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Review Article

Types of upper and lower respiratory tract infection in pediatrics

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ABSTRACT

The most prevalent diseases in infants and children, are respiratory infections including the common cold, acute rhinosinusitis, acute otitis media, flu-like illness, acute bronchitis, and pneumonia. Despite being mostly innocuous, they have a large negative impact on society and are a leading source of morbidity and mortality globally. They are further divided into two classes upper respiratory tract and lower respiratory tract infections. The purpose of this research is to review the available information about types of upper and lower respiratory tract infection in paediatrics. The common upper respiratory tract infections include acute pharyngitis which is usually self- limiting and benign and is mostly caused by viruses while inflammation of the mucosa of the paranasal sinuses and nasal cavity is a sign of acute rhinosinusitis. Common colds frequently come with uncomplicated rhinosinusitis, which does not have any clinically visible spread of the inflammation outside the paranasal sinuses and nasal cavity. A viral or bacterial infection of the middle ear causes acute otitis media. Bronchitis, bronchiolitis and pneumonia are lower respiratory infections common among children. More than one-third of children develop bronchiolitis in the first two years of life, which is the most common reason for hospitalization in the first year of life. The hospitalization rate for children has increased from 1% to 3% over the past 30 years while pneumonia is a significant contributor of morbidity and mortality among under 5 years children. Early diagnosis and prompt management can lead to better health outcomes among children.

Keywords: Respiratory, Infection, Children, Upper, Lower

INTRODUCTION

By 2030, the sustainable development goals aim to eradicate fatalities from diseases that may be prevented in newborns and young children. However, it is predicted that 5.5 million children in this age group passed away in 2017 from diseases that may have been prevented. The high frequency of acute respiratory infections (ARI), which are one of the primary causes of morbidity and mortality in children, is one of the obstacles to achieving this objective, which was approved by all United Nations member states. Southeast Asia and Africa have the highest rates of severe ARI.[1] ARI is characterized by coughing and short, fast breathing, which may be associated with death, particularly when there are other co-morbidities. Nearly half of the projected 5.4 million children under the age of five who died in 2017 were in sub-Saharan Africa, with ARIs being the leading cause of mortality in that region. The mortality rate from ARI varies greatly by region. More than 12 million children

with severe ARI were admitted to hospitals each year, according to the data from global burden of disease in 2010. Up to 50% of children's visits to hospitals around the world are due to ARI. Over 2400 children under the age of five per day pass away from pneumonia.[2]

ARI is described as an infection of the respiratory tract that causes obstruction of the air passage at the nasal and/or bronchial system. ARI symptoms can range from mild, like a cold, to more severe ones, like pneumonia or lung collapse. Because ARI directly impacts tissue oxygenation, which results in problems in children and negative implications like higher morbidity and death, ARI frequently qualifies as a medical emergency. ARI frequently necessitates intense treatment, ongoing evaluation, as well as swift and decisive interventions.[3] Children under the age of 12 frequently suffer from respiratory infections, which is the most frequent paediatric presentation treated by primary care physicians. The majority of these infections are self-limiting illnesses, even though they frequently last longer than physicians and parents had anticipated and infrequently progress to the point where hospitalization is necessary. Despite this, they can significantly increase parents' worry.[4] A proper understanding of the many entities that create these emergencies enables the physician to identify and treat the patient as soon as possible since many of such conditions have the potential to produce life-threatening situations. It is essential to pay immediate attention to the airway and be able to identify and treat these disorders.[5]

Upper respiratory tract infections (URTI) and lower respiratory tract infections (LRTI) are two sub-classes of ARIs. The airways in the upper respiratory system, which also include the middle ear and paranasal sinuses, extend from the nostrils to the voice cords in the larynx. The continuation of the airways from the trachea and bronchi to the bronchioles and alveoli is referred to as the lower respiratory tract.[6] The common cold, laryngitis, pharyngitis, acute rhinitis, acute rhinosinusitis, and acute otitis media are examples of URTIs. Infections of the lower respiratory tract include pneumonia, tracheitis, bronchiolitis, and acute bronchitis.[7] The purpose of this research is to review the available information about types of upper and lower respiratory tract infection in paediatrics.

