



Original Article

## Magnitude of Pneumonia and Bronchiolitis and Their Treatment Modalities Practiced in Under Five Children Attending a Tertiary Care Hospital

Md. Ruhul Amin,<sup>1</sup> Be-Nazir Ahmmad,<sup>2</sup> Fazlur Rahman,<sup>3</sup> Md. Mosharrof Hossain,<sup>4</sup>  
SK. Mohammad Ali Rashed,<sup>5</sup> Md. Sanaul Haque Mia<sup>6</sup>

### Abstract

**Background:** Pneumonia is the leading cause of death globally among children younger than five years of age. Acute bronchiolitis is also a major public health problem throughout the world. Many children with pneumonia and bronchiolitis are not properly diagnosed, and overuse of antibiotics has led to increasing drug resistance.

**Objectives:** To determine the magnitude of pneumonia and bronchiolitis and to study their treatment modalities practiced in under five children.

**Methods:** This cross-sectional observational study was carried out in the Pediatric inpatient department and outpatient department of Rajshahi Medical college Hospital from October 2015 to March 2016. Total 373 cases between 1 month to 59 months of age with acute respiratory infection who fulfilled the inclusion criteria were enrolled in the study. The inclusion criteria were any child between 1 month to 59 months of age presented with respiratory symptoms including cough/runny nose or breathing difficulty as complained by the caregivers or having chest in-drawing. Detailed information was obtained through structured questionnaire and then analyzed.

**Results:** In this study majority of the children 223 (59.78%) were under 12 months of age. There were 234 (62.73%) male and 139 (37.27%) female cases, male to female ratio being 1.68:1. Among studied children 217 (58.18%) were urban dwellers and 156 (41.82%) were from rural areas and majority of the children 268 (71.85%) came from lower socioeconomic strata. Out of 373 cases, pneumonia was diagnosed in 131(35.12%) cases, bronchiolitis in 88 (23.60%) cases and other acute respiratory tract infections in 154 (41.28%) cases. Most common antibiotic used for the treatment of both pneumonia and bronchiolitis was ceftriaxone in 34.35% and 25% cases respectively followed by other antibiotics and medications.

**Conclusion:** It is concluded that pneumonia was found in 35.12% cases and bronchiolitis in 23.60% cases among the under five children attending a tertiary care hospital with acute respiratory infection. Majority were under 12 months of age, male children, residing in urban areas and coming from lower socioeconomic status. Ceftriaxone was the commonest antibiotic used in the treatment of both pneumonia and bronchiolitis.

**Key words:** Magnitude, Pneumonia, Bronchiolitis, Treatment modalities.

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### Introduction

Acute respiratory infections in children less than five years old are the leading cause of childhood

mortality in the world. Most of the deaths are caused by pneumonia and bronchiolitis.<sup>1</sup>

Pneumonia, defined as inflammation of the lung parenchyma is the leading cause of death globally

<sup>1</sup> Assistant Professor, Department of Pediatrics, Rajshahi Medical College, Rajshahi, Bangladesh.

<sup>2</sup> Assistant Professor, Department of Pediatrics, Rajshahi Medical College, Rajshahi, Bangladesh.

<sup>3</sup> Assistant Professor, Department of Pediatrics, Naogaon Medical College, Naogaon, Bangladesh.

<sup>4</sup> Assistant Professor, Department of Pediatrics, Rajshahi Medical College, Rajshahi, Bangladesh.

<sup>5</sup> Senior Consultant (Pediatrics), 250 bedded District Hospital, Chapainawabganj, Bangladesh.

