International Journal of Healthcare Sciences ISSN 2348-5728 (Online)
Vol. 5, Issue 1, pp: (271-278), Month: April - September 2017, Available at: www.researchpublish.com

Community Acquired Pneumonia in Pediatric and Review of Different Antibiotics Treatment Options

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Abstract: **This review was aimed to summarizes etiological factors, diagnosis of Community-acquired pneumonia (CAP) also to emphasize the evidence on different antibiotic treatment of community acquired pneumonia in children. For this Review we searched MEDLINE, EMBASE, CINAHL. To search CENTRAL and MEDLINE we combined the following search strategy with the mesh terms for identifying child studies about Community-acquired pneumonia (CAP) "Pneumonia" "bronchopneumon" "Anti-Bacterial Agents" "Antibiotics" AND "Treatment of pneumonia in children". Only English language articles were searched with human subject content. Furthermore, references list of each articles were reviewed for more related articles to our concerned topic. Community-acquired pneumonia (CAP) in children is a leading source of childhood morbidity and also death primarily in the creating world. Its etiology can be viral, bacterial, or blended infection. The etiological agents are different in different age groups and throughout the numerous seasons of the year. Upper body X-rays and also inflammatory laboratory examinations have reduced analysis sensitivity and also specificity. The selection and also dosage of prescription antibiotics need to be based on the age of the patient, extent of the pneumonia and also expertise of local antimicrobial resistance patterns. For the therapy of WHO-defined non-severe community-acquired pneumonia (CAP) in children below 5 years of age amoxycillin is an option too. There are no noticeable distinctions in between azithromycin and also erythromycin, azithromycin as well as coamoxyclavulanic acid, or cefpodoxime as well as co-amoxyclavulanic acid. There are restricted data on other prescription antibiotics: co-amoxyclavulanic acid and cefpodoxime could be alternate second-line drugs. Both therapy plans-oxacillin/ceftriaxone and also amoxicillin/clavulanic acid-are effective in dealing with very severe CAP in 2-month- to 5-year-old hospitalized children.**

Keywords: **community-acquired pneumonia (CAP), pediatric, WHO.**

1. INTRODUCTION

Community-acquired pneumonia (CAP) is a typical reason for morbidity among children in established nations as well as make up an occurrence of 10-- 40 situations each 1000 children in the very first 5 years of life [(1,2,3)]. The definition of CAP is complicated and differs extensively in different guidelines [(4,5)], some guidelines are based on professional judgment only, whereas others also take radiographic searching for or research laboratory data into account [(4,5)].

Etiological research studies of CAP in children are made complex by the reduced return blood cultures, inadequate sputum specimens, and occasional workup with lung goal and also Broncho alveolar lavage. Quantification of etiology is further complicated by restricted microbiological workup in the neighborhood, seasonality, blended infection, as well as viruses and also commensal germs in examples [(6)].

S. pneumoniae is the leading cause worldwide of community-acquired pneumonia, Pneumococci are typically found in asymptomatic nasopharyngeal carriage, where the occurrence varies by age and also area. The asymptomatic carriage state is accountable for much of the transmission within populaces, such as day-care centers [(6)].

The diagnosis of pneumonia is based mainly on an algorithm improved patient's history, scientific signs and symptoms, lab tests as well as chest radiograph findings. Situation interpretations for pneumonia could differ by geographic region and even between numerous health centers as a result of lack of standardized diagnosis requirements [7,8]. Laboratory examinations measuring the systemic inflammatory response connected with pneumonia are being made use of consistently in professional method but their sensitivity and also uniqueness are fairly low. In addition, various other analysis strategies such as dimension of microbial antigens, antibodies, or immune complexes in blood or pee or microbial DNA were developed however their analysis value is suspicious [9,10]. Monitoring of CAP in children entails a variety of healing decisions consisting of the major one whether to deal with or not with antibiotics and also just what is the option of the appropriate antibiotic medication and its route of management [11,12].

This review was aimed to summarizes etiological factors, diagnosis of Community-acquired pneumonia (CAP) also to emphasize the evidence on different antibiotic treatment of community acquired pneumonia in children.