LITERATURE SEARCH

This study is based on a comprehensive literature search conducted on September 14, 2022, in the Medline and Cochrane databases, utilizing the medical topic headings (MeSH) and a combination of all available related terms, according to the database. To prevent missing any possible research, a manual search for publications was conducted through Google Scholar, using the reference lists of the previously listed papers as a starting point. We looked for valuable information in papers that discussed the information about types of upper and lower respiratory tract infection in paediatrics. There were no restrictions on date, language, participant age, or type of publication.

DISCUSSION

Globally, ARIs, notably pneumonia, which accounts for 18% of all under-five deaths in particular, are to be blamed for one-fifth of mortality in children under the age of five. Approximately 70% of under-five childhood morbidities in underdeveloped nations are attributable to ARIs, which continue to be the leading cause of morbidity among children. In underdeveloped nations, ARIs account for up to 30% of paediatric admissions and 30% to 50% of all paediatric outpatient visits, accounting for approximately 3.5% of the global disease burden. Worldwide, there are projected to be 150 million cases of paediatric pneumonia each year, with 1.3 million deaths; 90% of these deaths take place in underdeveloped nations. Despite a nearly half-decrease in under-five mortality worldwide from 1990 to 2012, pneumonia continues to be the leading cause of under-five mortality, surpassing other infectious diseases and post-neonatal conditions.[8]

Infections of the upper respiratory tract

The most typical diseases that affect children are URTIs, including otitis media. Each year, children suffer from six to eight upper URTIs on average. Although these infections are mostly minor and self-limiting, they can sporadically result in complications that are potentially fatal. Rhinosinusitis, pharyngitis, and otitis media are the three main types of infections that make up the majority of URTIs. There are a variety of related illnesses that may have overlapped or comparable clinical manifestations within each category of sickness. These respiratory mucosal infections are typically caused by viruses, but they can also be caused by bacteria, and many infections involve both viruses and bacteria. Both viral and bacterial illnesses are likely to go away on their own and the most frequent cause of persistent illness is a bacterial infection.[9]

Rhinitis and rhinosinusitis

In any case, the symptoms of rhinitis, such as rhinorrhoea, nasal congestion, sneezing, or itching, are general and non-specific and do not aid in determining the underlying causes. Any comorbidity could make the diagnosis easier: While gastric reflux, hormonal dysfunction, or a history of exposure to irritants or particular medicines may justify non-allergic non-infectious rhinitis, asthma, eczema, pollen-food syndrome, sleep difficulties, and hearing impairment are frequently associated with allergic rhinitis.[10] Regardless of the source, nasal mucosal inflammation may spread to the paranasal sinuses' neighbouring mucosa, resulting in sinusitis. Since rhinitis symptoms usually precede sinusitis, the term rhinosinusitis is currently considered to

be more relevant.[11] Rhinosinusitis is categorized as acute lasting up to one month, subacute lasting between one and three months, chronic lasting longer than three months, or recurring at least four episodes of acute rhinosinusitis per year with asymptomatic intervals of at least 10 days. According to estimates, 5%-13% of viral URTI in children may develop into acute rhinosinusitis, which is typically worsened by bacterial infections. *Streptococcus pneumonia*, *Haemophilus influenza*, and *Moraxella catarrhalis* are the most often involved microorganisms.[12]

