



## Review Article

# Review Article on Lower Respiratory Tract Infections

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The incidence of lower respiratory tract infection is increasing both in the community and hospital settings and they are one of the most common reasons for antibiotic prescription. The overuse and misuse of antibiotics related to the growing emergence of bacterial resistance, increased incidence of adverse effects and prolonged hospitalization.

**Keywords:** Respiratory tract, Laryngotracheobronchitis, Pneumonia, Inspiratory stridor

## 1. INTRODUCTION

Lower Respiratory tract infection or LRTI is a generic term for an acute infection of the trachea (windpipe), Airways and Lungs, which make up the lower respiratory system. LRTIs include bronchitis, larynx, trachea and pneumonia. This article focuses on Bacterial infections, which includes the larynx, trachea, bronchi and lung-parenchyma. Most common among these are bronchitis and pneumonia. LRTIs are more common in children and adults<sup>1</sup>. LRTI may result in acute exacerbations of chronic bronchitis in patients with underlying pulmonary disease, and it the severe end of the spectrum may result in community-acquired pneumonia, a condition that carries significant morbidity and mortality<sup>2</sup>.

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### Types of LRTIs:

Lower Respiratory tract infection are classified on the basis of anatomical region infected. They include:

- Laryngotracheobronchitis
- Bronchitis
- Bronchiolitis
- Pneumonia

### Laryngotracheobronchitis:

It is also known as croup. This infection is characterized by swelling of trachea, larynx. Croup can be caused by number of number of viruses including parainfluenza and influenza virus. Rarely is it due to a bacterial infection. The signs and symptoms include hoarse voice, harsh barking cough and inspiratory stridor<sup>3</sup>.

### Bronchitis:

It refers to the onset of productive cough in a patient with no history of chronic obstructive pulmonary disease and no evidence of pneumonia. It is an inflammatory condition of a large element of the tracheobronchial tree. The inflammatory process does not extend to the alveoli. Bronchitis is frequently classified as acute or chronic. Acute Bronchitis occurs in individuals of all ages, whereas Chronic Bronchitis primarily affects in adults<sup>4</sup>.

### Bronchiolitis:

Bronchiolitis is a common lung infection. It causes inflammation and congestion in the small airways (bronchioles) of the lung. It is always caused by a virus. Typically, the peak time for bronchiolitis is during the winter months<sup>5</sup>.

### Pneumonia:

Pneumonia is an infection of lungs affecting primarily the small air sacs known as alveoli. It causes the inflammation of alveoli, distal airways and interstitium of lungs<sup>6</sup>. It is usually caused by viruses or bacteria and less commonly by other micro-organisms, certain medications and conditions like autoimmune diseases<sup>7</sup>. The disease may be classified by where it was acquired with community, hospital or health care associated pneumonia. Pneumonia can be prevented by using some vaccines.

### Epidemiology:

Lower respiratory tract infections (LRTIs) are the third most important cause of mortality globally and are responsible for more than four million deaths annually. A large UK morbidity data base reported a consultation rate for 'acute bronchitis and bronchiolitis' as 71.9 per 1000 population per year<sup>8</sup>. The incidence was 2-4 times higher in those aged 60 or over than those aged less than 50. It is estimated in the UK that 5 % of patients treated for LRTI will have radiological evidence of pneumonia, of whom 20% will require hospital admission and 1-2% will die<sup>9</sup>. World health organization global burden of diseases study estimated that LRTIs which include CAP were 429.2 million episodes of illness worldwide and accounts for 94.5 million disability adjusted life years.(DALYS) In adults aged over 59 years it causes 1.6 million deaths annually. Estimated deaths 1 lakh

population population due to LRTI in India was 89.5. Age standardized death per 1 lakh population due to LRTI in India was 113.6. Estimated DALY per 1 lakh population due to LRTI in India was 1894. Age standardized DALY per 1 lakh population due to LRTI in India was 1772<sup>(10)</sup>.

### Aetiology:

Majority of the LRTIs is initiated by viral infections. The commonest bacterial organisms include *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Moraxella catarrhalis*, *Chlamydia pneumoniae*, *Enterococcus Sp.*, *Klebsiella pneumoniae*, *Escherichia coli*, *Proteus Sp.*, *Providencia sp.*, *Enterobacter sp.*, *Pseudomonas aerogenosa*, *Legionella pneumophila* *Mycobacterium tuberculosis* and *Haemophilus influenzae*<sup>11,12,13</sup>. The commonest viral pathogens includes *Influenza virus*. A large multinational surveillance study of sputum samples of LRTI patients has shown similar bacterial isolate profiles, with wide variations in anti- microbial resistance patterns<sup>14</sup>.

