



Comparison of Cefuroxim versus Cefotaxim in the Treatment of Pneumonia in Children Aged 3 Months- 5 Years an Imaging and Clinical Examination Evidence: Randomized Controlled Trial

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Abstract

Pneumonia is a common and potentially serious infection that affects children throughout the world. The aim of this study was to compare between cefuroxim and cefotaxim in the treatment of children with pneumonia. All 3 months-5 years old children admitted from 2/1/2012 to 4/31/2012 at Dorrah Hospital in Gaza were included in this study. The clinical outcome, length of hospital stay, and the association of pneumonia incidence to gender and age were compared. Of the 110 children admitted for non-complicated community acquired pneumonia (CAP), sixty patients were treated with cefuroxime and fifty were treated with cefotaxim. Clinical outcome and length of hospital stay is similar between both groups. Interestingly, the pneumonia incidence is higher in younger children and males. In conclusion, both drugs have similar treatment efficacy in terms of clinical outcome and the length of hospital stay. However, cefuroxim has several advantages over cefotaxim, including (1) oral form, allowing outpatient management, (2) less frequency of administration. Thereby, it should be recommended to treat pneumonia in children.

Key Words: Treatment, children, and exclude bacteria, ampicillin

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Introduction

Community-acquired pneumonia (CAP) is defined as an acute infection of the pulmonary parenchyma in a patient who has acquired the infection in the community, as distinguished from hospital-acquired (nosocomial) pneumonia. The annual incidence rate in children younger than 5 years age is 30- 40 case per 1000. The incidence rate in this age is higher than in adults, the only exception is geriatrics over age 70 years [1,2]. It considered the most sever and largest killer in children. Because pneumonia is common and is associated with significant morbidity and mortality, properly diagnosing pneumonia, correctly recognizing any complications or underlying conditions, and appropriately treating patients are important [3,4]. The causes of pneumonia vary depending on the age. Group B streptococcus and gram-negative enteric bacteria are the most common pathogens in neonates. Pneumonia in infants aged three weeks to three months is most often bacterial. Infants older than four months and in preschool-aged children, viruses are the most frequent cause. Respiratory syncytial virus (RSV) is the most common [5,6]. Bacterial infections can occur at any time of the year in preschool- and school-aged children and in adolescents. *S. pneumoniae* is the most common bacterial cause of community acquired pneumonia (CAP) after the neonatal period. Less common bacterial etiologies include *Haemophilus influenzae* type B, *Moraxella catarrhalis*, and *Staphylococcus aureus*. *Mycoplasma pneumoniae* and *Chlamydia pneumoniae* frequently are associated with CAP in pre-school-aged children and are common causes of CAP in older children and adolescents [7]. Clinical evaluation of pneumonia depends on symptoms, image study and physical examination. These include hyperthermia, tachypnea, cough, nasal flaring, retraction and other symptoms [8,9]. The decision of treatment is based on age, clinical and epidemiological factors. Antibacterial therapy should start promptly in children in who are thought to have CAP, because the underlying organism is unknown. Treatment includes administration of antibiotics for bacterial infections, ventilation or even intensive care unit administration. Immunization in USA reduces infection and improves treatment [10,11]. The type of antibiotic used depends mostly on the type of organism, but as empiric therapy the drug group ranges from betalactam drugs such as amoxicillin, cephalosporines such as cefuroxim or cefotaxim or cefotriaxon [12-15]. Macrolides are used for mycoplasma.

For pneumococcal pneumonia, antibiotics should probably be continued until the patient has been afebrile for 72 hours, and the total duration should not be less than 10 to 14 days (or 5 days if azithromycin is used) [16,17]. Available data do not support prolonged courses of

treatment for uncomplicated pneumonia. If viral pneumonia is suspected, it is reasonable to withhold antibiotic therapy, especially for those patients who are mildly ill, have clinical evidence suggesting viral infection, and are in no respiratory distress.

The antibiotics used range from ampicillin, cefuroxim, cefotaxim, erythromycin alone or in combination with gentamycin. The dose of antibiotic depends on the age and severity of infection [18-20].

A number of studies conducted on cefuroxim and cefotaxim in treatment of pneumonia. These studies concluded that both drugs are effective in treatment of pneumonia and other respiratory diseases such bronchitis and sinusitis. These studies show that cefuroxime is cost effective compared with other antibiotics and can be use orally in mild to moderate pneumonia [21-27] . For my knowledge there is no comparative studies conducted to compare between cefuroxim and cefotaxim in pneumonia.