2. METHODOLOGY

For this Review we searched MEDLINE, EMBASE, CINAHL. To search CENTRAL and MEDLINE we combined the following search strategy with the mesh terms for identifying child studies about Community-acquired pneumonia (CAP) "Pneumonia" "bronchopneumon" "Anti-Bacterial Agents" "Antibiotics" AND "Treatment of pneumonia in children". Only English language articles were searched with human subject content. Furthermore, references list of each articles were reviewed for more related articles to our concerned topic.

3. RESULTS

- **Etiology of CAP and complications:**

Establishing the cause of a private situation could be difficult [13]. Blood cultures are not consistently carried out as well as have little worth in areas where antibiotic use prior to looking for treatment prevails. The lung itself is hardly ever sampled directly, and also spit representing lower-airway secretions could rarely be acquired from children. Nasopharyngeal washes are a helpful device for the detection of breathing viruses usually related to pneumonia. Numerous researches of pediatric pneumonia have emphasized the value of infections with breathing viruses such as breathing syncytial infection (RSV), influenza, parainfluenza, adenovirus or rhinoviruses in children [7]. Mycoplasma pneumoniae was discovered mostly in school-age children and in lower price Chlamydia pneumoniae, 45-60% as well as 10- 17%, respectively [14]. The function of germs as a reason for severe pneumonia was finest recorded in lung-puncture studies, which validated the significance of S. pneumoniae, Staphylococcus aureus and H. influenzae, consisting of nontypable stress, as reasons for extreme pneumonia [15] An analysis of 59 research studies that were released in 6 languages located that microbial etiology can be spotted in > 50% of situations. In these researches S. pneumoniae was seclusion in cases of CAP differed extensively from 3% to 100% of all culture positive [16] In some studies, Streptococcus pyogenes as well as gram-negative enteric microorganisms have actually additionally been isolated [16].

Current methodical reviews of childhood years' pneumonia etiology suggest that in establishing countries, a couple of germs (S. pneumoniae as well as H. influenzae) and infections (Respiratory Syncytial Virus, Influenza infection) are associated with bulk of youth CAP [17,18,19]. A methodical review from India recommended that regarding 15 - 24% of microbial pneumonia in South Asian countries can be credited to S. pneumoniae [20]. Similarly, information from the Invasive Bacterial Infection Surveillance (IBIS) network in India suggests that invasive Pneumococcal disease could be a significant public health problem in the country, contributing to considerable morbidity as well as death [21].

- **Clinical features of CAP in children:**

The signs of pneumonia in neonates are nonspecific and consist of bad feeding, hypotonia, floppiness, sleepiness, apnea, temperature level altitude or depression, and also hypotension [22]. In older children, visibility of respiratory system infection could be identified by tachypnea and also periodically, hypoxia proceeding to apnea and require for ventilatory support. The World Health Organization has specified scientific criteria for making the medical diagnosis of pneumonia [23]. The standards contain presence of a coughing connected with tachypnea. Tachypnea is specified as a breathing price over 40 breaths/min in children one to five years old, over 50 breaths/min in children two to 12 months old, and also over 60 breaths/min in children under two months old. Use of the World Health Organization guidelines is associated with a

level of sensitivity of about 70% to 74% and also a uniqueness of 40% to 70% in properly determining pneumonia confirmed on the upper body x-ray [24,25].

The breast x-ray may have distinct airspace or air passage participation, or a scattered reticulonodular pattern indistinguishable from the picture seen with hyaline membrane layer disease. Patients with C trachomatis pneumonia normally present with an afebrile pneumonia associated with staccato cough, tachypnea, dynamic trouble breathing and also upper body x-ray findings of bilateral lung infiltrates as well as air trapping [26,27]. There is conjunctivitis in half of the cases. Breast evaluation might expose diffuse crackles, yet hissing is not usually a function. Lab evaluation might include an elevated total immunoglobulin M and eosinophilia.

Microbial pediatric CAP, specifically in cases due to S. pneumoniae, provides in its classical form as an acute disease with roughness, fever > 39 ° C, general malaise with effective coughing, dyspnea as well as upper body pain. The most usual symptoms in children are high temperature and cough, which take place in 90% and 70% of all patients, specifically [7,28]. In some cases, S. pneumoniae pneumonia could presents with a atypical and insufficient training course, offered as high fever as well as leukocytosis without respiratory system symptoms [29]. Severe stomach pain, with or without vomiting, might be the only presenting signs and symptom, especially in left reduced wattle pneumonia, because of bigger mesenteric lymphadenopathy [30]. Irritability of the meninges in cases of upper wattle pneumonia could evoke meningeal signs without meningitis [31]. Pleural effusion can be discovered in up to 40% of patients with pneumococcal pneumonia yet in just 10% the liquid amount is considered enough to be aspirated as well as just around 2% have empyema [32]. These patients can present with rubbing rub, abdominal pain, chest pain as well as monotony at percussion. In patients with pleural effusion, high temperature can persist for longer period compared to in patients with pneumonia without pleural effusion, in spite of sufficient treatment [28].

