less than 1 year children constituted highest percentage (59.2%).56.8% were males and 43.2% were females. A total of 1045 drugs were prescribed in 250 prescriptions (4.18 drugs/ prescription). Bronchiolitis (41.6%) was the most common diagnosis followed by Bronchopneumonia(33.6%). 32.77% of patients receive one antibiotic, 39.49% received 2 antibiotics and 27.73% of patients received 3 antibiotics. Most commonly prescribed antibiotic was Amoxicillin+clavulanic acid(58%), followed by Amikacin(57%) and Ceftriaxone(53%).

**Conclusion:** It is evident from the present study that antibiotics were most commonly prescribed for LRTI. Bronchiolitis is most often associated with a viral etiology and use of unnecessary antibiotics for viral LRTI will lead to increased threat of antibiotic resistance.

**Keywords:** LRTI, Antibiotics, Children.

### Introduction

Infants and children are the most vulnerable population that contract illnesses.<sup>(1)</sup> Lower Respiratory tract Infection (LRTI) is the largest cause of morbidity among children under five across the world.<sup>(2)</sup> In developing countries 30% of adults and 25% of pediatric inpatients are diagnosed with acute respiratory tract infection. While every year 3.5 million children die with LRTI<sup>(3)</sup> The use of antimicrobial agents has become a routine practice for the treatment of pediatric illnesses, and antibiotics are among the most commonly prescribed drugs in paediatrics.<sup>(4)</sup>

The quality of medical care requires prescribing to be judicious, appropriate, safe, effective and economic. "Good" prescribing is a complex balance between various conflicting factors. The aim is to achieve clinical benefit with minimum risk at cost effective price while respecting the patient's choice.<sup>(5)</sup>

The inevitable consequence of the widespread use of antibiotics has been the emergence of antibiotic resistant pathogens, fuelling and ever increasing the need for new drugs. Appropriate antibiotic use is thought to be the best way to control resistance. Although awareness in the consequences of antibiotic misuse is increasing, over prescribing remains widespread. It is driven largely by patient demand, time pressure on clinicians and diagnostic uncertainty. Definitive

identification of a bacterial infection, before treatment should be initiated, while often is not possible. Optimal and judicious selection of antibiotics for the therapy of infectious diseases requires clinical judgment and detailed knowledge of pharmacological and microbiological factors.<sup>(6)</sup> From the wrong drug prescribed to the wrong dosage or administration schedule advised, dispensed or administered, the impact of medication misadventures are a tremendously costly problem.<sup>(7)</sup>

The WHO Global Strategy defines the appropriate use of antibiotics as the cost-effective which maximizes clinical therapeutic effect while minimizing both drug-related toxicity and development of antimicrobial resistance.<sup>(8)</sup>

Hence the purpose of this study was to evaluate pattern of antibiotic use, ensure that drugs are used appropriately, safely, and effectively to improve patient's health status. Additionally, continual improvement in appropriate and effective use of drugs like antibiotics has potential to lower the overall cost of care. Hence this study was undertaken to address all these issues.

## Materials and Methods

**Study Design:** Non-interventional, prospective, observational study carried out for a period of 6 months from April 2014 to September 2014.

**Study Population:** The study was conducted in inpatients from Department of Pediatrics in collaboration with department of Pharmacology, Rajarajeswari Medical College and Hospital, a tertiary care hospital in Bangalore. Over a period of 6 months. The hospital caters to both urban and rural population. Most of the patients belong to lower and middle strata of the society.

**Study Sample:** A total of 250 inpatient case records of children with LRTI were analyzed with following inclusion and exclusion criteria:

### Inclusion Criteria:

- Children below 5 years of age with diagnosis of LRTI

### Exclusion Criteria:

- Patients with significant Hepatic and Renal diseases.
- Those with congenital anomalies.
- Children with major illness

**Ethical Approval:** The study was approved by Institutional Human Ethics Committee (IHEC).

**Data Analysis:** The data of each patient was collected in a specially designed case record form. The inpatient case records of admitted children were analyzed for the demographic data, diagnosis, duration of hospital stay, type of drug, dosage regimen (form, route, frequency and duration), average number of drugs per encounter, percentage of encounters with an antibiotic prescribed and group wise prescription of antibiotics. The data was pooled and descriptive analysis done. The results were presented as mean and percentages depicted in the form of tables and graphs.

## Results

A total of 250 inpatient case records of children admitted with LRTI were observed and analyzed. All the inpatient case records of children had complete documentation of information, including patient's demographic characteristics, provisional diagnosis, drug name, dose route and dosage.

