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Antibiotic choice for respiratory infection in pediatric

Mohammad Ghaderi

Intern, Department of Pharmacy Practice, J.K.K.Nattaraja College of Pharmacy, Tamil Nadu, India

Venkateswaramurthy N

Professor, Head of Pharmacy Practice Department, J.K.K.Nattaraja College of Pharmacy, Tamil Nadu, India

Abstract---Respiratory infection (RTI) is one of the leading factors of death in children in India. In most countries, RTI is a common cause of hospitalisation in children under five years old. There are different guidelines for management of various type of RTI. Most of these, emphasis on use of antibiotics in specific sub type of RTI. While literatures recommend avoiding antibiotic in viral infections, they mostly suggest beta lactams as first line drugs. Depends on patients, amoxicillin remains drug of choice for most of out-patients. In case of hypersensitivity to penicillin, cephalosporin commonly will be substituent. If specific and atypical organism found, need to switch to other type such as macrolides. In this research, we aimed to briefly review current guidelines and literatures regarding antibiotic selection in paediatrics suffering from different type of respiratory tract infection.

Keywords---antibiotic, respiratory tract infection, pediatric, hypersensitivity reaction.

Introduction

Respiratory infection (RTI) is one of the leading factors of death in children in India [1]. In most countries, RTI is a common cause of hospitalisation in children under five years old [2]. RTI may result to complications like pleural effusions, empyema or necrotizing pneumonia[3]. This disease is mild, self-limiting, and about 90% do not need therapy[4] but it can lead to economic burden. It is estimated that only upper respiratory infection costs about \$22 billion per annum in healthcare systems worldwide [5]. According to a study conducted in India, respiratory infection prevalence was higher in the first year of life and least at the

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age group 13 to 24 years [6]. The current article reviews recent research and clinical trials about antibiotic choice in respiratory tract infections in children.

Respiratory Tract Infection

Respiratory tract infection is a condition in which the respiratory system gets infected and can be classified as Upper respiratory or lower respiratory infection. The upper part of the respiratory system may be infected by the common cold, sinusitis, pharyngitis, epiglottitis and laryngotracheitis. In the lower part of the respiratory system, the infection is infected by bronchitis, bronchiolitis and pneumonia [7]. In both types, the causative organism enters to respiratory system by inhalation of droplets. Organisms are commonly viral or bacterial. However, viral respiratory infection is more abundant [7]. The common upper respiratory tract is mild, and infections often cause rhinorrhea or pharyngitis. Infections, especially pneumonia, will be more severe in the lower part. It causes fever, difficulty in breathing or chest pain. Cough can be present in either type [8].

Management of Respiratory Tract Infection

There are different guidelines for the management of this condition. Centre of Disease Control and Prevention (CDC) emphasises prescribing antibiotics only in case of bacterial infection [9], while the viral type is self-limited. CDC suggests antibiotics according to the type of respiratory infection and tolerability in paediatrics. In acute sinusitis, amoxicillin or amoxicillin and clavulanate remain the first line of therapy [10]. Amoxicillin and penicillin V are recommended for treating pharyngitis. In case of hypersensitivity, cephalexin, cefadroxil, clindamycin, clarithromycin, or azithromycin is recommended [11]. In common cold [12] and bronchiolitis [13], antibiotics should be avoided. For sinusitis in children, various guidelines were published by Blomgren [14], Esposito [15], Chow [16], Wald [17], and Shulman [18]. These guidelines recommend amoxicillin as the first-line therapy.

The infectious disease society of America (IDSA) suggests Amoxicillin-clavulanate (45 mg/kg/day) as the first choice of antibiotic for Acute Bacterial Rhino sinusitis in Children. IDSA recommends levofloxacin or clindamycin as alternatives in case of allergy to beta-lactam[19]. Community-acquired pneumonia (CAP) is another pathologic condition which leads to respiratory dysfunction and infection. In this condition, amoxicillin remains the antibiotic of choice [20]. A study recommends 3 to 5 days amoxicillin therapy for the non severe condition [21]. Ceftobiprole, as a new generation intravenous cephalosporin, was also approved for paediatric in CAP and hospitalized pneumonia and found safe [22].

The infectious Diseases Society of America (IDSA) has developed a guideline for community-acquired pneumonia in children. This institute regarding outpatients strongly recommends avoiding antibiotics for preschool children because this condition mostly happens with viral infections. Amoxicillin should be kept as the first choice in preschool-aged and school-aged patients whose source of infection is bacteria. IDSA also recommends that macrolide to be considered first-line if causative bacteria are atypical. Influenza antiviral therapy needs to be started for severe CAP with influenza. IDSA also recommends for inpatients preschool aged who immunized suggests ampicillin or penicillin G and ceftriaxone or cefotaxime for not immunized patients. Vancomycin or clindamycin also strongly recommended in combination with beta lactams for paediatric patients who causative organism found to be S.aureus [23].

World Health Organization evidence summaries provide five recommendations for treating pneumonia in children. WHO recommends amoxicillin for pneumonia with and without chest indrawing. In the severe type of pneumonia, parenteral ampicillin and gentamicin will be given. In case of failure of first line drugs, ceftriaxone will be given as alternative antibiotic [24]. If a virus causes respiratory infection, antibiotic therapy won't be effective. A randomized control trial showed Ergoferon could be prescribed to treat this viral condition [25].

Amoxicillin Regimen

The studies [26] conducted in UK and Ireland shows that a high dose of amoxicillin does not benefit over a low dose. No difference was observed between 3 and 7 days of therapy in managing community-acquired pneumonia [26]. Micromedex database suggests for ages more than three months, 45 mg/kg daily divided twice a day or thrice a day for weight up to 40 kg and 875 mg PO BD. It also recommends 90 mg/kg daily for community-acquired pneumonia [27]. IDSA recommends amoxicillin and clavulanic acid as 45 mg/kg/day for acute rhino-sinusitis in paediatric [19].

Amoxicillin Adverse Effect

Based on a randomized controlled trial (RCT), diarrhoea, skin rash, and oral thrush are, respectively most common adverse effects induced by amoxicillin in children. Respiratory illness and vomiting were serious adverse effect which led to hospitalization in less than 5% of participants [17].

Alternative Therapy

Amoxicillin belongs to broad spectrum penicillin, which is widely used for different bacterial infections. Penicillin, a member of beta-lactam antibiotics, is considered one of the safest antibiotics; however, 1 to 5 per 10.000 cases may induce a hypersensitivity reaction that may be life-threatening [28]. In the US, up to 10 % of people and about 5 million children have an allergy to penicillin [29]. CDC suggests, in case of non-type one hyper-sensitivity to penicillin, antibiotic therapy must switch to cephalexin, cefadroxil, clindamycin, clarithromycin or azithromycin [9]. IDSA recommends oral amoxicillin and clavulanic acid as alternative of amoxicillin in outpatient with less than 5 year old age and clarithromycin as a substituent for azithromycin for same group of children [22].

Conclusion

Respiratory tract infection in two different subtypes, upper and lower part infection, is one of the leading causes of hospitalization and mortality in children worldwide. It may cause by virus or bacteria. While the viral type is more common, the bacterial type is more severe. The viral type is self-limited. However,

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bacterial one needs antibiotic therapy. Amoxicillin is drug of choice in all sub types caused by bacteria. Main adverse effect can be listed as diarrhoea, rash and respiratory illness. There is no benefit for long term, high dose amoxicillin therapy on low dose short term regimen. Different guidelines suggest the optimal dose of amoxicillin, around 40 mg/kg/day for children. An alternative therapy should be followed in case of failure of amoxicillin or hypersensitivity reaction.

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