- **Diagnosis of CAP:**

Chest x-ray for initial diagnosis:

Suspicion of diagnosis on medical grounds ought to be followed by upper body x-ray verification because of the lack of contract between clinical pneumonia and also radiologicallyconfirmed pneumonia, and also to stop unneeded antibiotic usage when a most likely medical diagnosis is viral bronchitis [33,34].

Follow-up upper body x-ray is not suggested with the exception of a child that is presenting with recurrent pneumonias. Follow-up movies work to figure out whether there has actually been resolution in between episodes in the last scenario [35].

Computed Tomography (CT):

Atypical pneumonia has a pattern of focal ground-glass opacity in a lobular distribution. Involvement is bilateral and typically scattered [7,10]. There may additionally be proof of pleural effusion. Bronchial wall surface thickening is one more typical CT searching for. Diffuse ground glass nodules in a centrilobular pattern are often present, although they progress to a soft cells thickness as the infection and also inflammation development. In Mycoplasma pneumoniae infection, airspace combination prevails. HRCT is sensitive for nodules, which are seen in ~ 90% of patients [7]. In Legionella pneumophila infection, residual scarring may continue after resolution of the infection [22].

Tachypnea seems to be the most substantial clinical sign. To be determined accurately, the respiratory system price has to be counted over a full minute when the child is quiet [36].15 In febrile children, the absence of tachypnea has a high adverse anticipating value (97.4 %) for pneumonia [36,37]. Conversely, the presence of tachypnea in febrile children has a low favorable predictive worth (20.1%) [36]. Fever alone can increase the respiratory system rate by 10 breaths each minute per level Celsius [37]. In febrile children with tachypnea, findings of breast retractions, groaning, nasal flaring, as well as crepitation boost the likelihood of pneumonia. The World Health Organization makes use of tachypnea in the existence of coughing as the analysis standard of pneumonia in developing nations where upper body radiography is not conveniently offered [38,39] Chest radiography is often made use of to detect CAP. Several studies utilize chest radiography as the favored analysis modality, yet positive findings have not been shown to boost scientific outcomes or considerably change treatment [38]. When the diagnosis is unsure or when the searching for from the history as well as physical exam are irregular, upper body imaging is most helpful. Antigenic examinations are readily available to assist in the detection of respiratory syncytial virus and flu A and B. The Infectious Diseases Society of America suggests that all persons with high temperature and also respiratory symptoms be checked for influenza when it exists in the community [39,40].

- **Antibiotic Therapy for Management of CAP:**

Choices regarding which child needs health center admission need to be made on a case-by-case basis using factors such as hydration status, oxygenation status, toxic appearance, lack of response to oral treatment and also reoccurrence or underlying disease. If the patient has inadequate oral consumption or looseness of the bowels, intravenous hydration and also antibiotics ought to be offered. Children that are hypoxic or in respiratory system distress must receive oxygen as well as might require favorable end-expiratory respiratory tract stress or ventilation. The choice of antibiotics for believed bacterial pneumonia ought to be based on the age group of the child. Empiric treatment for neonates should reflect the suggestions for therapy of neonatal blood poisoning. For children that are between 3 weeks and also three months old with afebrile pneumonia syndrome of infancy, a macrolide such as erythromycin should be provided [41]. Infants with extreme pneumonia who are admitted to the intensive care unit need to additionally receive protection versus Staphylococcus aureus as well as H influenzae [42,43] (**Table 1**).

