

## Treatment Pattern in Children with Lower Respiratory Tract Infection in a Tertiary Care Hospital of Eastern India

Madhusmita Mishra\*, Ratikanta Tripathy\*\*, P.K Panda\*\*\*, Mirabai Das\*\*\*\*, Nirmal Kumar Mohakud\*\*\*\*\*

\*Mpharm Student \*\*\*Professor, Utkal University, Vani Vihar, Bhubaneswar, Odisha 751004, India. \*\*Assistant Professor \*\*\*\*Associate Professor, Kalinga Institute of Medical Sciences, KIIT University, Bhubaneswar, Odisha 751024, India. \*\*\*Medical Officer, Kalinga Institute of Social Sciences, KISS University, Bhubaneswar, Odisha 751024, India.

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### Abstract

Lower respiratory tract infections (LRTIs) are the leading cause of death among infectious diseases and responsible for large burden of avoidable morbidity and mortality in childhood. The present study was done to assess the prescribing pattern of drugs in LRTI in children aged 1 month-14 years old using WHO core antibiotics drug prescribing indicators. This was a cross sectional, record based study carried out for a period of 1 year in the Department of Pharmacology in collaboration with Department of Pediatrics, PBMH, KIMS, Bhubaneswar. This study was approved by KIMS research committee and institutional ethics committee. Study states that LRTI (42%) was highest in the incidence followed by WALRI. Most commonly prescribed antibiotic was Cephalosporin group (Ceftiraxone) followed by Amikacin. Levosalbutamol with Ipratropium was the most commonly used nebulizing drug followed by combination with steroid (budesonide). Antibiotics were prescribed for 245(100%) patients followed by bronchodilators, antipyretics, cough medications, oxygen inhalation, nasal decongestants, steroids and others which include multivitamins. Admissions of males (70.6%) were more as compared to females(29.4%) indicating gender bias is still persisting in society. Antibiotics stewardship is very much needed to prevent its overuse and emergence of resistances.

**Keywords:** Hospital Stay; Prescription Pattern; Antibiotics; LRTI.

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### Introduction

LRTI is infection below the level of larynx and used synonym for Pneumonia, can also be applied to others type of infection including bronchiolitis, bronchitis, lung abscess and laryngotracheobronchitis [1]. LRTI is one of the most common conditions encountered in Pediatric Departments during the winter months and its management consumes substantial health-care resources [2]. As reported in 2015, 3.6million (3.3-3.9million) episodes of severe pneumonia and 0.35million (0.31-0.40million) of all causes of pneumonia deaths occurred in children younger than 5years in India [3]. According to global burden of

disease study estimated that LRTI include CAP (Community Acquired Pneumonia), were 492.2million episodes of illness worldwide and accounts for 49.5million disability adjusted life years (DALYS). In children aged over 5years, it causes 1.6million deaths annually [4]. Worldwide, infants and children represent a higher proportion of the population. 28% of the world's total population is accounted by children younger than 15 years of age. In developing countries 25% of all pediatric admissions are due to acute respiratory tract infections and which ultimately causes death of 3.5 million children each year [5]. Pediatric population is prone to suffer from recurrent infections of the respiratory tract [6]. The use of antimicrobial agents, especially antibiotics has

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**Corresponding Author:** Nirmal Kumar Mohakud, Associate Professor, Kalinga Institute of Medical Sciences, KIIT University, Bhubaneswar Odisha 751024, India.  
E-mail: [nkmohakud@yahoo.co.in](mailto:nkmohakud@yahoo.co.in)

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become a routine practice for the treatment of pediatric illness [7]. Essential drugs offer a cost-effective solution to many health problems in a developing country [8].

*Objectives*

To study the following parameters in the study population-

- Sociodemographic profile of the subjects diagnosed with LRTI.
- Prescriptions for LRTI for pattern of antibiotics use and alterations of antibiotics.
- Assess the subject for possible associations between living conditions and the disease or course of disease.

**Materials and Methods**

*Study Type and Duration*

This was a cross sectional observational, record based study carried out for a period of 1 year (Aug 2016 to July 2017) in the Department of Pharmacology in collaboration with Department of Pediatrics, PBMH, KIMS, Bhubaneswar. This study was approved by KIMS research committee and institutional ethics committee. A total of 245 inpatients fulfilling the inclusion criteria were included. Current diagnosis, treatment chart, length of hospital stay, empirical and combinations of antibiotics on admission to discharge were recorded and analyzed.

