An overview of respiratory tract infections in South Africa

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Abstract

Respiratory tract infections represent a significant global health concern, including high rates of morbidity and mortality. Upper respiratory tract infections (common cold, rhinosinusitis, tonsillitis, laryngitis and otitis media) are usually mild and self-limiting, while lower respiratory tract infections lead to more severe illness (bronchitis, bronchiolitis and pneumonia), and are still one of the top ten leading causes of mortality. In Africa, and other lower-income countries, the burden especially among children under the age of five years is severe.

Respiratory tract infections can be differentiated between upper or lower respiratory tract infections. Upper respiratory tract infections have mainly viral origins and can be treated symptomatically. Lower respiratory tract infections involve bronchi, bronchiole and alveoli, with pneumonia the most common presentation.

Management of lower respiratory tract infection depends on the underlying cause, severity, and comorbidities. Viral lower respiratory tract infection requires supportive care such as rest, hydration and antipyretics. Antiviral therapy may be considered for confirmed influenza. Bacterial lower respiratory tract infections, particularly community-acquired pneumonia, require empiric antibiotic therapy guided by local antimicrobial guidelines.

As accessible frontline health professionals, pharmacists assess symptoms, identify critical warning signs, and facilitate appropriate referrals, thereby ensuring safe and timely patient care. This paper provides an overview of the relevant symptoms and management of upper and lower respiratory tract infections.

Keywords: respiratory tract infections, viral infections, bacterial infections; symptomatic management

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Introduction

Respiratory tract infections (RTIs) are a group of infectious diseases affecting the human respiratory system, which reach from the nostrils and sinus cavities to the lungs.[1] These infections represent a significant global health concern, responsible for high rates of morbidity and mortality.[2]

Respiratory tract infections are primarily classified based on the anatomical location of the infection within the respiratory system, identifying them as upper and lower respiratory tract infections.[1] Upper RTIs are usually mild and self-limiting, and include the common cold, rhinosinusitis, pharyngitis, tonsillitis, laryngitis and otitis media.[1,3] Lower RTIs affect the airways and lungs, often leading to more severe illness.[1] Examples of lower RTIs include bronchitis, bronchiolitis and pneumonia.[1]

On a global scale, lower RTIs are one of the top ten leading causes of mortality. Moreover, pneumonia and other lower RTIs fell within the most lethal category of communicable diseases in 2019.[4] Influenza alone accounts for approximately a billion cases annually, with 290 000 to 650 000 respiratory deaths worldwide.[5] The WHO influenza seasonal update (2025) stated that 99% percent of influenza deaths in children under the age of five years occur in developing countries. Global age-standardised death rates for lower RTIs decreased between 1990 and 2021, however, the burden remains highest in low Socio-demographic Index (SDI) regions and sub-Saharan Africa.[4]

In Africa, RTIs, particularly lower RTIs, present a public health challenge, with an immense burden of mortality and morbidity, especially among children.[4] For instance, in Ethiopia, RTIs were responsible for 18% of all deaths of children under five years of age in 2023.[6]

Samples tested in South Africa during the influenza season in 2025, revealed the most prevalent viral causes for RTIs to be influenza, respiratory syncytial virus (RSV), and the SARS-CoV-2 virus.[7]

Upper respiratory tract infections

Pathophysiology

Most upper respiratory tract infections (URTIs) are caused by viruses, particularly rhinovirus, influenza virus, coronavirus, and respiratory syncytial virus, as shown in Figure 1.[8] Viral causes are mostly responsible for the disease process in common colds and flu, with rhinitis as the main symptom. Furthermore, the following bacteria constitute a partial list of pathogens associated with URTI symptoms, including sore throat and inflammation of the pharynx and larynx: Group A beta-hemolytic Streptococcus (*Streptococcus pyogenes*), Group C and G beta-hemolytic Streptococci, *Mycoplasma pneumoniae*, *Moraxella catarrhalis*, *Haemophilus influenzae*, and *Streptococcus pneumoniae*.[3] In an upper respiratory infection (URI), the inflammation of the nasal mucous membrane can block the opening of a paranasal sinus, leading to the absorption of oxygen from the sinus into the blood vessels of the mucous membrane. This creates a relative negative pressure within the sinus, known as vacuum sinusitis, which can be painful. Hypoxia-inducible factor (HIF)-1α is crucial in mediating the inflammatory