Table 1: Empiric antimicrobial therapy for paediatric pneumonia, by age group [42,43]

Age group	Outpatients	Patients in hospital	Patients in intensive care unit
1 to 3 months	Afebrile pneumonitis Initial outpatient management not recommended	Erythromycin 40 mg/kg/d in 4 doses or other macrolide for 10 to 14 days	Erythromycin 40 mg/kg/d in 4 doses or other macrolide for 10 to 14 days
	Other Initial outpatient management not recommended	Cefuroxime 150 mg/kg/d in 3 doses for 10 to 14 days	Cefuroxime 150 mg/kg/d in 3 doses or cefotaxime 200 mg/kg/d in 3 doses plus cloxacillin 100–200 mg/kg/d in 4 doses for 10 to 14 days
3 months to 5 years	Amoxicillin 40 mg/kg/d or 80 mg/kg/d to 90 mg/kg/d* in 3 doses or erythromycin 40 mg/kg/d in 4 doses or other macrolide for 7–10 days	Ampicillin 150 mg/kg/d in 4 doses or cefuroxime 150 mg/kg/d in 3 doses for 7 to 10 days	Cefuroxime 150 mg/kg/d in 3 doses plus erythromcyin 40 mg/kg/d in 4 doses or other macrolide for 7 to 10 days
5 to 18 years	Erythromycin 40 mg/kg/d in 4 doses or other macrolide for 7 days	Erythromycin 40 mg/kg/d in 4 doses or other macrolide with or without cefuroxime 150 mg/kg/d in 3 doses or ampicillin 150 mg/kg/d in 4 doses for 7 to 10 days	Cefuroxime 150 mg/kg/d in 3 doses for 7 to 10 days, plus erythromycin 40 mg/kg/d in 4 doses or other macrolide for 7 days

The preliminary antibiotic therapy of CAP is empiric since the virus is rarely known at the time of diagnosis (**Tables 1 & 2**) [44,45,46]. Empiric antibiotic options need to be based on the patient's age and also intensity of health problem, and regional resistance patterns of common virus [44,45,46]. Couple of large randomized controlled trials have actually contrasted anti-biotics in the treatment of childhood years CAP, but numerous organizations have published therapy guidelines (44,45,46). Oral management of prescription antibiotics is chosen other than when the patient cannot endure oral treatment or has severe CAP [45].

Table 2: different antibiotic for treatment of CAP:

Age group	Outpatients
60 days to 5 years*	Cefuroxime (Zinacef)
	150 mg per kg per day IV, in divided doses, given every 8 hours for 10 to 14 days
	In critically ill patients:

Age group	Outpatients
	Cefuroxime
	150 mg per kg per day IV, in divided doses, given every 8 hours for 10 to 14 days
	plus
	Erythromycin
	40 mg per kg per day IV or orally, in divided doses, given every 6 hours for 10 to 14 days
	or
	Cefotaxime (Claforan)
	200 mg per kg per day IV, in divided doses, given every 8 hours for 10 to 14 days
	plus
	Cloxacillin (no longer available in the United States)
	150 to 200 mg per kg per day IV, in divided doses, given every 6 hours for 10 to 14 days
5 to 16 years	Cefuroxime
	150 mg per kg per day IV, in divided doses, given every 8 hours for 10 to 14 days
	plus
	Erythromycin
	40 mg per kg per day IV or orally, in divided doses, given every 6 hours for 10 to 14 days
	or
	Azithromycin (Zithromax)
	Day 1: 10 mg per kg IV or orally
	Days 2 through 5: 5 to 10 mg per kg per day IV or orally

4. CONCLUSION

Community-acquired pneumonia (CAP) in children is a leading source of childhood morbidity and also death primarily in the creating world. Its etiology can be viral, bacterial, or blended infection. The etiological agents are different in different age groups and throughout the numerous seasons of the year. Upper body X-rays and also inflammatory laboratory examinations have reduced analysis sensitivity and also specificity. The selection and also dosage of prescription antibiotics need to be based on the age of the patient, extent of the pneumonia and also expertise of local antimicrobial resistance patterns. For the therapy of WHO-defined non-severe community-acquired pneumonia (CAP) in children

below 5 years of age amoxycillin is an option too. There are no noticeable distinctions in between azithromycin and also erythromycin, azithromycin as well as coamoxyclavulanic acid, or cefpodoxime as well as co-amoxyclavulanic acid. There are restricted data on other prescription antibiotics: co-amoxyclavulanic acid and cefpodoxime could be alternate second-line drugs. Both therapy plans-oxacillin/ceftriaxone and also amoxicillin/clavulanic acid-are effective in dealing with very severe CAP in 2-month- to 5-year-old hospitalized children.

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