The clinical picture of acute bacterial rhinosinusitis is heterogeneous, and the diagnosis can be made if the child exhibits mild URTI symptoms including cough, nasal discharge, or both for longer than 10 days or gets better quickly but relapses with fever, a worsening of the cough, or a new episode of purulent rhinorrhoea and fever. Additionally indicated is blatantly purulent nasal discharge that lasts for more than three days in a row and is accompanied by headache and/or face pain. For acute, uncomplicated rhinosinusitis, guidelines indicate 10-14 days of oral amoxicillin, with or without clavulanate, and clinicians sometimes prescribe longer antibiotic courses for chronic rhinosinusitis.[13] Prompt treatment of acute cases might prevent cases from becoming resistant to polymicrobial infections and becoming chronic. Chronic rhinosinusitis management is an expensive, protracted process with a high risk of complications. Therefore, preventing and treating rhinosinusitis will help to lower morbidity and financial burden of healthcare.[14]

Pharyngitis

One of the most frequent diseases for which children consult their primary care physicians is acute pharyngitis. Mostly the acute pharyngitis cases in children are self-limiting and benign and are mainly caused by viruses. The most significant bacterial cause of acute pharyngitis is group A beta-haemolytic *Streptococcus*. Differentiating between children with viral pharyngitis, who would not benefit from antimicrobial therapy, and children with group A beta-haemolytic streptococcal pharyngitis, for whom antimicrobial therapy would be beneficial, is the aim of strategies for the diagnosis and treatment of acute pharyngitis. Recognizing this distinction is essential for reduction of the use of unneeded antimicrobials in children.[15] Penicillin or amoxicillin are the recommended antibiotics when treatment is provided because they are narrow-spectrum antibiotics and clinical failure due to resistance has not yet been proven. Given that shorter courses seem to have a lower likelihood of clearing group A *Streptococcus* carriage, a 10-day oral course is advised. Evidence for clearing carriage for prevention of rheumatic fever, however, is inadequate and indirect.[16]

Laryngitis

Epiglottitis and sub glottis laryngitis must be separated from one another. There is no comparison between these two illnesses: Even though acute respiratory distress might happen, laryngitis is primarily viral and typically moderate.[17] The parainfluenza viruses are the most common laryngitis-causing agents. Laryngitis in children is diagnosed clinically, with typical symptoms including a dry, frequently barking cough, difficulty inhaling, and wheezing. The age of onset typically ranges from 0.5 to 3 years. It is indeed important to pay attention to structural and functional defects in infants under a year old that could be the source of laryngitis-like symptoms brought on by an infection. Most patients are able to receive care at home. Racemic adrenaline inhalation and oral glucocorticoids are both useful medications in emergency situations.[18]

Otitis media

Otitis media is middle ear effusion and the sudden start of one or more signs or symptoms of middle ear inflammation, such as fever, otalgia, or otorrhoea. Otitis media that is not complicated only affects the middle ear. *Streptococcus pneumoniae*, non-typeable *Haemophilus influenzae*, and *Moraxella catarrhalis* are the three most frequent bacterial causes of otitis media. Since the advent of pneumococcal conjugate vaccinations, there is growing evidence that the primary pathogen responsible is shifting from the typeable *Streptococcus pneumoniae* to the non-typeable *Haemophilus influenzae*. Approximately 60% of children get symptom improvement in 24 hours without antibiotic treatment, and 80% experience spontaneous symptom resolution in 3 days. Meningitis, acute mastoiditis, and, very infrequently, intracranial problems are serious side effects of otitis media. About 1 to 2 children out of every 10,000 will get acute mastoiditis if antibiotics are not used.[19] With 80% of children experiencing an episode before the age of three, acute otitis media continues to be a significant public health issue worldwide. It is the most common cause of antibiotic prescription in children and may present with vague symptoms, recurrent recurrences, and multiple visits to the physician.[20]

Epiglottitis

The most frequent cause of epiglottitis is bacterial infection, which causes swelling and inflammation of the supraglottic tissues nearby as well as the epiglottis itself. Prior to the introduction of the *Haemophilus influenzae* B vaccine, children between the ages of 2 and 6 were the main target population for acute infections; however, cases in adults are now becoming more common. Epiglottitis typically manifests clinically as fever and sore throat.[21] At any age, acute epiglottitis can emerge. To prevent potentially fatal complications, this critical disease must be diagnosed early and treated carefully and promptly.[22] In the post-vaccine era, epiglottitis is a rare, complicated, and time-consuming condition to treat. The peculiar features of this disease have an impact on how future surgeons are taught to properly manage this potentially fatal condition.[23]

