Lobar Pneumonia in Hospitalized Children and Response to Empirical Antibiotic Treatment

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ABSTRACT:

BACKGROUND:

It is an inflammatory disease of lungs with consolidation of one or more lobes caused mostly by Streptocccus pneumoniae bacteria. It is a worldwide disease with high mortality among children less than 5 years old.

OBJECTIVE:

To determine the proper empirical antibiotic treatment for lobar pneumonia in hospitalized children and the correlation between the blood culture result and response to treatment.

METHODS:

A Cross sectional study was performed between January 2013 through December 2013 to 69 patient admitted to Central Teaching Hospital Of Pediatrics in Baghdad, aged more than two months to ten years, all of them met the WHO case definition of pneumonia, data was collected from the mothers for (age, sex, previous health and vaccination status). Blood sample was collected for blood culture and sensitivity for all patients.

RESULTS:

The study showed that of 69 patients hospitalized with lobar pneumonia 69.5% were males, and 30.5% were females, 82.6% of patients were in an age group less than one year. The study found that 69.6% of patients were not vaccinated and they were mostly less than 1 year. The response to treatment range from 88.8%-94% and Blood culture was negative in 95.6% of samples. Mortality rate was 4.3%

CONCLUSION:

Treatment with Ceftriaxone (3rd generation Cephalosporine) alone is effective as an empirical treatment for lobar pneumonia in hospitalized patients, so no need for combination therapy of Ceftriaxone and Vancomycin and the Blood culture was negative for Streptococcus pneumoniae in all cases so the results of Blood Culture had no correlation with response to treatment.

KEYWORDS: lobar pneumonia, empirical treatment, streptococcus pneumniae.

INTRODUCTION:

Pneumonia is an inflammatory disease of the lungs caused by infectious and non-infectious causes [(1)]. Of the infectious causes, 50% of the cases are estimated to be caused streptococcus pneumoniae and 20% by Heamophilus Influenzae [(2)]. Mixed infection (viral and bacterial) can occur in 45% of pneumonia in children [(3)].There are two types of acute bacterial pneumonia, lobar pneumonia and bronchopneumonia (lobular) [(4)].Lobar pneumonia is a radiological pattern when one or more lobes of the lung consolidate in response to infection with bacterial organism [(5)]. It is a common illness which occurs worldwide and considered to be a major cause of death in all age groups [(6)], with more than 2 million death in children aged less than 5 years and 90% of that death occurs in developing countries, it's a vaccine preventable disease [(7)]. Diagnoses of pneumonia can be achieved by combination of physical examination and radiological findings (confluent lobar consolidation is typically seen in pneumococcal pneumonia while viral pneumonia is usually characterized by hyperinflation and bilateral interstitial infiltrate) [(8)], there is no definite test able to distinguish bacterial and non-bacterial causes [(9)]. WHO has defined pneumonia in children clinically based on cough, difficult

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breathing, age/adjusted increase in respiratory rate, chest in- drawing and decrease in level of consciousness with or without vomiting & poor feeding [10]. Worldwide 7-13% of children with pneumonia need hospitalization [11] and because of high mortality and morbidity risk of pneumonia, empirical antibiotic treatment should be started immediately without awaiting the result of blood culture to improve the outcome [12] .The empiric treatment of suspected bacterial pneumonia in hospitalized children is parentral Cefuraxamine, Ceftriaxone or Cefotaxime [8].

AIMS OF THE STUDY:

In this study we try to find the most appropriate empirical Antibiotic treatment for lobar pneumonia in hospitalized patients aged more than two months to ten years, and to find the significant of Blood culture to diagnose the causative agents or decision to choose the empirical treatment.

PATIENTS AND METHOD:

This is a cross-sectional study included 69 patients admitted to Central Teaching Hospital of Pediatric in Baghdad city from 1st of January 2013 to 31st of December 2013. The patients included in this study aged more than two months to ten years, they were divided into 3 age groups, first group (2 month- up to1 year), second group (1 year- up to5 years),third group (5 years- up to10 years). The patients less than 2 months were excluded from the study because the causative agents in this period are different. Data about age, sex, previous health, symptoms and vaccination status were obtained from the mothers. All patients included met the case definition criteria of pneumoni a according to WHO fever, cough, increase in respiratory rate (up to 2 months RR >60, 2months -1 year > 50,> 1year – 5 years> 40) chest in- drawing and/or disturb level of consciousness. The diagnoses of lobar pneumonia was confirmed by chest x-ray (the reports were written by expert radiologist).Blood samples were collected from those 69 patients for culture and sensitivity using Hand-Brain-Heart broth and incubated in 37C, initial result were obtained after 48 hours. Final results were obtained after 7 days. Any patient with incomplete history was excluded from the study. Other children with history of recurrent chest infections, congenital heart disease or neurodevelopment delay were excluded from the study. Some children with documented history of kerosene poisoning or history of chocking with food or aspiration were excluded. Some children met the criteria of WHO for pneumonia but with no radiological evidence of lobar pneumonia were also excluded. All the patients admitted to the hospital were started on antibiotics empirical either Ceftriaxone in dose of 100mg/ kg/ day, or combination of Cefitriaxone 100mg/kg and Vancomycin 15mg / kg/dose 6 hourly. All the patients were followed in the ward by clinical examination (Temp., Respiratory rate, Heart rate, level of consciousness &Oxymetry for oxygen saturation) for 72 hours for clinical response. The patient considered non-responder if there is lack of clinical improvement within 48 -72 hrs. of treatment .Chi-Square (X^2) test was used to test for the presence of statistical association. No significant p- value found in response to treatment (p- value 0.641 p), significant p-value<0.05

RESULTS :

