

LRTI: An Emerging Future Aspect in Public Health

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Abstract:- RTIs (respiratory tract infections) are infections of the sinuses, throat, airways, or lungs, which are all involved in breathing. It can be classified as upper respiratory tract infection and lower respiratory tract infection. Lower respiratory tract infections include acute bronchitis, bronchiolitis, pneumonia, severe acute respiratory syndrome, tuberculosis. Respiratory tract infections are one of the most prevalent reasons for individuals to contact their doctor, general practitioner, or pharmacy. It is necessary to estimate the burden of severe LRTI due to waning immunity in order to calculate the advantages of many immunizations on this crucial public health issue.

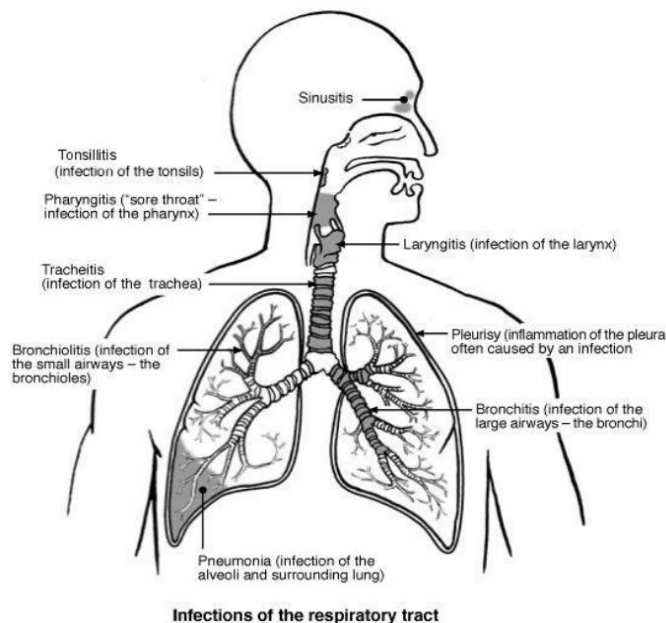
Keywords:- Lower Respiratory Tract Infection, Pediatrics, Antibiotics, Tuberculosis, Pneumonia.

I. INTRODUCTION

➤ Definition

Respiratory tract infections are described as an infection of the upper or lower respiratory tract caused by the invasion of harmful micro-organisms that can progress to a disease state.

Fig 1: Types of Respiratory tract infections



Source: <https://images.app.goo.gl/iuxY6AtuuWuNqED69>

It can be classified as Upper Respiratory Tract Infection (URTI) and Lower Respiratory Tract Infection (LRTI). Upper Respiratory Tract Infections (URTIs) include the common cold, laryngitis, pharyngitis/tonsillitis, acute rhinitis, acute rhinosinusitis, and acute otitis media.^[1] Among all infectious diseases, LRTIs are the major cause of death globally. Lower respiratory tract infections are the major cause of death compared to upper respiratory tract infections. Lower respiratory tract infections are any infections in the lungs or below the larynx. These include bronchitis, bronchiolitis, pneumonia, and pulmonary tuberculosis.^[2]

Viruses like respiratory syncytial virus and bacteria like streptococcus or staphylococcus aureus cause the majority of lower respiratory tract infections.^[3]

II. EPIDEMIOLOGY

LRTI most commonly affects young children and older adults and worldwide it is a major cause of death. Of the 5.9 million deaths which occurred worldwide due to respiratory tract infections, 1.2 million deaths were in India.^[4]

In developing countries, 30% of adults and 25% of pediatric inpatients are diagnosed with acute respiratory tract

infection. While each year 3.5 million children die with LRTI. The use of antibiotics has become a routine practice for the treatment of pediatric illnesses and antibiotics are the most commonly prescribed drugs in the pediatric population.^[5]

Every year, around 9 million children under the age of five die from respiratory illnesses, with pneumonia being the most common cause.^[6]

III. PATHOPHYSIOLOGY

Microbes enter the respiratory tract by inhaling contaminated air that contains bacteria, which then infect the mucosal lining of the respiratory tract. The invasion of this organism will trigger an inflammatory response, which will result in the release of leukocytes and neutrophils and it also activates the immune system. This inflammatory response eventually leads to epithelial destruction, which will stimulate intrapulmonary sensory nerves. It also puts a greater strain on the respiratory muscles, resulting in airflow blockage and pulmonary embolism. Due to chemoreceptor stimulation, there is an increased burden on respiratory muscles, which manifests as hypoxia, hypercapnia, and acidosis.

➤ Etiology of LRTI

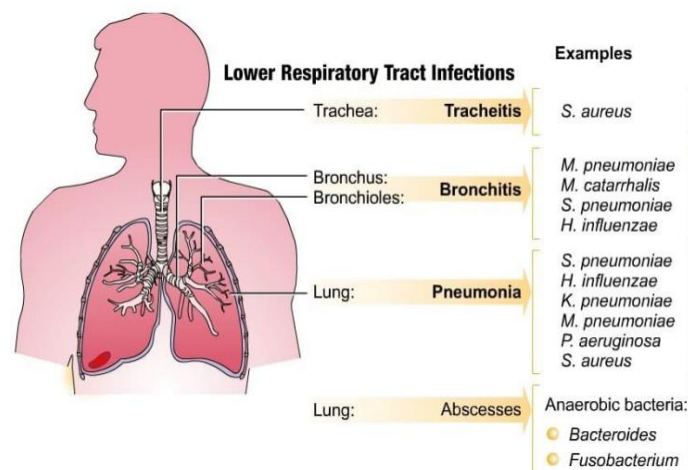


Fig 2: Types of Lower respiratory tract infections
Source: <https://images.app.goo.gl/h9PsUvutKgooDaHQ8>