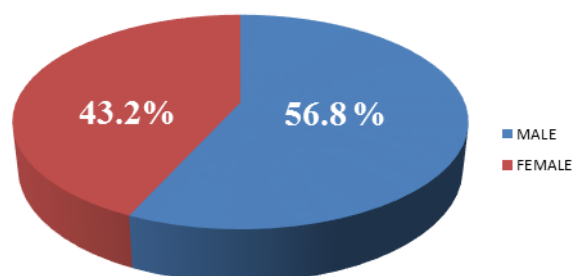
In this study, the analysis of demographic data showed that 59.2% of children were less than 1 year of age while 56.8% of the study participants were males (Fig. 1, 2).

**Fig. 1: Age Distribution**

| Age              | No. of male patients | No. of female patients | Total no. of patients | % total no. of patients |
|------------------|----------------------|------------------------|-----------------------|-------------------------|
| Less than 1 year | 84                   | 64                     | 148                   | 59.2                    |

|                  |    |    |     |      |
|------------------|----|----|-----|------|
| 1 year – 5 years | 58 | 44 | 102 | 40.8 |
|------------------|----|----|-----|------|

## GENDER DISTRIBUTION



**Fig. 2: Gender distribution**

The total number of drugs prescribed was 1045 in 250 prescriptions and the mean number of drugs per prescription was 4.18 (Table 1). The average duration of hospital stay was found to be 8.2 days. The most common diagnosis was bronchiolitis (41.6%) (Fig. 3).

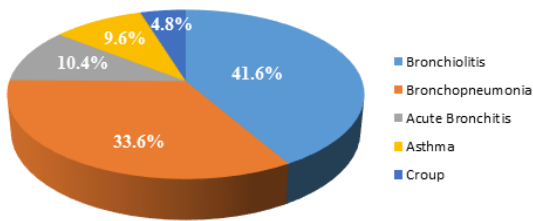
In our study 95.2% (n= 238) of prescriptions was with an antibiotic (Fig. 4), of which 32.77% patients received monotherapy, 39.49% - dual therapy and 27.73% patients receive triple therapy (Table 2). Cephalosporins (41.5%) group of antibiotics were most frequently prescribed antibiotics followed by Penicillin groups, Aminoglycosides, Macrolides and other higher antibiotics like vancomycin, meropenem (Fig. 5). The other drugs which were co prescribed along with antibiotics were bronchodilators (90.4%), antipyretics (83.2%), intravenous fluids (76.8%), cough medications (58.4%), vitamins and minerals (31.2%), nasal decongestants (21.6%) followed by steroids (18.4%) (Fig. 4).

Most of the antibiotics were administered parentally. Maximum number of antibiotics prescribed were Amoxicillin+Clavulanic acid (n=58) followed by Amikacin (n=57), Ceftriaxone (n=53), Cefotazidime (n=15), Azithromycin (n=13), Ampicillin+Cloxacillin and Piperacillin+Tazobactam (n=10), Cefuroxime (n=9), Cefotaxime (n=8), Vancomycin (n=3) and Meropenem (n=2) (Fig. 6).

**Table 1: Drug prescribing pattern**

| Parameter  | Number / Percentage |
|--|---------------------|
| Total number of patients prescriptions analysed    | 250                 |
| Total number of drugs prescribed                   | 1045                |
| Average number of drugs per prescription           | 4.18                |
| % of prescriptions with oral antibiotic prescribed | 238 (95.2)          |
| % of prescriptions with an injection prescribed    | 234 (93.6)          |

**DISEASE DISTRIBUTION**

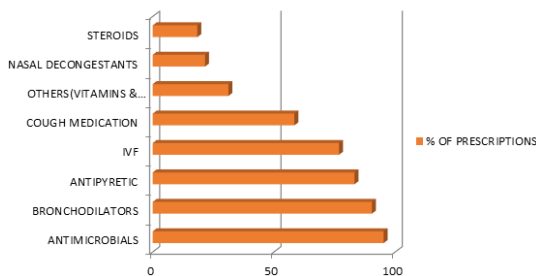


**Fig. 3: Disease distribution**

**Table 2: Pattern of use of antibiotic**

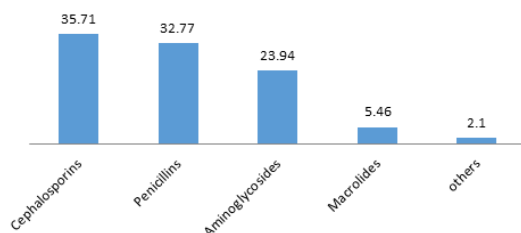
| Prescribing pattern of antibiotics | No. of prescriptions [n] | % of prescriptions |
|------------------------------------|--------------------------|--------------------|
| Mono therapy                       | 78                       | 32.77              |
| Dual therapy                       | 94                       | 39.49              |
| Triple therapy                     | 66                       | 27.73              |