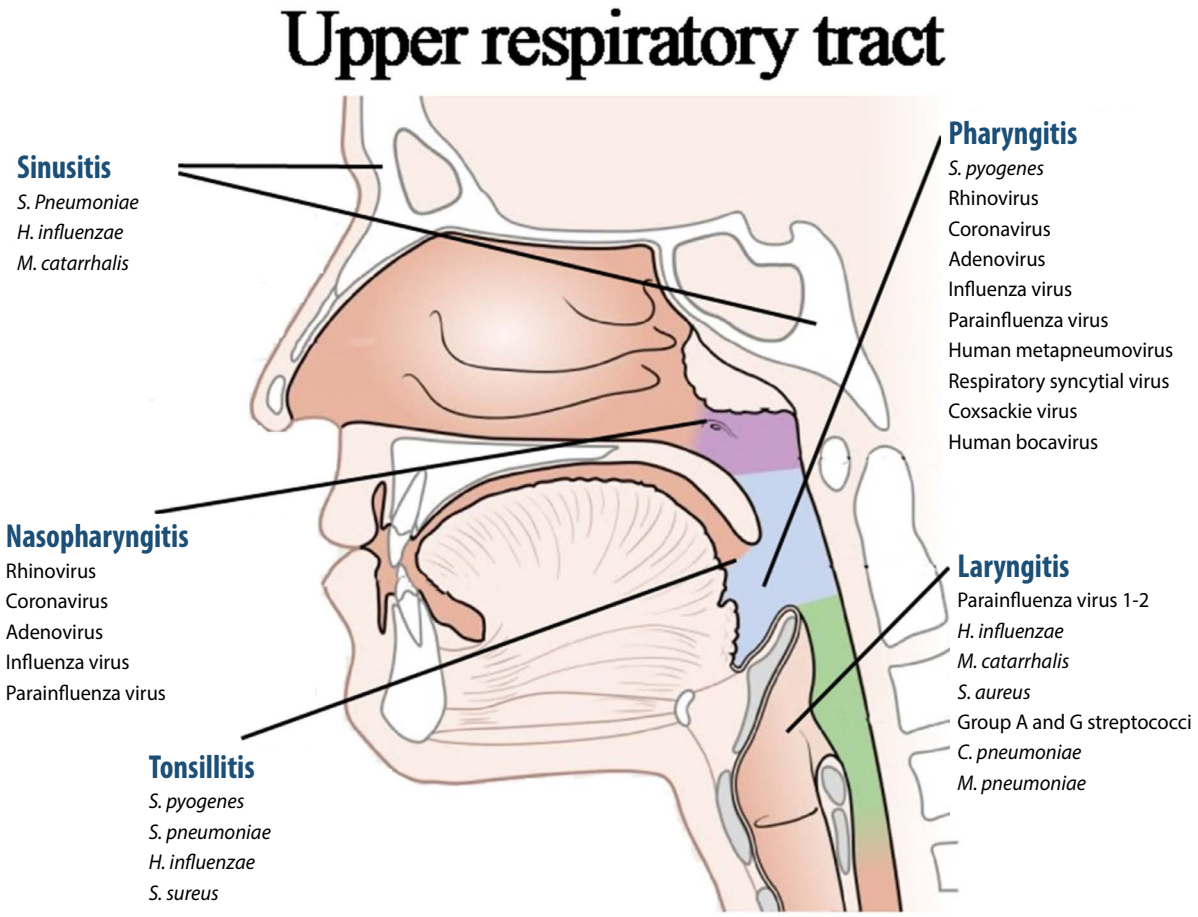

Figure 1: Pathogens that cause upper RTIs [8]

response and the overproduction of mucus.[9] Microorganisms enter the respiratory tract through inhaled droplets, leading to mucosal invasion, which may result in epithelial damage, characterised by redness, oedema, haemorrhage, and occasionally exudate.[10] The clinical symptoms of upper respiratory tract infections (URTIs) primarily result from the host's inflammatory response rather than direct viral damage.[11] Infected epithelial cells release proinflammatory cytokines, such as IL-8, along with chemokines and bradykinin, which attract neutrophils and monocytes to the infection site.[11]