The study shows that males are predominant on females with 69.5%(48) patients while females only 21 (30.5%) ,most of the patient were in group of less than 1 year 57(82.6%) ,group 2 only 9 (13.1%) and group 3 the total patients 3(4.3%) as shown in Table 1. According to vaccination the study shows that 21(30.4%) out of 69 patients were vaccinated with Penta vaccine (DPT, HBV, Hib), while 48(69.9%) were not vaccinated, of those 35(72.9%) receive initial (OPV, HBV and BCG) vaccination, the other 13 (27%) receive no vaccine as shown in Table -2-

Table -3- shows the Empiric antibiotics and response to treatment, 51(73.9%) of patients received combination of Ceftriaxone and Vancomycin of which 48(94%) responding to treatment, 3(6%) were not responding, while in the group receiving Ceftriaxone alone 16(88.8%) responding to treatment and 2(11.2%) were not responding to treatment, p value 0.641 (significant p value < 0.05), one of those patients had allergy to Ceftriaxone and change to combination of Ampicillin and Cloxacillin.

For Blood Culture results as shown in Table -4- , 66(95.6%) had negative results , the other 3(4.4%) had positive results of which 2 grew Klebsiella sp. and one grew E-coli sp., No growth of Streptococcus Pneumoniae detected in all samples.

Three patients died during the study (4.3%), they were on combination of Ceftriaxone & Vancomycin, which changed later on to Meronem, 2 of them with positive Blood Culture (Klebsiella) and the other had negative result.

Table 1: Age and Sex Distribution

Females	Males	percentage	No. of Patients	Age group
17(30%)	40(70%)	82.6%	57	2 months – up to 1 year
3(33.4%)	6(66.6%)	13.1%	9	1 year – up to 5 years
1(33.4%)	2(66.6%)	4.3%	3	5 years – up to 10 years

Table 2: Vaccination Status.

Females	Males	percentage	No. of Patients	
8(38.1%)	13(61.9%)	30.4%	21	Vaccinated(Penta vaccine)
15(31.3%)	33(68.7%)	69.9%	48	Not Vaccinated
5(38.5%)	8(61.5%)	27.0%	13	No Vaccination at all
12(34.3%)	23(65.7%)	72.9%	35	Initial Vaccination

Table 3: Empirical Antibiotics and Response to Treatment.

Not Responding	Responding	No. of Patients	Antibiotic
2(11.2%)	16(88.8%)	18	Ceftriaxone
3(6%)	48(94%)	51	Ceftriaxone + Vanconycin

Chi square =0.5412, p. value = 0.461, significant at < 0.05

Table 4: Blood Culture &sensitivity results .

%	No. of Samples	Results
95.65	66	Negative
4.35	3	Positive Klebsiella E-Coli
	2	
	1	

DISCUSSION:

This study showed a predominance of males(69.5%),and most of the patients were less than one year 57(82.6%) which is in agreement with Lee GE et al. study, which found that infants less than 1 year old had the highest rate of Hospitalization while children more than 10 years had the lowest rate [13]. Infants and young children tend to have sever pneumonia with greater need for hospitalization [14]. The study showed that only 21(30.4%) of patients vaccinated, this may be due to security issue of the country, lack of education about the benefit of immunization in preventing morbidity & mortality from disease. WHO estimated that 21.8 million infants worldwide are still missing out the basic vaccines [15].

According to empirical treatment, the study show that the response to treatment was 94% in combination therapy and 88.8% in single therapy, this met the results of studies by Bradly JS et al[16], that the 3rd generation Cephalosporines should be prescribed for hospitalized infants and children with lobar pneumonia who are not fully immunized and Vancomycin has not been shown to be more effective than 3rd generation Cephalosporines in the treatment of pneumococcal pneumonia [16].Failure of treatment was observed in both groups 6% and

11.2% respectively. Menendez R & Torres A showed in their study that over all non-responder to treatment were in range of 5-15% in hospitalized patients with pneumonia [17].From this result we concluded that parentral 3rd generation Cephalosporines alone is a good choice as an empirical treatment for lobar pneumonia in hospitalized children and no need for combination therapy (Ceftriaxone and Vancomycin).

Blood Culture results were negative in 66(95.6%) of the patients and positive in 4.4%, Bonadio WA study show that Blood Culture positive for pathogenic bacteria in children hospitalized for lobar pneumonia is reported in 1.4-3.4% [18].Negative results may be attributed to the effect of pre-culture antibiotics, inadequate Blood Culture technique, insufficient Blood volume for culture or some combination of those factors [19].

In children they found urine Antigen test for pneumococcal pneumonia were positive in 76% of lobar pneumonia [20], so it can be more informative than Blood Culture in diagnosis.

Dwell SF, et al study showed that mortality related acquired pneumonia among children was less than 5% in hospitalized pt. [21], in this study, the mortality rate was 4.3% and all of them less than one year old as shown in other study that the risk factor for death in children hospitalized for pneumonia was age between 2-11 months [22] but the mortality rate decrease as getting older.

CONCLUSION:

We concluded from this study that 3rd generation Cephalosporines (Ceftiaxone) is effective in treatment of hospitalized children with lobar pneumonia, so it can be a good choice as an empirical treatment with no need for combination of Cephalosporine and Vancomycin. The Blood culture results were negative for Streptococcus pneumonae in all cases so the results of Blood Culture had no correlation with response to treatment.

Recommendations:

1-to set guidelines for assessment of severity, criteria for admission and discharge for children with lobar pneumonia, because not all cases of pneumonia need hospitalization.

2-the Blood cultures were negative in most of the cases, so the need of new diagnostic tests to ease the diagnosis of sever pneumonia and its response to treatment

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