*Inclusion Criteria*

- Pediatric patients admitted within the age group of (1mo-14 years) diagnosed with LRTI.

*Exclusion Criteria*

- Patients having chronic diseases (cystic fibrosis,

on long standing steroids, failure to thrive, immunodeficiency, any coexisting infections (urinary or meningeal)

- OPD patients.
- Left against Medical advice during the course of treatment.

*Data Collection*

Data was collected from total of 245 pediatric inpatients treated for Lower respiratory tract infection (Bronchiolitis, Bronchitis, Laryngotracheobronchitis, wheeze associated with LRTI) aged between (1mo-14yrs) fulfilling the inclusion criteria were taken. Demographic profile, antibiotics prescribed, use of oxygen, other drugs used are collected. A written informed consent was obtained from parents/guardians of all the children after explaining the study procedure.

*Statistical Analysis*

Collected Data was be analyzed using GRAPH-PAD statically software to find any statically significant difference. Categorical data were expressed as percentage and average as comparative statistical analysis. Necessary statistical figures were shown using Bar Diagram, Chart and other necessary tools.

**Results**

The number of children diagnosed with lower respiratory tract infection is maximum in the age group of 0-1 yrs and accounts for 49.8% of total children admitted with LRTI. There is a fall in the number of children admitted with LRTI beyond 1 year age to almost 1/4<sup>th</sup> of this value with a small surge of cases in the age group of 6-10 years. Overall there is strong significant association between age of patients and the types of disease (p<0.001).

**Table 1:** Distribution of Disease in Male and Female

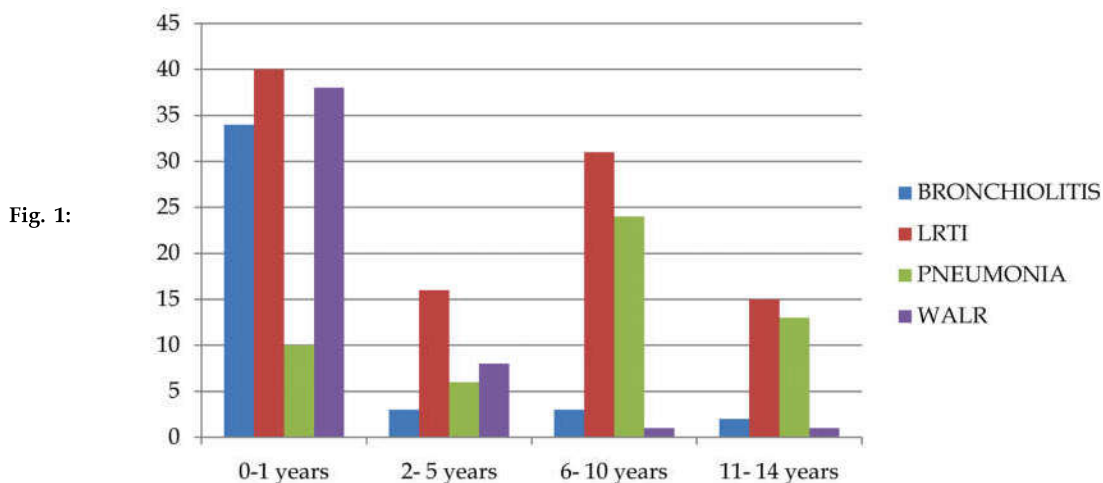
Types of Disease	Sex		Total
	Female	Male	
Bronchiolitis	11	31	42
Lrti	38	64	102
Pneumonia	9	44	53
Walr	14	34	48
Total	72	173	245

As p-value<0.05 there is significant relationship between sex and types of disease

**Table 2:** Disease Distribution in different Age group

Types of Disease	Age				Total
	0-1 years	2- 5 years	6- 10 years	11- 14 years	
Bronchiolitis	34	3	3	2	42
Lrti	40	16	31	15	102
Pneumonia	10	6	24	13	53
Walr	38	8	1	1	48
Total	122	33	59	31	245

Different types of diseases with different age group of admitted children and their incidence.