<sup>6</sup> Professor and Head, Department of Pediatrics, Islami Bank Medical College, Rajshahi, Bangladesh.

among children younger than five years, accounting for an estimated 1.2 million (18% total) deaths annually.<sup>2</sup> Recent studies have identified *S. pneumoniae*, *H. influenzae* and respiratory syncytial virus as the main pathogens associated with childhood pneumonia.<sup>3</sup> Pneumonia can be diagnosed clinically in a febrile and coughing child based on fast breathing and chest in-drawing, the two important features for the diagnosis of pneumonia in children.<sup>4,5</sup> Additionally, crackles, occasional rhonchi and end point consolidation and other infiltrate on x-ray chest might help for the diagnosis of pneumonia in children.<sup>6</sup> Treatment of suspected bacterial pneumonia is based on the presumptive cause and the age and clinical appearance of the child. For mildly ill children who do not require hospitalization, amoxicillin is recommended. Therapeutic alternatives include cefuroxime axetil and azithromycin. In areas without substantial high level penicillin resistance among *S. pneumoniae*, children who are fully immunized against *H. influenzae* type b and *S. pneumoniae* and are not severely ill should receive ampicillin or penicillin G. For children who do not meet the criteria, ceftriaxone or cefotaxime should be used. If clinical features suggest staphylococcal pneumonia, initial antimicrobial therapy should also include vancomycin or clindamycin.<sup>2</sup>

Acute bronchiolitis is predominantly a viral disease. Respiratory Syncytial Virus (RSV) is responsible for more than 50% cases. Other agents include parainfluenza, adenovirus, rhinovirus, and mycoplasma. Emerging pathogens include human metapneumovirus and human bocavirus, which may be a primary cause of viral respiratory infection or occur as a co-infection with RSV.<sup>7</sup> In hospital-based studies, diverse criteria have been used to define bronchiolitis. The features which characterize bronchiolitis are coryzal symptoms followed by rapid onset of wheezing, fever, tachypnea, chest retraction and rhonchi with radiographic evidence of hyperinflation.<sup>8,9</sup>

There are lot of recent advances in the management of bronchiolitis,<sup>10</sup> but supportive interventions remain the mainstay of management.<sup>11</sup> Supportive interventions for

bronchiolitis management include cool humidified oxygen, maintaining optimum body position, nutritional management, frequent suctioning of nasal and oral secretions. Antibiotics have no value unless there is coexisting bacterial infection.<sup>7</sup> Many children with acute lower respiratory tract infections are not properly diagnosed, and overuse of antibiotics has led to increasing drug resistance. The prevalence of antibiotic resistance probably reduces the possibility of treating acute lower respiratory tract infections effectively and increases the risk of complication and mortality.<sup>12</sup>

This study was undertaken to have the knowledge of the magnitude of pneumonia and bronchiolitis and their treatment modalities practiced by the doctors who are at first involved in the management of under five children attending a tertiary care hospital with acute respiratory infection.

### Materials and Methods

This cross-sectional observational study was conducted in the Pediatric Inpatient Department (IPD) and Outpatient Department (OPD) of Rajshahi Medical College Hospital from October 2015 to March 2016. Total 373 cases between 1 month to 59 months of age were enrolled in the study. Sample size was calculated by using appropriate statistical formula. The inclusion criteria were, any child between 1 month to 59 months of age presented with respiratory symptoms including cough/runny nose or breathing difficulty as complained by the caregivers or having chest in-drawing. Exclusion criteria were, any child having respiratory distress due to heart failure or asthma or non-respiratory causes. For pneumonia<sup>13</sup>, clinical diagnostic criteria were fever and cough with fast breathing, lower chest wall in-drawing and coarse crepitation on auscultation. For bronchiolitis<sup>14</sup>, clinical diagnostic criteria were runny nose followed by cough and breathing difficulty, chest in-drawing and rhonchi on auscultation in children less than 2 year of age. Fast breathing<sup>13</sup> was documented when respiratory rate at age: within <2 months- 60/min or more, 2-11 months- 50/min or more, 1-5 years- 40/min or more. Detailed information was obtained through structured questionnaire with