The objectives of this study is to compare between cefuroxim and cefotaxim in the treatment of inpatient children with imaging and clinical evidence of pneumonia, to evaluate the efficacy of cefuroxime sodium in treatment of pneumonia and to provide data for proper use of antibiotics and reduce its misuse.

Materials and Methods

The study conducted in Dorrah Hospital in Gaza between 1/2/2012–31/4/2012 designed randomized clinical trial in which all children age 3 months-60 month were included in this study. The inclusion criteria age (mentioned above) and evidence of image study and clinical symptoms, these include hyperthermia, tachypnea, cough, nasal flaring, retraction and elevated white blood cell count. All patients must be inpatient, any other patients do not obey this criteria will be excluded. The patients were allocated into two groups randomly. The patients in the first group received a fixed dose of (200 mg/kg/day) of cefotaxim sodium, the second group received a fixed dose (150 mg/kg/day) of cefuroxim sodium. No adjustments of the dose were made during the entire period of the study. Both groups were observed for the treatment period of the study (3months). Daily follow up for each patient include general condition, fever, and clinical picture was done. The total number of patients was 125, of whom 15 were withdrawn against medical advice and excluded of our study. Sixty patients

treated with cefuroxim sodium and fifty treated with cefotaxim sodium. The data collected were tabulated and analyzed with spss version 13. Independent sample T- test is used to compare between means and the value of $p < 0.05$ were considered statistically significant.

Results

Outcome variables of pneumonia were improved in the variables mentioned in methodology. Treatment failure is considered if the patient takes the antibiotic for three days without any improvement in the symptoms based on the criteria mentioned above. Antibiotic therapy continued until patient discharge from the hospital.

Table 1. Drug treatment versus outcome

Drug	N	Mean	Std. Deviation
Cefuroxime	60	1.0833	0.03598
Cefotaxim	50	1.1000	0.04286
P- Value= 0.766			

This table show that there is no difference in outcome between the two drugs in pneumonia treatment (P-value=0,766 it is not statistical significant).

Table 2. Drug treatment versus hospital stay in days.

Drug	N	Mean	Std. Deviation
Cefuroxime	60	1.3273	0.06385
Cefotaxim	50	1.3333	0.07107
P- Value= 0.966			

This table show that there is no difference in hospital stay between the two drugs in pneumonia treatment (P-value=0,966 it is not statistical significant).

Table 3. Relation between disease versus gender and age group

Disease	Gender		Age group		
	Male	Female	3 – 12 month	12.1-36month	36.1-60 month
Number	58	52	53	51	6
Percent	53%	47%	48%	46%	8%

This table show that the incidence of pneumonia between males is higher than females(53% versus 47%) repectively also, pneumonia affects small age more than older ages.