**Table 3:** Empirical Antibiotics Used in Male and Female Gender Distribution

Antibiotics Used	Sex		Total	Chi-square/Exact test	DF	P-value
	Female	Male				
AMIKACIN	5	16	21	6.956	9	0.642(*)
AMIKACIN,AMP	2	2	4			
AMIKACIN,PIP	0	1	1			
AMOXICILLIN	1	9	10			
AMPICILLIN	0	4	4			
AMPICILLIN,CLOXACILLIN	1	4	5			
AZITHROMYCI	1	1	2			
CEFTIRAXONE	62	134	196			
CIPROFLOXAC	0	1	1			
PIPERACILLI	0	1	1			
Total	72	173	245			

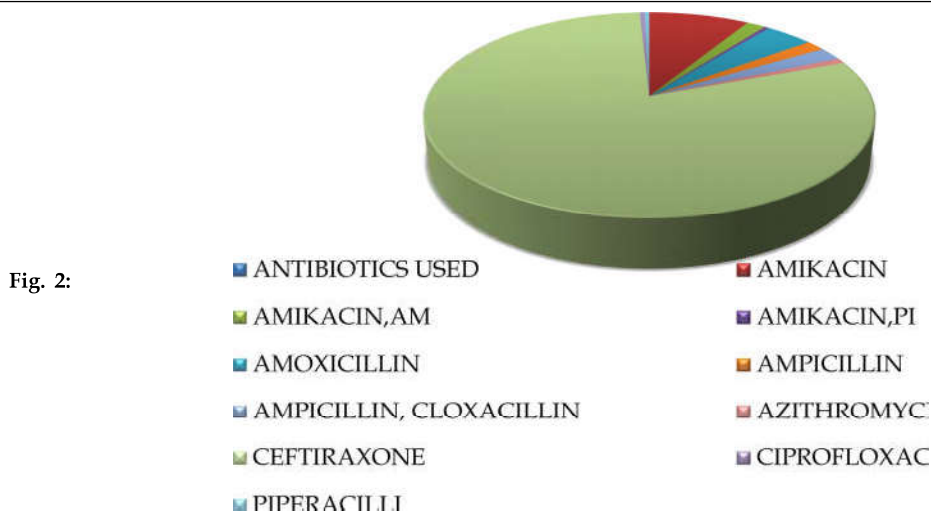


Fig. 3:

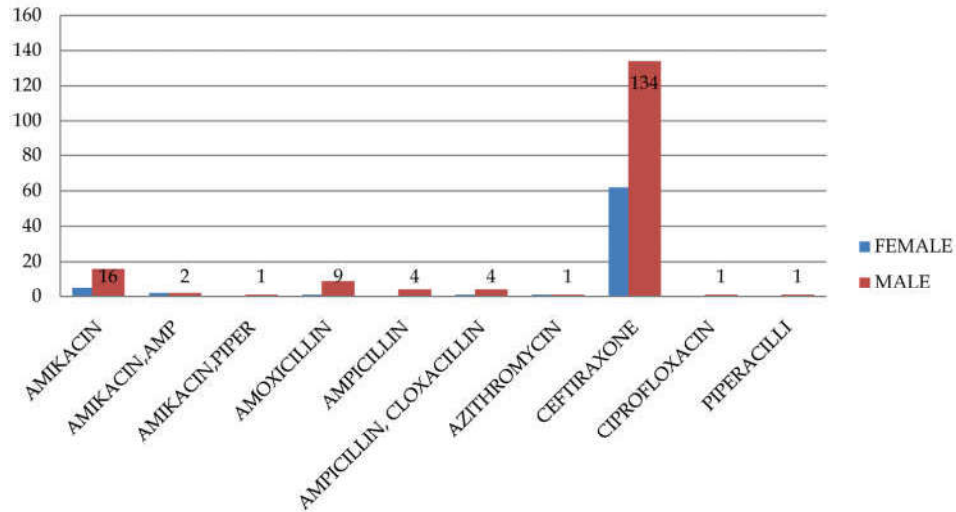


Table 4: Empirical Antibiotics Used in different Age group

Antibiotics Used	Age				Total	Chi-square	DF	P-value
	0-1 years	2- 5 years	6- 10 years	11- 14 years				
AMIKACIN	8	6	4	3	21	33.44	27	0.183(#)
AMIKACIN,AMP	3	0	1	0	4			
AMIKACIN,PIP	0	1	0	0	1			
AMOXICILLIN	6	1	2	1	10			
AMPICILLIN	4	0	0	0	4			
AMPICILLIN, CLOXACILLIN	5	0	0	0	5			
AZITHROMYCI	1	0	0	1	2			
CEFTIRAXONE	94	25	52	25	196			
CIPROFLOXAC	0	0	0	1	1			
PIPERACILLI	1	0	0	0	1			
Total	122	33	59	31	245			