**PERCENTAGE OF PRESCRIPTION OF MAJOR DRUG CLASSES**



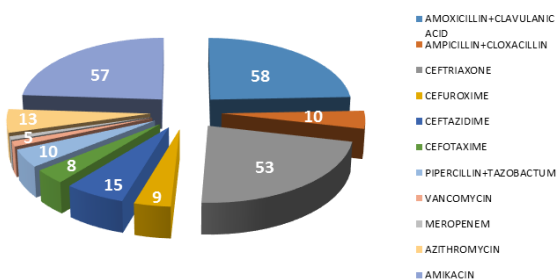
**Fig. 4: Other medications prescribed along with antibiotics**

**Percentage Of Administration Of Different Groups Of Antibiotics**



**Fig. 5: percentage of difference class of antibiotics**

**DISTRIBUTION OF INDIVIDUAL antibiotics**



**Fig. 6: Distribution of individual antibiotics**

**Discussion**

The emerging problem of antibiotic resistance has become a major threat to the medical field. Excessive and inappropriate use of antibiotics has been a major contributor to this ever growing problem.<sup>(5)</sup> The age distribution of the patients showed that the age group were among the children with less than 1 year 59.2% while majority were male patients (56.8%). Similar finding were found in Kathmandu hospital (Palikhe, 2004)<sup>(9)</sup> and Trinidad hospital (Orrett et al., 2010).<sup>(10)</sup> The average number of drugs/prescription was found to be 4.18 and the common diagnosis was bronchiolitis (41.6%) followed by bronchopneumonia (33.6%).

Antibiotics are among the most commonly prescribed drugs in hospitals and in developed countries while around 30% of the hospitalized patients are treated antibiotics.<sup>(11)</sup> Paediatric patients require more attention while prescribing antibiotics in order to avoid the resistance, adverse drug reactions and drug-drug reactions.<sup>(12)</sup> In this study we found that Amoxicillin + Clavulanic acid (n=58) followed by Amikacin (n=57) and Ceftriaxone (n=53) were the most frequently prescribed antibiotics. The combinations prescribed were Amoxicillin + Clavulanic acid with Amikacin, Cephalosporins with Amikacin, Ampicillin + Cloxacillin, Piperacillin + Tazobactam. A study conducted in tertiary care hospital by Shriram and colleagues in 2008<sup>(13)</sup> summarized that the commonly used antibiotic combination were Cephalosporin with Aminoglycoside, Cephalosporin with Macrolide and Penicillin with Aminoglycosides Another study done in child care centre of Moradabad city have found common antibiotics combinations of Cefpodoxime with Amikacin, Cefotaxim with Salbactam, Amoxycillin with Clavulanicacid, Ceftriaxone with Vancomycin and Amoxicillin with Cloxacillin(Ashraf et al., 2010).<sup>(14)</sup>

The combination of Ampicillin + Cloxacillin prescribed in about 10 patients is not synergistic as cloxacillin, not active against gram-negative bacteria and does not inhibit beta lactamase while ampicillin is not active against staphylococci. Thus, the combination only adds to the cost and adverse effect of both drugs.

In our study, 39.2% of prescriptions had two antibiotics. Most of the studies have shown varying percentage of antibiotics prescription in paediatric patients (Palikhe, 2004; Jason Hall, 2002 & Sriram et al., 2008).<sup>(13,15,16)</sup> These variations in antibiotic prescription to paediatric patients may be caused due to difference in clinical setting and hospital protocol from one region to another.

In this study the other classes of drugs prescribed along with the antibiotics were also analyzed. Accordingly the most commonly used drugs were bronchodilators (90.4%), antipyretics (83.4%) and cough medication (58.4%), vitamins and minerals (31.2%), nasal decongestants (21.6%), steroids (18.4%). Our finding was similar to the study of Sriram and his co investigators in which antipyretics, bronchodilators, and

expectorants accounted for the vast majority of medication prescribed with antibiotics.<sup>(13)</sup> This seems reasonable as fever is the most common finding as the sign of infection during presentation to hospital. Again as asthma and other respiratory disorders are common in children the use of bronchodilators, steroids and expectorants are also justifiable.

Majority of the drugs were given by intravenous route followed by the oral route as also identified in a study conducted on antibiotic use in paediatrics.<sup>(17)</sup> This mainly indicates that patients in wards or ICUs necessarily require the IV route for urgent control of infections and to minimize morbidity as compared to oral route.

Irrational prescribing is a habit that is difficult to cure. However, prevention is possible by interventions such as short problem based training course in pharmacotherapy and rational use focused workshops.<sup>(5)</sup> Besides the drug cost, antibiotic use is not benign, it increases the risk of colonisation with resistant organisms and side effects occur relatively frequently.

Doctors should be educated on more appropriate and cost effective prescribing. There have been many forum of intervention aimed at changing physician's prescribing behaviour. These have included audit studies, group discussions and feedback, introduction of hospital formulary, guidelines for antibiotics and NSAID's. The benefits of the intervention studies, namely the use of fewer and cheaper prescriptions are shown to disappear overtime, which suggests the need for repeating the intervention at frequent intervals. Rational prescribing messages should be promoted at national and local medical meetings.<sup>(5)</sup>

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