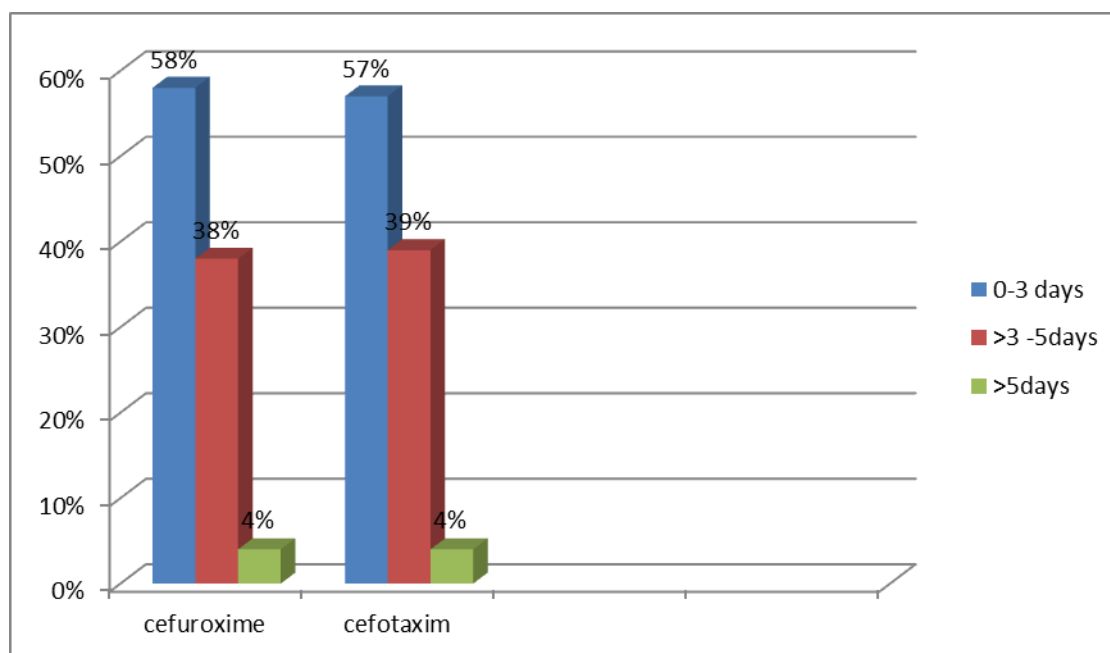


Figure 1. Comparison of duration of hospital stay between the two drugs, it is clear that both drugs are closed to each other in hospital.

Discussion

Pneumonia is a common and potentially serious infection that afflicts children throughout the world. In this study we focused attention on two antibiotics and tried to compare the efficacy between them, cefuroxime sodium and cefotaxim sodium in treatment of community acquired pneumonia (CAP). The parameters used for diagnosis and decide success treatment were mentioned in the methodology. We used t-student test to compare between the two drugs, the test show that there is no difference between the two drugs.

Treatment success

The result of our study showed that both drugs are effective in treatment of pneumonia. The results show that there is no difference between the two drugs in treatment outcome and P-value (0.766) is not statistical significant. The patients in both groups improved clinically and based on the parameters used. Also there were negligible difference between the two means for cefotaxim but this was not important. The result confirmed that success rate is 91% in

patients treated with cefuroxime and 92% in those treated with cefotaxime. This means that second generation cephalosporin (cefuroxime) is effective as third generation (cefotaxime).

This result is helpful in reducing antibiotic misuse in hospitals and confirms the same efficacy of cefuroxime sodium. Another important issue is that none of the patients complains of side effects like diarrhea.

Duration of Hospital Stay

The duration of hospital stay is nearly the same figure 1 shows that (96%) of both groups stayed in the hospital less than five days. This means that both drugs have similar results in efficacy and outcome. This is confirmed by the absence of difference in means and P-value (0.966) which is not statistically significant. Also the difference between the two means was trivial which confirms our findings. The result of this study is similar to other studies in other countries which show that there is no difference between the two drugs in treatment of pneumonia and upper respiratory tract infections. The course of antibiotic treatment is still controversial but in general, patients with pneumonia should receive at least three days of antibiotics after fever subsides. This must be to prevent the emergence of resistance strains of bacteria.

Age and Gender

Also the study confirmed that pneumonia affects small age population more than older ages. The incidence is more common between children below one year of age (48%) for children below one year, (46%) for children aged one - three years and (8%) aged more than three years- five years, this may be due to low immunity between small age children.

The incidence between males is more common than females (53%- 47%) respectively, this may be due to that males are exposed more than females to the outer environment which is polluted, or this may be due to social habits since most of families take their children mostly males outdoors which increase the chance for infection among male children.

Conclusion

The results show that both drugs have similar efficacy in outcome and hospital stay in treatment of pneumonia so we recommend the following:

1) Considering cefuroxime in treatment of pneumonia (CAP) despite the part of the lobe affected. The superiority of this drug over cefotaxime is the oral form, permitting outpatient

treatment completion on the same drug. This reduces the emergence of resistant strains of bacteria.

2) For other forms of pneumonia such as perihilar or other upper respiratory tract infections ampicillin is enough.

3) In CAP start with antibiotic promptly because underlying organism is unknown, the dose of antibiotic should be in the therapeutic range. If it is necessary to duplicate or triplets the dose, it should be done as this possible or there is limitation (maximum dose reached).

4) Treatment should be continuo for 72 hours without any improvement in the general condition and persistence of fever before changing antibiotic.

5) It is not recommended to use two antibiotics except in life threatening cases as in intensive care unit or failure treatment on single therapy taking into consideration condition 3.

6) The hospital administration and ministry of health should encourage further researches in all health disciplines. This provides practical data about the epidemiology and the diseases in Gaza strip and facilitates the introduction of applicable, appropriate treatment guidelines.

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