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Comparison between Efficacy of Clarithromycin versus Ceftriaxone in the Treatment of Community Acquired Pneumonia in Children

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A B S T R A C T

Background: The most prevalent infectious scenario which results in hospitals stay as well as death, particularly among the elderly, is community-acquired pneumonia (CAP). It is one of the most common illnesses worldwide with the greatest death rate among pediatric younger than five years old.

Objective: The main goal of the study was to explore the efficacy of clarithromycin versus ceftriaxone in the treatment of community acquired pneumonia in children.

Methodology: From August 2019 to March 2021, a quasi-experimental study was carried out in the pediatric ward at Department of pediatrics, Saidu Teaching Hospital Swat, Khyber Pakhtunkhwa, Pakistan. A total of 140 children participated in this study which were divided in to two groups treated with ceftriaxone and clarithromycin. Clinical cure, or illness resolution following forty-eight hours of treatment with antibiotics, afebrile status without antipyretic use, respiratory rate <25/min, and/or O_2 saturation >96%, were used to assess the study medications' efficacy.

Results: Analysis of the efficacy in terms of reduction of fever, respiratory rate, and O_2 saturation revealed that ceftriaxone was successful in 84% of individuals whereas clarithromycin was effective in 90% of them.

Conclusion: For the treatment of community acquired pneumonia in children both drugs have effect but as compared to ceftriaxone the results of clarithromycin were much better.

Keywords: Efficacy; Clarithromycin; Ceftriaxone; Community Acquired Pneumonia

Introduction

The most prevalent infectious scenario which results in hospitals stay as well as death, particularly among the elderly, is community-acquired pneumonia (CAP).[1] It is one of the most common illnesses worldwide with the greatest death rate among pediatric younger than five years old.[2] S. pneumoniae and Mycoplasma pneumonia 2 are the two most frequent bacterial infections that cause pneumonia in teenagers.[3] An estimated 156 million children are believed to suffer from pneumonia every year, of which thirty-five million are thought to reside in Africa and 151 million in countries that are developing. Hospitalization is necessary for 7–13% of the sick people who have life-threatening episodes and seventy-five percent are citizens of African nations.[4] Every year, pneumonia affects approximately ten million kids under the age of five in Pakistan.[5] Blood cultures' unreliable findings, limited sensitivity, challenges in gathering sputum from very young children, and laborious staining procedures make it difficult to diagnose pneumonia.[6] The effectiveness of antibiotic regimens for pneumonia in pediatric patients admitted to hospitals has not been well studied.[7] The most often prescribed first-line antibiotic in the world for treating pediatric pneumonia patients is ceftriaxone, yet it doesn't appear to work against mycoplasma pneum-onia, which accounts for one-third of pediatric pneum-onia cases.[8] In 2020, a systematic analysis examined six publications and found that the use of macrolide as either a monotherapy or adjunct treatment in addition to beta-lactam antibiotics is more successful in treating pneumonia that is acquired in the community.[9] When treating childhood CAP, ceftriaxone and clarithromycin are two of the most often recommended medications.[10] Children who received clarithromycin for the treatment of CAP had 94% effectiveness with higher tolerability in a comparative research conducted previously.[11]

Therefore, the goal of the current study was to find out the comparison between efficacy of clarithromycin versus ceftriaxone in the treatment of community acquired pneumonia in children.

Objective

Objective of the present study was the main goal of the study was to explore the efficacy of clarithromycin versus ceftriaxone in the treatment of community acquired pneumonia in children.

Methodology

From August 2019 to March 2021, a quasi-experimental study was carried out in the pediatric ward at Department of pediatrics Saidu Teaching Hospital Swat, Khyber Pakhtunkhwa, Pakistan. The WHO calculator was used to calculate the sample size, which consisted of 140 individuals, based on the following parameters: a confidence interval of 95%, (78.2%) ceftriaxone effectiveness, (94.9%) clarithromycin efficacy, and 90% test power (two-sided).[12] Inclusion criteria was the Patients who met the inclusion criteria, which included no hospital admissions within the previous week, fever exceeding 100 degrees Fahrenheit, respiratory signs and symptoms such as cough, tachypnea exceeding 30 minutes, and/or O_2 saturation less than 96% with radiological evidence of pneumonia, were enrolled in the study. Patients of both genders and ages were eligible. Individuals with congenital cardiac disease, immunocompromised conditions, malnourishment, or persistent cough/wheeze were excluded from the study. After taking the approval from ethics committee of institute and permission from guardians the study was carried out. A total of 170 patients were divided into group A, receiving ceftriaxone treatment (50 mg/kg/day) and group B, receiving clarithromycin treatment (15 mg/kg/day). In the hospital, all drug administration was done by qualified nurses. The clinical cure, which is defined as the remission of the disease after 48 hours of antibiotic therapy, the absence of antipyretics in an afebrile condition, a respiratory rate of less than 25/min, and/or an oxygen saturation of more than 96%, were used to assess the efficacy of the study medications. Data was entered into a pre-made proforma and examined using SPSS version 20. For categorical factors such as effectiveness and gender, percentages and frequency distributions were computed. Age was one of the continuous variables for which mean ± SD was computed. To observe changes in impact, effectiveness was stratified by age and gender among several groups. The Chi square test was applied for the whole data analysis. P values below 0.05 were regarded as significant.

