Original Research Article

AMPICILLIN & GENTAMICIN V/S 3RD GENERATION CEPHALOSPORIN FOR THE MANAGEMENT OF COMMUNITY-ACQUIRED PNEUMONIA IN CHILDREN; A COMPARATIVE ANALYSIS

ABSTRACT

BACKGROUND

Community acquired pneumonia (CAP) is a common cause of childhood morbidity, attributed to every 1 in 500 hospitalization of children under the age of 5 years. While science made therapeutic advancements to battle CAP, the pathogens too have acquired resistance to many drugs. In this fight for dominance, Ampicillin plus Gentamicin and 3rd Gen Cephalosporins are nowadays the cornerstone of treatment. However, their efficacy varies in different parts of the world owing to differing levels of drug resistance.

OBJECTIVE

To compare the effect of Ampicillin and Gentamicin vs. third generation cephalosporin in treatment of severe community acquired pneumonia.

METHODOLOGY

This Randomized Controlled Trial was conducted at the Dept. of Pediatrics (Ziauddin University Hospital) upon a sample of 74 patients (in two equal groups) of either gender, aged 2 months to 5 years, presenting with CAP. After taking written informed consent, data was recorded onto a pre-structured questionnaire containing inquiries pertaining to basic biodata, sociodemographic details, presenting complaints, immunization status of the pneumococcal and HIB vaccine, laboratory values, and treatment outcome.

RESULTS

The mean age of the sample stood at 15 months (SD ± 3) with a majority of the sample comprising of male children (52.7%). The mean weight stood at 8.7 kg (SD ± 0.9) and the mean height was recorded to be 74.2 cm (SD ± 11). The commonest symptoms included fever, fast breathing, chest in-drawing and added sounds. It was revealed that

both treatments achieved successful treatment outcomes in all patients with no mortality. The resolution of symptoms however varied with faster resolution observed in the Cephalosporin group.

Conclusion

After careful consideration, it can be concluded that 3rd generation cephalosporins is more efficacious at treatment of CAP with significantly faster resolution of disease symptoms and a shorter hospital stay.

KEYWORDS

Community Acquired Pneumonia,
Gentamicin,
Ampicillin,
3rd Gen Cephalosporin,
&Therapeutic Efficacy.

INTRODUCTION

Community acquired pneumonia (CAP) is a common cause of childhood morbidity, attributed to every 1 in 500 hospitalization of children under the age of 5 years. S. Pneumoniae and Haemophillus Influenza are the commonest organisms isolated in children under five years with CAP; accounting for up to 50% and 30%, respectively. Around 50% of the total mortality incurred by the disease can be attributed to the two aforementioned bacterial pathogens. [1 - 4]

In this modern era of medicine when many pharmaceutical interventions to CAP are present, such a high burden of disease is not acceptable and one may assume that despite availability of the many interventions, effective selection and use is probably not being practiced. [5]

Bacterial Pneumonia should be treated with antibiotics. Most cases of pneumonia require oral antibiotics. [6]In last decade, several guidelines identified the best antimicrobial regimen for CAP in children considering spectrum of activity, antimicrobial susceptibility, tolerability, bioavailability, safety, and cost. World health organization recommends domiciliary treatment with oral Amoxicillin (40 mg/kg/dose) two times in a day for 3 days for pneumonia without chest in-drawing and 5 days for pneumonia with chest in-drawing. [7, 8]

If there is no improvement in 48 h, Amoxicillin should be replaced with 2nd line drug therapy.Injectable Ampicillin plus Gentamicin is now first choice for hospital-based treatment of severe CAP. In absence of satisfactory improvement in next 48 h, antibiotics should be changed to ceftriaxone. A randomized trial study on children under 5 years of age reported higher treatment failure in oral cotrimoxazole group (39.1%) than oral amoxicillin group (8.1%). [9, 10]

Immunization status in children with respect to S. pneumonae and H. influenza type B is one of key factor in antibiotic selection. First-line choice for appropriately immunized children with CAP is amoxicillin/ampicillin. According to Infectious Disease Society of America and other supporting guidelines; if the child is not immunized appropriately for pneumococcus and Hib first-line choice IV ceftriaxone with move to oral therapy as able.