informed written consent of the children's parents. Then the children were examined by the research doctor clinically and the questionnaire were filled-up to document the history, clinical findings regarding age, sex, socioeconomic status, cough, runny nose, fast breathing, chest in-drawing, fever, crepitation, rhonchi etc. The research doctor also documented the mode of diagnosis and management given by the first attending local doctors of this hospital e.g. medical officers working at Pediatric OPD and IPD and then documented the actual diagnosis according to

clinical diagnostic criteria of this study. In case of patients admitted to Pediatric IPD the researcher used to fill-up the questionnaire within 24 hours of admission regarding history, clinical findings and management given by the first attending local hospital doctors. After collection, data editing and clearing was done manually and prepared for data entry and statistical analysis was performed by computer using SPSS statistical software version 16. Ethical approval was obtained from the ethical committee of the hospital.

## Results

A total 373 children with acute respiratory infection were studied in the Pediatric OPD and IPD of Rajshahi Medical College Hospital, Bangladesh. The results of the study have been described below.

**Table 1: Distribution of respiratory cases by hospital services of IPD and OPD (n=373)**

Hospital Services	Number	Percentage (%)
IPD	78	20.91
OPD	295	79.09
Total	373	100.00

**Table 1** Shows that the study included 373 cases with acute respiratory infection. Among them greater number and percentage of children attended Pediatric OPD than IPD for receiving treatment.

**Table 2: Distribution of studied children according to socio-demographic characteristics (n=373)**

Variables	Number	percentage
Age distribution		
≤ 6 months	117	31.37%
7-12 months	106	28.41%
13-24 months	95	25.47%
25-59 months	55	14.75%
Gender distribution		
Male	234	62.73%
Female	139	37.27%

Distribution according to social class as per parent's monthly income<sup>15</sup>

Upper class > 200000 Tk	11	02.95%
Middle Class 10000-199000 Tk	94	25.20%
Lower class 1200- < 10000 Tk	268	71.64%

Distribution according to living places

Urban	217	58.18%
Rural	156	41.82%

**Table 2** Shows that highest number of the children were from  $\leq 6$  months age group (117,31.37%). Among 373 children, 234 (62.73%) were male and 139 (37.27%) were female. Male to female ratio was 1.68:1. Most of the children were from lower class family 268 (71.64%) status and majority of the children 217 (58.18%) were urban dwellers.

**Table 3: Number and percentage of pneumonia and bronchiolitis among the respiratory cases diagnosed clinically by the attending medical officers and the research doctor (n=373)**

Clinical diagnosis	Hospital services		Total n=373
	OPD n=295	IPD n=78	
By the attending medical officers of this hospital			
Pneumonia	61 (20.68%)	45 (57.69%)	106 (28.42%)
Bronchiolitis	39 (13.22%)	22 (28.21%)	61 (16.35%)
Other acute respiratory tract infections	195 (66.10%)	11 (14.10%)	206 (55.23%)
By the research doctor according to clinical criteria of this study			
Pneumonia	83 (63.36%)	48 (36.64%)	131 (35.12%)
Bronchiolitis	60 (68.19%)	28 (31.81%)	88 (23.60%)
Other acute respiratory tract infections	152 (98.70%)	02 (01.30%)	154 (41.28%)

**Table 3** Shows that the clinical diagnosis done by the local hospital doctors or medical officers were pneumonia in 106 (28.42%), bronchiolitis in 61 (16.35%) cases and other acute respiratory tract infections in 206 (55.23%) cases. On the contrary, according to clinical diagnostic criteria of this study pneumonia was diagnosed in 131 (35.12%), bronchiolitis in 88 (23.60%) and other acute respiratory tract infections in 154 (41.28%) cases. So, attending medical officers under-diagnosed some pneumonia and bronchiolitis cases and over diagnosed other acute respiratory tract infections.