### Signs and Symptoms:

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The primary signs and symptoms of any lower respiratory tract infection include:

- Coughing
- Dizziness
- Feeling a pressure or heaviness in the chest
- Shortness of breathing
- Blocking and watering of nose
- Dyspnea
- Wheezing and Fever
- Increased sputum volume
- Increased purulence

### Diagnosis:

The diagnosis of LRTIs depends on the broad spectrum of clinical, radiological, microbiological and biochemical techniques.

#### ➤ Chest X-ray:

Chest X-ray and sometimes other imaging studies, such as CT Scan, are used for diagnosing pneumonia when the history and physical examination also support the diagnosis.

- Complications of pneumonia, including pleural effusions and abscesses.
- White areas in the lung called infiltrates, which indicate infection<sup>16,17,18</sup>.

#### ➤ Gram stain:

It is important to stress on the quality of expectorated specimen which needs to be from the deep lung and free from salivary contamination<sup>17,18</sup>.

#### ➤ Sputum Testing:

Sample of sputum is collected from a deep cough and cultured to identify the bacteria that caused the LRTI to determine the antibiotic that is best correlated between the gram stain and culture will augment the final validity of organism<sup>17,18</sup>.

➤ **Serology:**

Measurement of specific antibody response to microorganisms and have a limited application in day to day practice<sup>17</sup>.

➤ **Urine antigen testing:**

Urine tests can be helpful for diagnosing pneumonia caused by two bacteria. These test are easy to perform and provide rapid result<sup>19</sup>.

➤ **Bronchoscopy:**

Patients who present initially with severe pneumonia are who failed to improve or worsen during their hospitalization despite treatment with antibiotics may require further testing with bronchoscopy. This procedure allows to collect fluid samples or a biopsy and determine whether there is an underlying cause of infection<sup>19</sup>.

**2. MANAGEMENT**

**Non-pharmacological:<sup>20</sup>**

- **Oxygen:** Long term oxygen at home has been shown to improve the life expectancy of the patients with severe hypoxemia resulting from advanced COPD. To achieve this , oxygen treatment needs to be given for as long as possible each day(15 out of 24 hours)
- **Physiotherapy:** It is helpful as an aid to clearing bronchial secretions and in the patients with chronic production of infected sputum, as in CF and bronchiectasis. Other physiotherapy includes exercise and muscle training is employed as part of pulmonary rehabilitation.
- **Ventilator Support:** In intermittent positive pressure ventilation the air is delivered into trachea via an endotracheal tube, or if ventilation needs to continue for a prolonged period, via a tracheostomy tube. In continuous positive airway pressure is a simpler form of ventilator support, which is beneficial in improving oxygenation. In non-invasive ventilation need for sedation is avoided. It is also used in some patients with severe COPD.
- **Radiotherapy:** This approach is only appropriate for patients with small peripheral tumors.
- **Thoracic surgery:** It is used for both malignant and non-malignant respiratory disease. It is the treatment of choice for primaryno small cell bronchial carcinoma, and gives the best prospect of cure when the tumor appears technically resectable, there is no evidence of metastasis and the patient is fit for the procedure.

**Pharmacological Treatment:**

- Initial treatment of LRTIs is based upon the organism that is affected. Most patients improve with empirical treatment<sup>19</sup>.
- Once the etiology of LRTI has been identified on the basis of reliable micro-biological methods, anti-microbial therapy should be directed at that pathogen.

- Commonly used antibiotics for the treatment of LRTIs are Beta-lactam antibiotics such as penicillin, cephalosporin’s, carbapenems and fluoroquinolones, macrolides, vancomycin, linezolid, Teicoplanin.
- Multiple antibiotics may be administered in combination in an attempt to treat all of the possible causative micro-organisms. Antibiotic choices may vary from hospital to hospital because of regional differences in the most likely micro-organisms abilities to resist various antibiotic treatments<sup>(19)</sup>.
- Depending on the clinical condition of the patient, local patterns of infections, site/source of infection and laboratory parameters empirical antibiotics selected, awaiting culture and antibiotic sensitivity report is available.

**Table 1: Oral and parenteral therapy depending on the severity and age<sup>21</sup>.**

Severity of infection	Oral therapy	Parenteral therapy
Mild to moderate Age <60 years no coexisting illness	Macrolide or doxycycline	Macrolide + either benzyl penicillin or procaine penicillin or cephalothin or cephazoline
Mild to moderate Age >60 years and/or co existing illness	Amoxicillin or potassium clavulanate or roxithromycin or doxycycline	Benzyl penicillin or procaine penicillin or cephalothin or cephazoline

**Duration of treatment:<sup>21</sup>**

The total length of the treatment will depend on the clinical response, but is usually 5-10 days. For sever diseases therapy should be for 7-14 days but prolonged therapy may be necessary if complications such as empyema or abscess formation occur. Treatment for *Legionella* should be for at least 14days.

**3. CONCLUSION**

lower respiratory tract infection shows effect on socio economic status of Urban areas. So to reduce this effect, early detection is necessary as said prevention is better than cure.

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