Infections of the lower respiratory tract

Each year, LRTIs in children under the age of five cause more than 700 000 deaths.[24] Children's morbidity and mortality from LRTI continue to be key causes of concern. LRTI is brought on by a variety of species, including bacteria, fungi, viruses, and parasites. It also happens that infections are brought on by two or more different organisms, which can sometimes make the infection worse. Medical imaging not only aids in the confirmation of a diagnosis but also in the assessment of acute and chronic complications. Paediatric patients who have persistent or recurrent symptoms as well as immunocompromised patients can benefit from medical imaging examinations that assess underlying disease.[25] Different types of LRTIs are briefly discussed below.

Pneumonia

Pneumonia is the most common cause of morbidity and mortality in children under 5 years old worldwide. Despite the fact that developing countries account for the bulk of paediatric pneumonia-related mortality, developed countries bear a sizable share of the disease's burden and its associated expenses for healthcare.[26,27] The most frequent cause of community-acquired pneumonia in children under the age of five is typically a virus, particularly the respiratory syncytial virus. The most typical bacterial cause across all age groups is streptococcus pneumoniae. In children under the age of five, *Haemophilus influenzae, Streptococcus pyogenes, Staphylococcus aureus, and Moraxella* catarrhalis are additional significant bacterial causes. In addition to *S. pneumoniae, Mycoplasma pneumoniae* and *Chlamydophila pneumonia* are significant causes of pneumonia in children aged 5 and older. Clinically, bacterial and viral pneumonia typically cannot be reliably separated from one another. In actuality, the majority of children with pneumonia are empirically treated with antibiotics; the choice of drugs is determined by the patient's age and the most likely infection. Clindamycin, azithromycin, clarithromycin, and levofloxacin are suitable substitutes for children who have type 1 hypersensitivity to penicillin. Cephalosporins should be taken into consideration for children who have a non-type 1 hypersensitivity to penicillin. Macrolides like azithromycin and clarithromycin are the preferred medications for previously healthy children above the age of five.[28]

Bronchitis and bronchiolitis

More than one-third of children get bronchiolitis in their first two years of life, making it the most frequent reason for hospital admission in their first year. Hospitalization rates for babies have climbed from 1% to 3% during the past 30 years.[29] Infants and young children are highly susceptible to acute viral bronchiolitis and wheezy bronchitis. They are brought on by viruses, mainly the rhinoviruses and respiratory syncytial virus. Premature delivery, exposure to tobacco smoke, and immune system disorders are risk factors for serious illness. Chest X-rays and laboratory tests are not typically required in order to make a diagnosis; patient history and a physical examination suffice. Numerous treatments for acute bronchiolitis have been proposed, but mainly supportive measures, such minimum handling, ensuring adequate oxygenation, and hydration, are typically advised. It is not usually advised to take antibiotics, bronchodilators, corticosteroids, or leukotriene receptor antagonists. The initial line of defence against wheezy bronchitis is short-acting beta-2 agonists. Children with wheezy bronchitis that is frequently recurrent and/or severe may try inhalational corticosteroids to treat their symptoms. However, no pharmacological treatment can stop bronchial asthma from developing.[30] Further research can be beneficial in increasing awareness of risk factors of URTIs and LRTIS among the community also aid in development of more recent and innovative management strategies and can also significantly contribute to literature since studies available are limited to past time.

CONCLUSION

ARI are common among children and assessment and evaluation of children and risk factors is essential as an early diagnosis and prompt treatment will guarantee generally better outcomes. Awareness and implementation of prevention strategies from ARI among parents is needed to reduce the burden of the disease.

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