Table 5: Nebulizer drug used in Male and Female Gender Distribution

Nebulizer Drug Used	Sex		Total	Chi-square	DF	P-value
	Female	Male				
Levosalbutamol	20	57	77	3.299	4	0.509(\$)
Levosalbutamol, Budesonide	3	11	14			
levosalbutamol, budesonide, hydr	12	26	38			
Levosalbutamol,Hydrocortis	9	11	20			
Levosalbutamol,Ipratropium	28	68	96			
Total	72	173	245			

As p-value>0.05 there is no significant relationship between antibiotics used and age (Table 3). Out of 245 patients studied, highest numbers of patients were infants with 122 patients having age less than 1 year there were less patients in the older age groups. However there was no antibiotic preference for any particular age group as p-value >0.05 for this correlation indicating that there is no significant relationship between antibiotics used and age.

Ceftriaxone was the most commonly used antibiotic

administered to 196 patients followed by amikacin with 21 cases (Figure 1).

Asp-value>0.05 there is no significant relationship between age and nebulizer drug used (Table 4). In addition to antibiotics used all the patients were administered nebulization therapy. Levosalbutamol, ipratropium, budesonide, hydrocortisone were the drugs used in varying combination for nebulization purpose. However there is no significant relationship between age and nebulizer drug used with p value >0.05.

**Table 6:** Nebulizer drug used in different Age group

Nebulizer Drug Used	Age				Total	Chi-square	DF	P-value
	0-1 years	2- 5 years	6- 10 years	11- 14 years				
Levosalbutamol	40	10	15	12	77	14.232	12	0.286(**)
Levosalbutamol,Budesonide	12	0	2	0	14			
Levosalbutamol,Budesonide, Hydr	14	7	10	7	38			
Levosalbutamol,Hydrocortis	8	3	7	2	20			
Levosalbutamol,Ipratropium	48	13	25	10	96			
Total	122	33	59	31	245			

## Discussion

In general practice, the therapeutic approach for lower respiratory tract infection is primarily empirical and the main aim of the physicians is to treat as specifically as possible. The present study indicates the general trends of use of antibiotics in lower respiratory tract infection in pediatric inpatient department. Antibiotic resistance is an emerging problem and has become a major threat to the medical field. Excessive and in appropriate use of antibiotic has been a major contributor to this ever growing problem.

### Age Distribution

The total population was categorized into four groups and patient in each group were recorded. The data from our study represent that, out of 245 patients the highest number of patients in age group 0-1yr (113; 46.12%), 1-5yr (36; 14.69%), 6-10yr (74; 30.20%) and 11-14yr (22; 8.97%), i.e. highest number of patients were in age group 0-1yr and lowest number were in age group 11-14yr. So the mean age of pediatric patient was 51.608 (in months) or 4.30 (in years).

Among all pediatric patients 101 patients (41.22%) were diagnosed with LRTI, 67 patients (27.34%) with Pneumonia, 46 patients (18.77%) with WALRTI, 28 patients (11.48%) with Bronchiolitis, 2 patients (0.81%) with Bronchitis, and 1 patient (0.40%) with Laryngotracheobronchitis. The highest numbers of patients were diagnosed with LRTI and lowest numbers of patients were diagnosed with Laryngotracheobronchitis.

Other studies of children with LRTI shows the highest number of patients were in age group less than a year i.e. 38.1% and lowest number were in age group 9-11 i.e. 0.6% [9]. It was seen that patients from age group 2-14yrs were 42.27%, followed by <12months were 32.73% with LRTIs [10]. In our study the mean age of pediatric patient affected with LRTI was 4.3 years.

Most of the hospitalized pediatric patients belonged to age group of less than one year. This is indicative of susceptibility of infant below one year towards various infective diseases. It was revealed that infant less than one year received antibiotics more frequently than older children. The author also stated that this could be due to higher susceptibility of infections at a younger age and needs a greater concern for infant's health relatively [11]. But if we take admission to pediatrics ward, patients being hospitalized belongs to age group 5-12yr [7].