Another determinant of the antibiotic choice is the resistance pattern of the local populace. It is a fact that "various biologic or biochemical mechanisms may lead to bacterial resistance; ample evidence points to the fact that antimicrobial resistance is directly linked to antibiotic usage. While overuse and misuse of antibiotics have beenobserved globally, both in industrialized and developing countries, this problem has assumed immense proportions in the latter."[11, 12]

Studies on antibiotic usage for inpatients have demonstrated that antibiotics may have been prescribed unnecessarily. Cephalosporin were often reported to be the class with higher rates of prescription for CAP treatment, as reported by many centers in different countries, like Ethiopia, Saudi Arabia, Nepal, Serbia, Sudan, US, Italy, and other European countries. [13 - 20]

Pakistan has no published data regarding prescription of IV antibiotics in children but it is reported that ceftriaxone in adults is most commonly prescribed IV antibiotic with severe CAP. In India ceftriaxone is the second common IV antibiotic after ampicillin/calvulanic acid prescribed in severe community acquired pneumonia. Current WHO recommendation is Ampicillin and Gentamicin for severe community acquired pneumonia, but it is observed that ceftriaxone is usually prescribed in severe pneumonia. [21, 22]

MATERIALS AND METHODS

This Randomized Controlled Trial was conducted at the Dept. of Pediatrics (Ziauddin University Hospital) upon a sample of 74 patients (in two equal groups) of either gender, aged 2 months to 5 years, presenting with CAP. After taking written informed consent, data was recorded onto a pre-structured questionnaire containing inquiries

pertaining to basic biodata, sociodemographic details, presenting complaints, immunization status of the pneumococcal and HIB vaccine, laboratory values, and treatment outcome.

Inclusion Criteria:

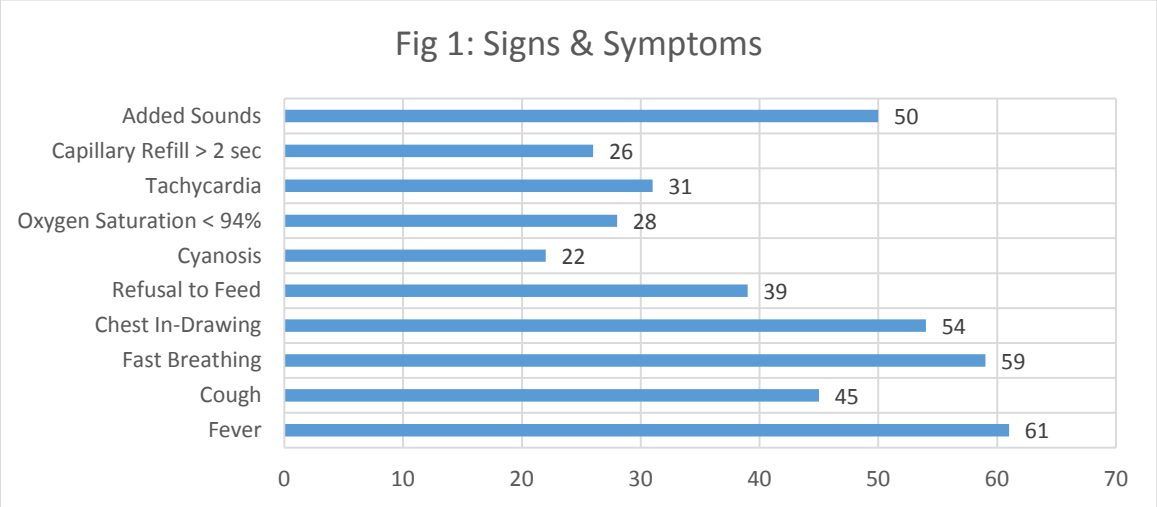
- Children of consenting parents
- Children aged between 2months to 5years of age
- Either gender
- Children with sign and symptoms of severe community acquired pneumonia (cough, chest in drawing, refused to feed, lethargic/unconscious, convulsion) as per operational definition.

Exclusion Criteria:

- Children who need ventilator support at the time of admission
- Severe malnutrition/immunocompromised patient
- Chronic lung diseases like cystic fibrosis, bronchiectasis
- Patient with Congenital heart defect

RESULTS

The mean age of the sample stood at 15 months (SD ± 3) with a majority of the sample comprising of male children (52.7%). The mean weight stood at 8.7 kg (SD ± 0.9) and the mean height was recorded to be 74.2 cm (SD ± 11). The commonest symptoms included fever, fast breathing, chest in-drawing and added sounds.