Viruses cause bronchitis, bronchiolitis, and pneumonia, which are all referred to as LRTI. Streptococcus pneumoniae, chlamydia spp., legionella, and Coxiella burnetii viruses are the most prevalent causes of community-acquired pneumonia. Gram-negative organisms, primarily staphylococci, cause nosocomial pneumonia. Organisms enter the body through a different pathway, including inhaled air, aspiration, and hematogenous seeding. Pathogens multiply inside or on the surface of the epithelium after entering the body. In severe bronchiolitis, epithelial inflammation and necrosis can plug small airways, leading in airway obstruction.^[7]

IV. CLINICAL PRESENTATION

Nasal congestion, low-grade fever, mild headache, sore throat, and dry cough characterize LRTIs that are less severe in nature. Fever, wheezing, dyspnea, chest pain, and in some circumstances, bluish discoloration of the skin are symptoms of more severe LRTIs.^[8]

➤ Diagnostic Tests

Chest X-rays, complete blood counts to screen for infection-causing pathogens such as bacteria and viruses, pulse oximetry to assess the quantity of oxygen in the blood, and mucus samples to identify the bacteria or viruses present. These are the different diagnostic tests that are commonly used to detect if a patient has LRTIs.^[9]

V. PHARMACOLOGICAL MANAGEMENT

➤ *Bronchiolitis:*

Bronchiolitis is an LRTI caused by virus-infected droplets breathed into the lungs. The most serious disease is caused by the Respiratory Syncytial Virus (RSV), which is identified in 50– 80% of individuals. It is the most common cause for infants of less than 1 year to be hospitalized, particularly between the ages of three and six months.^[10]

The bronchial tubes in the lungs become irritated in this illness. In 2006, the American Academy of Pediatrics (AAP) issued a statement in collaboration with the American Academy of Family Physicians (AAFP), the American College of Chest Physicians (ACCP), and the American Thoracic Society (ATS) recommending that antibiotics be used only if a bacterial infection has been confirmed.^[11]

➤ *Bronchitis:*

Acute bronchitis is an inflammation of the bronchial airways which is self-limited. Every year, it affects approximately 5% of individuals. As physical examination findings are frequently limited and investigations yield non-specific results, diagnosis is usually based on clinical complaints.^[12]

The treatment for bronchitis is separated into two parts:

- Macrolide antibiotics are an example of antibiotic therapy.
- Antitussives, expectorants, and inhaler medicines are used to treat symptoms.^[13]

➤ *Pneumonia:*

Pneumonia is caused by microorganisms invading the lower respiratory system, below the larynx, by inhalation, aspiration, invasion of the respiratory epithelium, or hematogenous dissemination. Lobar pneumonia is divided into four phases. Alveolar edema and vascular congestion define the initial stage, which begins within 24 hours. There are bacteria as well as neutrophils present.

The second stage is red hepatization, which has the consistency of the liver. Neutrophils, red blood cells, and desquamated epithelial cells define this stage. Fibrin deposits are widespread in the alveoli.

The lung looks dark brown in the third stage of grey hepatization, which occurs 2-3 days later. Hemosiderin accumulates, and red blood cells are hemolyzed. Patch consolidation of one or more lobes is common in bronchopneumonia. The neutrophilic infiltration is concentrated in the bronchial centre.^[14]

The treatment given for pneumonia is,

- Antibiotics, either IV or oral, are used to treat bacterial infections.
- Intravenous fluids
- Oxygen treatment is used to relieve nasal congestion and clear thick mucus that has formed as a result of the child's nose and mouth being suctioned.^[15]

➤ *Tuberculosis*

Mycobacterium tuberculosis is an acid-fast rod-shaped bacteria that grows only in the presence of oxygen, which causes tuberculosis. After being released from an infected host, these microorganisms can float in the air as airborne droplets for hours. This bacteria can reside in the alveoli of a susceptible host and can be swallowed up by alveolar macrophages, resulting in dormant tuberculosis if the disease is controlled.^[16]

The aim of tuberculosis treatment is to treat the individual, limit the spread of the disease, and reduce medication resistance.^[17]

Treatment for Tuberculosis is separated into two parts

- 1) First-line anti-TB agent: Daily dosages are as follows: (mg/kg of body weight per day)
Rifampicin 10-12 mg/kg (max 600 mg/day)
Isoniazid 10 mg/kg (max 300 mg/day)
Ethambutol 20-25 mg/kg (max 1500 mg/day)
Pyrazinamide 30-35 mg/kg (max 2000 mg/day 2)

- 2) Second line anti-TB agent
Streptomycin 15 mg/kg (max 1gm/day).^[18]

VI. CONCLUSION

The burden of severe LRTI owing to declining immunity must be determined. One of the most common causes for patients to consult their doctor, general practitioner, or pharmacist is for respiratory tract illnesses. The use of an antibiotic with a spectrum tailored to the variety of lung infections is necessary due to the diversity of LRTI pathogens and the requirement for empirical treatment. The use of alternative agents is necessary due to the growing issue of antibiotic resistance.

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LIST OF ABBREVIATION

Abbreviation	Terminology
RTIs	Respiratory Tract Infection
LRTIs	Lower Respiratory Tract Infection
TB	Tuberculosis
IV	Intra Venous
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
AMAs	Anti-Microbial Agents