Results

This study was conducted at the Department of pediatrics Saidu Teaching Hospital Swat, Khyber Pakhtunkhwa, Pakistan. A total of 140 children were examined to determine the effectiveness of ceftriaxone and clarithromycin in treating community-acquired pneumonia, and the data were analyzed. Table 1 elucidates the age and gender distribution. Of the children in the ceftriaxone-treated group, 31 (44%) were between the ages of 5-7, 24 (34%) were between the ages of 8-10, and 15 (22%) were between the ages of 11-12, with a mean age of 8 ± 1.76 years. In the group treated with clarithromycin, 32 (45%) of the children ranged in age

from 5 to 7 years, 25 (36%) from 8 to 10 years, and 13 (19%) from 11 to 12 years, with a mean age of 7 ± 1.51 years. In the group treated with ceftriaxone, there were 44 (63%) male and 26 (37%) female children; in the group treated with clarithromycin, there were 45 (65%) male and 25 (35%) female children. Table 2 clarifies that 59 (84%) of the kids in group treated with ceftriaxone and 63 (90%) Children in the group receiving clarithromycin treatment become afebrile. 51 (73%) in ceftriaxone had a respiratory rate of fewer than 25 breaths per minute. 53 (76%) in the group receiving treatment with clarithromycin and the treated group. Additionally, 49 (70%) of the children in the group treated with ceftriaxone and 50 (72%) of the children in the group treated with clarithromycin had O2 saturation >96%. Therefore, there was no discernible difference in the two groups' post-treatment condition for fever, respiratory rate, and oxygen saturation (p values of 0.313, 0.699, and 0.853, respectively). Clarithromycin was somewhat more successful than ceftriaxone, with a 90% vs 84% difference. However, the variance was not statistically significant, with a p value of 0.313. After stratification, there was not a significant distinction (p value >0.05) in the reaction of the study medicines across the ages and genders in Table 3.

Table 1. Age and gender wise distribution between treatment groups (N=140)

Characteristics	Ceftriaxone Treated Group	Clarithromycin Treated Group
Age Group (Years)		
5-7	31 (44%)	32 (45%)
8-10	24 (34%)	25 (36%)
11-12	15 (22%)	13 (19%)
Gender		
Male	44 (63%)	45 (65%)
Female	26 (37%)	25 (35%)

Discussion

Different treatment recommendations for community-acquired pneumonia have been created over a long period of time.[13] Even with the rapid advancements in medical and treatment techniques, there have been significant occurrences of pneumonia linked to high fatality rates, particularly in underdeveloped nations like Pakistan. There have been very few studies to assess the suggested antibiotic regimen and the application of empirical antimicrobial therapy for community-acquired pneumonia, particularly in pediatric patients.[14] This study compared the two most often given antibiotics for the treatment of community-acquired pneumonia (CAP) in 140 pediatric patients. Clarithromycin was found to be successful in 90% of children, while ceftriaxone was shown to be effective in 84% of children, demonstrating that both agents are valuable and equivalent in the therapeutic arsenal when it comes to curing fever, respiratory rate, and oxygen saturation. However, the danger of developing super infections such as MRSA and Clostridium difficile-associated diarrhea (CDAD) still exists while using cephalosporin. Therefore, it would be unwise to promote its usage and would be contradictory

Table 2. Post Treatment Eminence of Fever, Respiratory rate and O2 saturation

Treatment status	Ceftriaxone	Clarithromycin	P-Value
Afebrile	59(84%)	63(90%)	0.13
Respiratory rate less than 25 min	51(73%)	53(76%)	0.699
O2 Saturation greater than 96%	49(70%)	50(72%)	0.853

to suggest it even as a second-line therapy. In an effort to lessen these unintended effects, several hospitals in the UK have switched from treating CAP using cephalosporin. Furthermore, there isn't any solid proof that cephalosporin work better clinically or economically than clarithromycin and other macrolides for treating respiratory infections. On the contrary, there is mounting proof that narrow-spectrum prescription works just as well as broad-spectrum prescribing. Numerous research and recommendations suggest combined treatment for severe pneumonia. The first-line treatment for severe illness is a combination of beta lactam antibiotics such as ceftriaxone and macrolides, according to the authors of an Australian prospective research on CAP treatment.[15] For treating severe CAP, the BTS recommendations advise using a combination of clarithromycin with co-amoxiclav as first-line therapy and a combined of clarithromycin plus cephalosporin as an alternate

Table 3. Stratification of Medicine effectiveness with Age and Sex Distribution

Characteristics		**Group A (Ceftriaxone**	**Group B (Clarithromycin)**	**P-Value**
Age Groups (Years)				
05 - 07	Effective	26	29	0.42
	Non effective	5	3	
Total		31	32	
08 - 10	Effective	38	41	0.355
	Non effective	6	4	
Total		42	45	
11 - 12	Effective	13	2	0.877
	Non effective	2	13	
Total		15	15	
Gender				
Male	Effective	38	41	0.478
	Non effective	6	4	
Total		44	45	
Female	Effective	21	22	0.478
	Non effective	5	3	
Total		26	25	

regimen.[16] Results from earlier trials that showed ceftriaxone's effectiveness in terms of clinical cure rates in clinically evaluable populations and modified intent to treat populations were 78.2% and 77.2%, respectively, provided support for our findings.[17] Comparably, in a trial by English ML et al., the corresponding clinical cure rate of clarithromycin in the population that was intended to be treated and the clinical population that followed protocol was 81.8% and 93.8% in focus 1, and 88.5% and 95.9% in focus 2.[18]

The comparative effectiveness of popular antibiotics, as determined by local statistics, can help medical providers choose the most effective antimicrobial drug to promote a speedy recovery for hospitalized children with CAP. Additionally, these findings may be projected to different healthcare facilities in order to enhance present treatment plans and lower the region's rates of morbidity and death.

Conclusion

The study's outcome states that both medications are useful in treating children's community-acquired pneumonia, yet clarithromycin had somewhat more encouraging outcomes than ceftriaxone.

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