Types of diseases in different age is statistically significant as 0-1yr age group was having higher occurrence of subtypes of LRTI except pneumonia which is more in 6-10 years of age group.

### Disease Diagnosed

Among all 245 pediatric patients 101 patients (41.22%) were diagnosed with LRTI, 67 patients (27.34%) with Pneumonia, 46 patients (18.77%) with WALRTI, 28 patients (11.48%) with Bronchiolitis, 2 patients (0.81%) with Bronchitis, 1 patient (0.40%) with Laryngotracheobronchitis. The highest numbers of patients were diagnosed with LRTI and lowest numbers of patients were diagnosed with Laryngotracheobronchitis.

Another study shows 55.46% patients were diagnosed with Bronchopneumonia being highest in the incidence followed by WALRI and Bronchiolitis [10]. Few studies, states that WALRI is the highest incident followed by Bronchopneumonia [5]. In a report prepared by International Vaccine Access Center (IVAC) in 2014 revealed that Pneumonia in developing countries remains fairly stagnant despite of major reductions in globally.

Most of authors state that Pneumonia is still a leading killer of young children through there are simple, safe, effective and expensive interventions to minimize the risk. They also emphasized that the reason could be poverty and lack of access to healthcare in developing countries [15].

### *Number of Antibiotics Per Prescription*

Third generation, ceftriaxone (80%) was the leading antibiotic prescribed followed by amikacin (9%), amoxicillin (4%) and ampicillin (1.6%). The least prescribed antibiotics were cloxacillin, azithromycin and piperacillin. Higher prescription rate of cephalosporin could be attributed to its broad spectrum of activity and tolerance across all age group.

Study revealed that 127 (51.83%) patients were on monotherapy of antibiotics followed by 73 (29.79%) patients were on two combination antibiotics therapy, 41 (16.73%) patients were on three combination antibiotics therapy and 4 (1.63%) patients were receiving more than three combination antibiotics therapy. So the mean average number of antibiotics per prescription of patient staying in hospital ward was 1.68.

A studies comprising of 150 case records of children, most patients were put only one combination of antibiotic (45.3%) and others were put on two antibiotics (33.3%) which is a very good clinical practice observed [9]. Average number of drug is an important indicator for assessing rationality of prescription. It is preferable to keep the mean number of drugs per prescription as low. The WHO recommends that the average number of drugs per prescription should be less than 2 [13]. The average number of drugs per prescription value should be as low as possible to prevent the unfavorable outcomes of polypharmacy such as increased risk of drug interactions, increased cost of therapy, non-compliance and emergence of resistance in case of use of antimicrobials [14].

### *Nebulized Drugs Used*

According to our study the different bronchodilators used with steroids are levosalbutamol with ipratropium 93 (37.95%), levosalbutamol 77 (31.42%), levosalbutamol followed with budesonide & hydrocortisone 39 (15.91%), levosalbutamol & hydrocortisone 21 (8.57%), levosalbutamol & budesonide 15 (6.12%). A study of 150 case records of children with LRTI analyzed, bronchodilators were observed in 90% of case records and Salbutamol (88.67%) was most commonly prescribed followed by Budesonide (70%) [9]. The American Academy of Pediatrics recommends that inhaled bronchodilators should not be used routinely for the management of Bronchiolitis. One possible exception is for LRTI with underlying reactive-airway disease and where wheeze is the hallmark symptoms of LRTI, short acting beta 2 agonists may be effective

for individual patients. Intravenous Hydrocortisone was prescribed for 18% of patients in our study in addition to inhalational Budesonide but a meta-analysis of studies comparing systemic glucocorticoid treatment to placebo did not find any difference in the length of hospital stay or clinical score of infants and young children with LRTI from either group. Hence routine use of corticosteroids is not recommended according to standard treatment guidelines [15].

### **Conclusion**

Rational use of drugs was largely influenced by knowledge and attitude and its importance had to be emphasized. This study included in medical education to have long term beneficial effects. Strict antibiotic prescribing policy may significantly overcome the overuse of antibiotics and reduce the development of resistance to antibiotics. This study will help the clinicians to know about pattern of Antibiotics used and types of LRTI in Pediatric patient.

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