Clinical features/symptoms of upper respiratory infections

Whilst different types of URI can cause different symptoms, some common symptoms include:[12]

- coughing
- discomfort in the nasal passages
- mild fever
- excess mucus
- nasal congestion
- pain or pressure within the face
- a runny nose
- a scratchy or sore throat
- sneezing

Other symptoms can include

- bad breath
- body aches
- headache
- hyposmia, or a loss of the sense of smell
- itchy eyes, with or without exudate

Diagnosis

Timely and precise diagnosis of an RTI is essential for effective patient management, including the administration of appropriate antiviral or antibacterial medication.[13] The diagnosis of RTIs begins with an examination of symptoms and signs to identify the key clinical presentations. Identification of symptoms can guide clinicians and other healthcare workers to distinguish between viral and bacterial infections, and to treat them symptomatically when necessary. For more severe respiratory tract infections, developing an appropriate diagnostic workflow, starting with the selection of the correct respiratory specimen, is important.[13]

Management

Most URTIs are viral and self-limiting; therefore, treatment primarily aims at symptom relief through analgesics, decongestants, and hydration rather than an anti-infective agent. Over-the-counter and herbal remedies, including menthol, eucalyptus, and herbal

teas, are frequently utilised and are generally regarded as safe and effective for mild cases.[11,14,15] Antiviral agents like oseltamivir may be beneficial in confirmed viral influenza cases for specific identified causative agents like swine origin or avian flu caused by H1N1 virus. Antibiotics are not advised for viral upper respiratory tract infections, such as the common cold, influenza, and laryngitis. They may be warranted for confirmed bacterial infections, including group A streptococcal pharyngitis, acute otitis media, and certain cases of rhinosinusitis. Careful prescribing is crucial to address antibiotic resistance.[16,17]

Systematic reviews and patient surveys indicate that honey is an effective, safe, and cost-effective treatment for symptomatic relief, particularly for cough.[14,18] Foods like elderberry, kiwi, and probiotics may decrease the incidence or duration of upper respiratory tract infections in specific populations, although the evidence is limited and varied.[19]

Lower respiratory tract infections

Pathophysiology

Lower respiratory tract infections (LRTIs) involve the trachea, bronchi, bronchioles, and alveoli, with pneumonia being the most common form of LRTIs.[20,21,22] Figure 2 shows parts of the lower respiratory tract with possible pathogens that cause infections in these parts. The infection begins when pathogens such as viruses or bacteria bypass the upper respiratory tract defenses and enter the lower airways, leading to inflammation of the bronchi or alveoli.[22] The host immune response triggers the release of proinflammatory cytokines (IL-1, IL-6, TNF-α), which attract neutrophils and macrophages to the infection site.[23] This process causes alveolar oedema, capillary leakage, and the accumulation of exudate, impairing gas exchange and resulting in hypoxia.[23] The degree of inflammation and tissue injury determines disease severity, ranging from mild bronchitis to severe pneumonia or acute respiratory distress syndrome (ARDS).[23]

Clinical features/symptoms

Common symptoms of LRTIs include cough as the main symptom, and at least one of the following respiratory symptoms; dyspnoea, chest pain, and production of purulent sputum.[24] Systemic manifestations such as fever, chills, fatigue, and malaise are often present due to the inflammatory response.[23] Children presenting with rapid respiration of cyanosis (blue lips) should seek urgent medical care.