**Table 4: Breakdown of other acute respiratory tract infection cases diagnosed by the research doctor (n=154)**

Clinical diagnosis	OPD	IPD
Common Cold + Others <sup>1</sup>	148	01
Viral croup	00	01
Otitis media + other <sup>2</sup>	04	00
Total	152	02

1- Includes rhinitis, sore throat

2- Includes common cold, rhinitis

**Table 4** Shows that common cold were the predominant other cases of acute respiratory tract infections attending the Pediatric OPD of the hospital.

**Table 5: Clinical symptoms and signs of pneumonia and bronchiolitis cases recorded by the research doctor**

Symptom / Sign	Pneumonia (n=131)	Bronchiolitis (n=88)
Cough	131 (100.0%)	88 (100.0%)
Fever	131 (100.0%)	54 (61.36%)
Runny nose	15 (11.45%)	86 (97.73%)
Respiratory distress	120 (91.60%)	84 (95.45%)
Feeding difficulty	82 (62.12%)	37 (42.05%)
Fast breathing	29 (98.47%)	80 (90.90%)
Chest indrawing	83 (63.36%)	82 (93.18%)
Wheeze	06 (04.58%)	78 (88.64%)
Rhonchi	43 (32.82%)	88 (100.0%)
Crepitation	94 (71.76%)	38 (43.18%)

**Table 5** Shows that cough was the predominant symptom in 100% cases of pneumonia and bronchiolitis. Fever was present in 100% cases of pneumonia and 61.36% cases of bronchiolitis. Respiratory distress was common in both pneumonia (91.60%) and bronchiolitis (95.45%). Crepitation was more common in pneumonia (71.76%) than in bronchiolitis (43.18%).

**Table 6: Different modalities of treatment given by the first attending medical officer of this hospital for children with pneumonia and bronchiolitis**

<b>Treatment modalities</b>	<b>Pneumonia (n=131)</b>	<b>Bronchiolitis (n=88)</b>
Oxygen inhalation	18 (13.74%)	08 (09.09%)
Intravenous fluid	25 (19.08%)	21(23.86%)
Nebulization (with salbutamol + Ipratropium)	38 (29.00%)	22 (25.00%)
Antibiotic oral	78 (59.54%)	37 (42.04%)
Antibiotic parental	53 (40.46%)	22 (25.00%)
Antihistamine	21 (16.03%)	35 (39.77%)
Oral bronchodilator	25 (19.08%)	58 (65.91%)
Paracetamol	32 (24.43%)	10 (11.36%)
Name of antibiotics used		
Amoxicillin	03 (02.29%)	02 (02.27%)
Erythromycin	05 (03.82%)	04 (04.55%)
Azithromycin	25 (19.08%)	20 (22.73%)
Cefpodoxime	16 (12.21%)	06 (06.82%)
Cefixime	27 (20.61%)	05 (05.68%)
Cephradine	02 (01.52%)	00 (00.00%)
Flucloxacillin	22 (16.80%)	01 (01.40%)
Ceftriaxone	45 (34.35%)	22 (25.00%)
Cefepime	06 (04.58%)	00 (00.00%)
Meropenem	02 (01.52%)	00 (00.00%)

**Table 6** Shows that pneumonia was treated with parental antibiotics in 53 (40.46%), oral antibiotics in 78 (59.54%) cases along with other medications. Bronchiolitis was treated with oral antibiotics in 37 (42.04%), parental antibiotics in 22 (25%) cases along with other medications. Pneumonia was treated with parental antibiotic mostly with ceftriaxone in 45 (34.35%) cases followed by other antibiotics. Most common antibiotics used for bronchiolitis was ceftriaxone in 22 (25%) followed by other antibiotics.

## Discussion

In this study, total 373 children with symptoms and signs of acute respiratory infection were enrolled. Among them 295 (79.09%) were

outpatient and 78 (20.91%) were inpatient department cases. A study by Kabir AL et al.<sup>16</sup> showed that children with respiratory disorders were more treated in OPD (85%) than being hospitalized (15%).