It was revealed that both treatments achieved successful treatment outcomes in all patients with no mortality. The resolution of symptoms however varied with faster resolution observed in the Cephalosporin group.

Table 1: Comparative Trajectory of Treatment

Variable	Day 01		Day 2		Day 3		Day 4	
	G1	G2	G1	G2	G1	G2	G1	G2
Fever	*30*	*31*	*25*	*21*	*18*	*14*	*07*	*01*
Cough	*21*	*24*	*26*	*13*	*16*	*06*	-	-
Chest In - Drawing	*26*	*28*	*20*	*21*	*15*	*15*	-	-
Tachycardia	*14*	*17*	*08*	*12*	*02*	*01*	-	-
Refusal to Feed	*22*	*17*	*08*	*04*	-	-	-	-
Fast Breathing	*26*	*33*	*14*	*16*	*05*	*01*	-	-
Oxygen Sat < 94%	*14*	*14*	*04*	-	-	-	-	-

Table 2: Outcome Comparison

Variable		Group A	Group B
Antibiotic Change		-	-
Adv Airway Support		8.1%	-
Length of Stay (days)		5	5
Final Outcome	**Discharge**	100%	100%
	Expired	-	-

DISCUSSION

The mean age of the sample stood at 15 months (SD ± 3) with a majority of the sample comprising of male children (52.7%). This is comparable with the statistics yielded by the latest Pakistan Demographic Health Survey wherein it is reported that the gender ratio is 51.3%, and thus is matches the gender ratio of our study participants. Additionally, disease (CAP) specific research conducted in different parts of the country have yielded information suggesting that the incidence of community acquired pneumonia is slightly higher 1.1:1 to 1.3:1.[23, 24]

The mean weight stood at 8.7 kg (SD ± 0.9) and the mean height was recorded to be 74.2 cm (SD ± 11). Though this is not ideal and falls short of meeting the reference values laid out by World Health Organization (WHO), however, this is expected from a developing and low-income country wherein the nutritional needs of the population are not met and

hence the weight, height, and BMI are sub-par in comparison to the international standards. [25, 26]

Additionally, CAP is a serious ailment, which manifests strong effects on a child's body. It is only natural to assume that the disease state leads to a decrease in the weight and BMI. Additionally, prolonged diseases states may stunt the growth of a child and decrease the height of the child. This is substantiated by a large pool of literature.[27, 28]

The commonest symptoms included fever, fast breathing, chest in-drawing and added sounds. Published evidence reports fever, coupled with respiratory symptoms to be the commonest manifestations of CAP. In this research we operationally defined CAP as a disease state characterized by cough or difficult breathing and tachypnoea. The symptoms may vary with disease severity, but the common symptoms remain the same.[29]

It was revealed that both treatments achieved successful treatment outcomes in all patients. Again, this was outcome since both the treatment regimens are not experimental and have been used and recommended as the treatments of choice by several drug regularity authorities and health administrative services (national and international).

One interesting finding though is that the mortality rate, despite falling everywhere else in the world, is high in Pakistan as reported in literature. But in this research, no mortality was reported which is an encouraging observation giving hope that if either of these treatment regimens are administered to children with CAP, a good chance at survival and eventual recovery awaits the child.[30, 31]

In this modern world of specialized medicine, the healthcare needs of the patients have become more and more demanding with many patients not only seeking a recovery but one that is achieved the fasted with minimal risk of adverse events. In this research, it was noted that the resolution of symptoms however was faster in the Cephalosporin group, than the other group. [32]

Contradictory evidence is available on the matter with certain research suggesting the Cephalosporin to act as a superior therapeutic agent while just as many report ampicillin and gentamicin to yield better results. The trends are different in different parts of the world and may vary according to disease strains and patterns of antibiotic resistance noted in the regions. However, this research confirms that the use of third generation Cephalosporins is ideal in our region. [32, 33]

CONCLUSION

After careful consideration, it can be concluded that 3rd generation cephalosporins is more efficacious at treatment of CAP with significantly faster resolution of disease symptoms and a shorter hospital stay.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

Ethical Approvals: we conducted our research after obtaining proper IEC approval.

Consent

As per international standard or university standard, patients' written consent has been collected and preserved by the author(s).

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