Diagnosis

Diagnosis of LRTIs involves a combination of clinical evaluation, imaging, and laboratory testing such as sputum analysis to rule out or identify bacterial infections, or other microbiological results. Chest radiography may be used for detecting consolidation or infiltrates indicative of pneumonia.[25] Laboratory investigations include complete blood counts (to detect leukocytosis), C-reactive

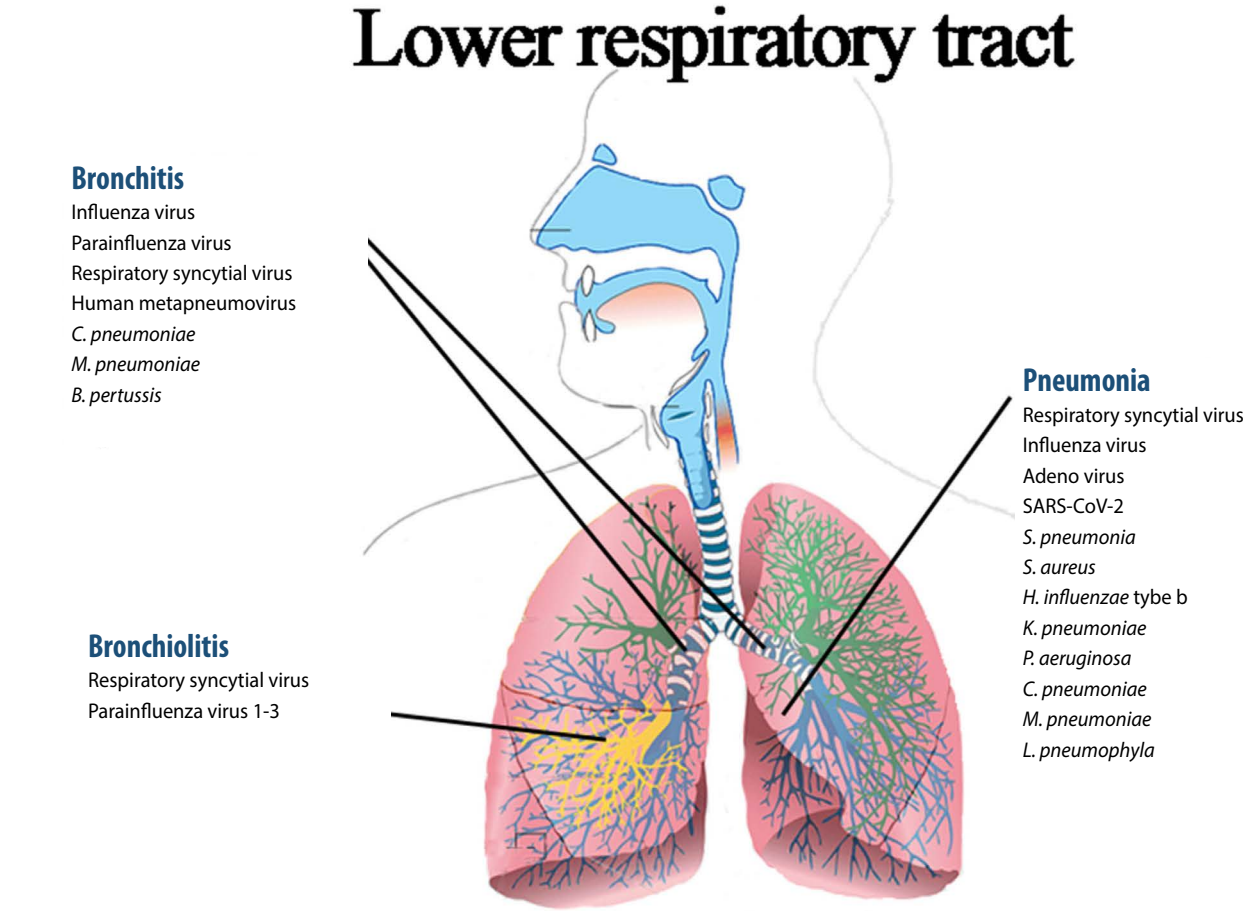

Figure 2: The lower respiratory tract and pathogens that cause infections[8]