The age distribution findings of the studied children demonstrate that majority of the children 223 (59.78%) were under 12 months of age. This age distribution findings are partially similar with the results of a study by Kumar SG et al.<sup>17</sup> in India. A study by Baqui AH et al.<sup>18</sup> in Bangladesh observed that acute lower respiratory tract infection related admission rate decline with increasing age of the children after the first year of life. This may be attributed to the fact that younger children are less immune competent compared to the older children and therefore more likely to get infected.<sup>19</sup> Among the studied children 234 (62.73%) were male and 139 (37.27%) were female and male to female ratio was 1.68:1. This gender specific distribution results are consistent with the observations by Baqui AH et al.<sup>18</sup> in Bangladesh. This could be due to higher rates of care seeking for male children than for female children, given strong preferences for sons in the South Asian regions.<sup>20</sup> In this study, majority of children with acute respiratory infection were urban dwellers 217 (58.18%) and greater number of children 268 (71.85%) came from lower socioeconomic strata. These findings are partially similar with the observations by Ujunwa FA et al.<sup>21</sup> in Nigeria.

The attending medical officers of this hospital diagnosed pneumonia in 106 (28.42%), bronchiolitis in 61 (16.35%) and other acute respiratory tract infections in 206 (55.23%) cases. On the other hand, according to clinical diagnostic criteria of this study, pneumonia was diagnosed in 131 (35.12%) cases, bronchiolitis in 88 (23.60%) and other acute respiratory tract infections in 154 (41.28%) cases. These study results are partially supported by results of a study by Ujunwa FA et al.<sup>21</sup> where 31.6% cases were diagnosed as pneumonia, 6.9% bronchiolitis and 61.5% cases were acute upper respiratory tract infections. The clinical symptoms and signs recorded in this study were almost similar with a study by Yilgwan CS et al.<sup>22</sup> in Jos Nigeria.

In the present study, bronchiolitis was treated with oral antibiotics in 42.04%, parenteral antibiotics in 25% cases along with other medications. Pneumonia was treated with parenteral antibiotics

in 40.46%, oral antibiotics in 59.54% cases along with other medications. This pattern of medications use was more or less similar with a study by Kabir AL et al.<sup>16</sup> in Bangladesh. In this study, most common antibiotics used for the treatment of pneumonia was ceftriaxone in 34.35% cases followed by other antibiotics. A study by Kabir AL et al.<sup>16</sup> also found that pneumonia was treated mostly with ceftriaxone in 47.5% cases followed by other antibiotics. In this study, most common antibiotics used for the treatment bronchiolitis was ceftriaxone in 25% cases followed by other antibiotics; but different studies by Hamid F et al.<sup>23</sup> and Kabir AL et al.<sup>16</sup> do not support the routine use of antibiotics in the treatment of bronchiolitis. Antibiotic should be considered only when there is evidence of secondary bacterial infection.<sup>24</sup> Though routine use of antibiotics in the treatment of bronchiolitis was not recommended in different study findings, but in the present study, use of antibiotics was found to be in 67.04% cases of bronchiolitis.

## Conclusion

It is concluded that pneumonia was found in 35.12% cases and bronchiolitis in 23.60% cases among the under five children attending a tertiary care hospital with acute respiratory infection. Majority were under 12 months of age, male children, residing in urban areas and coming from lower socioeconomic status. Ceftriaxone was the commonest antibiotic used in the treatment of both pneumonia and bronchiolitis.

**Limitations of the study:** The sample size of this study was small. Investigations like x-ray chest, complete blood count, nasopharyngeal aspirate for viruses were not used due to limited time and constraint of fund. The children under 1 months of age were not studied which may have remained a bias in generating perfect results.

**Conflict of interest:** None declared

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All correspondence to  
**Dr. Md. Ruhul Amin**  
 Assistant Professor  
 Department of Pediatrics  
 Rajshahi Medical College, Rajshahi, Bangladesh.  
 Email: aminruhul355@gmail.com