Table I: Available vaccines for RTIs in South Africa[28,29,30]

Vaccines	Age for administration	Prevention against which RTIs
Hexavalent (DTap-IPV-HepB-Hib)	6 weeks; 10 weeks; 14 weeks; 18 months	Diphtheria, pertussis and other RTIs caused by *Haemophilus influenzae* type b
Pneumococcal conjugate	6 weeks; 14 weeks; 9 months	RTIs caused by *Streptococcus pneumoniae*
Tetanus, diphtheria, acellular Pertussis (Tdap)	6 years; 12 years	Diphtheria and Pertussis
Influenza	Annually	Flu (influenza virus)

protein (CRP), and procalcitonin (PCT) levels to differentiate bacterial from viral infections.[26] Microbiological confirmation through sputum culture, Gram-staining, and polymerase chain reaction (PCR) assays helps identify causative organisms that may include methicillin sensitive *Staphylococcus aureus* (MSSA) and methicillin resistant *Staphylococcus aureus* (MRSA) on bronchoalveolar lavage (BAL) specimens in patients with suspected ventilator-associated pneumonia.[25]

Management

Management of LRTIs depends on the underlying cause, severity, and comorbidities. Viral LRTIs, including influenza, respiratory syncytial virus (RSV), and seasonal viral pneumonias, require supportive care such as rest, hydration, antipyretics, and antiviral therapy may be considered for confirmed influenza, with the greatest benefit observed when treatment is initiated early.[27] Bacterial LRTIs, particularly community-acquired pneumonia, require empiric antibiotic therapy guided by local antimicrobial guidelines, with amoxicillin, macrolides, and tetracyclines commonly used in outpatient settings.[20] Severe cases may require hospitalisation for intravenous antibiotics, oxygen therapy, and monitoring for complications such as sepsis or respiratory failure.

Prevention of respiratory tract infections

Several vaccines are available in South Africa for the prevention of RTIs. These include Hexavalent (DTap-IPV-HepB-Hib), Rotavirus, Pneumococcal conjugate (PCV), Tetanus diphtheria, acellular Pertussis (Tdap) and influenza vaccines.[28,29] Table I shows the available vaccines, age for administration and RTIs they offer prevention against.

The role of the pharmacist in RTI

Pharmacists are integral to managing RTIs through early assessment, patient triage, antimicrobial stewardship, and vaccination promotion. As accessible frontline health professionals, they assess symptoms, identify critical warning signs, and facilitate appropriate referrals, thereby ensuring safe and timely patient care.[31] Their role in antimicrobial stewardship is well-established, with evidence from South Africa and other regions indicating that pharmacist-led interventions enhance the appropriateness of antibiotic prescribing, dosing, and duration—key factors in preventing resistance in RTIs.[31,32] Additionally, pharmacists counsel patients on proper antibiotic use, adherence, drug interactions, and adverse effects, thereby improving treatment outcomes. They significantly contribute to RTI prevention by advocating for influenza and pneumococcal vaccinations; systematic reviews indicate that pharmacist-led initiatives markedly increase immunisation rates.[33,34] In African health systems, where infectious disease burdens are substantial, pharmacists enhance public health education and require robust leadership training to optimise antimicrobial stewardship across the continent.[35] Collectively, these contributions affirm the essential role of pharmacists in reducing inappropriate antibiotic use, improving vaccine uptake, and enhancing the overall management of respiratory tract infections.

Conclusion

Respiratory tract infections still represent a significant global health concern and are responsible for high morbidity and mortality. The correct early diagnosis and appropriate treatment may improve patient outcomes. However, the inappropriate use of antibiotics in primary viral infections in respiratory tract infections, can increase antimicrobial resistance. Pharmacists as front-line healthcare workers are central to the correct identification and management of respiratory tract infections. Furthermore, through vaccine promotion, pharmacists may play a role in the prevention of common respiratory tract infections.

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