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Paediatrics

ANTIBIOTICS AND ITS OUTCOMES AMONG CHILDREN WITH COMMUNITY-ACQUIRED PNEUMONIA

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ABSTRACT Pneumonia is a lower respiratory tract infection characterized by inflammation of lung tissue and infiltration of alveoli and bronchioles. The most common type is community-acquired pneumonia. Our study objectives include identifying the most common Causative Microorganisms, assessing the risk of developing CAP in patients having Comorbidities, and identifying the most commonly prescribed antibiotic regimen. This is a hospital based Prospective Observational study, conducted for 6 months period at RIMS, Kadapa. 70 patients were recruited based on inclusion criteria using study materials like patient data collection proforma, ICF, and patient information leaflets. Treatment was given according to IDSA & ATS & IPA guidelines. In a total of 70 patients, 44 were males and 26 were females, 69 patients belonged to the 0-8 years age group; patients with single lobe infiltrations are 55 & patients with multiple lobe infiltrations are 15; In our study. streptococcus pneumoniae and pseudomonas aeruginosa were the most common isolated organisms: Monotherapy was given for 7 patients, dual therapy for 55 patients and triple therapy for 8 patients; 28 patients received CEF+AMK, 15 patients received AMK+PTZ, 3 patients received AMK+AMX, 7 patients received CEF, 1 patient received VAN+MPM and 1 patient received PTZ+VAN; 2 patients received PTZ+CEFTO, 8 patients received CEF+PTZ+AMK, 5 patients received PTZ+CEF, patients had less than 8 days of hospital stay. We have concluded that beta-lactam antibiotics and Aminoglycoside were the most commonly prescribed class & CEF+AMK was a highly recommended drug regimen.

KEYWORDS : Community-acquired Pneumonia, Antibiotic Regimen

INTRODUCTION

Pneumonia is a lower respiratory tract infection characterized by inflammation of lung tissues accompanied by infiltration of alveoli and often bronchioles. Pneumonia infection may be mild, moderate, or severe and its severity depends on the type of microorganism involved, age, metabolic function, and immunity of individuals. Community-acquired pneumonia (CAP) is a significant cause of respiratory morbidity and mortality in children, especially in developing countries. Worldwide, CAP is the leading cause of death in children younger than five years. Factors that increase the incidence and severity of pneumonia in children include prematurity, malnutrition, low socioeconomic status, exposure to tobacco smoke, and childcare attendance.

A wide range of organisms can cause pneumonia, so it is useful to apply some kind of classification system, at least until the etiology of a particular case has been determined. Pneumonia is often classified clinically into lobar pneumonia, bronchopneumonia, or atypical pneumonia, but this does not correlate entirely with the bacteriological cause and in any case, the distinctions are often blurred. It is more practical to classify pneumonia according to the nature of its acquisition, the usual terms being community-acquired pneumonia (CAP) and hospital-acquired pneumonia (HAP)[1].

In pneumonia, microorganisms enter the lower respiratory tract from the oropharynx through micro aspiration, inhalation of contaminated droplets, and hematogenous spread. Macrophages and other components of innate immunity such as surface proteins A and D engulf the bacteria and help in decreasing disease progression. Classical pneumonia is caused due to streptococcus pneumonia, in this, lobar patterns are present, evolve through four phases, and are characterized by changes in the alveoli:

- Stage of congestion—indux crepitus (fine crackles) heard.
- Stage of red hepatization - Tubular type of bronchial breathing heard.
- Stage of grey hepatization-Tubular type of bronchial breathing heard.
- Stage of resolution—Redux crackles appear, and fine crackles become coarse[2].
- Community-acquired pneumonia etiologies are many organisms including bacteria, viruses, and fungi.

The most common bacterial causes are S. pneumoniae, C. pneumoniae, H. influenza, M. penumoniae, staphylococcus aureus, klebsiella pneumoniae, legionella pneumophilla, clamydophilla pneumoniae, mycoplasma pneumoniae. Common viral causes include coronavirus, adenovirus, influenza virus, metapneumovirus, parainfluenza virus, Epstein-Barr virus, coxsackie virus, varicella virus, hantavirus, severe acute respiratory syndrome, Middle East respiratory syndrome. Common fungi causes are histoplasmosis, coccidioidomycosis, blastomycosis, aspergillus, phycomycosis, candidiasis, Non-infectious causes are aspiration inhalation, post-radiation, post-drug administration, and hypersensitivity[1].

Diagnostic tests for confirmation of community-acquired pneumonia are signs and symptoms of past medical history[3], laboratory investigations like chest x-ray, sputum and blood tests, CRP, leukocyte count, total cell count, and pulse oximetry[4].

Antibiotics are a group of medicines used to treat infections caused by germs (bacteria and certain parasites). A parasite is a type of germ that lives in another living being(host). Antibiotics are sometimes called antibacterial or antimicrobials. Antibiotics are available in parenteral, oral, and topical (creams, ointment, or lotions) to treat certain infections[5]. It is important to remember that antibiotics only work against infections caused by bacteria and certain parasites. They do not work against infections that are caused by viruses (for example, the common cold or flu) or fungi (for example, thrush in mouth or vagina)

or fungal infections of the skin. There are various antibiotics available that exist in different brand names. Certain antibiotics kill germs like bacteria or parasites by interfering with the structure of the cell wall of the bacterium or parasites, termed Bactericidal and some other antibiotics inhibit the growth of germs termed Bacteriostatic. The choice of antibiotic mainly depends on the type of infection and the germ (bacterium or parasite) responsible for causing infection, because each antibiotic is effective only against certain bacteria and parasites[6].

Antibiotics given to treat community-acquired pneumonia are Piptaz (piperacillin and tazobactum sodium), amikacin, vancomycin, meropenem, ceftriaxone, augmentin/amoxiclav (amoxicillin and potassium clavulonic acid)[7].

Empherical antibiotic treatment of community-acquired pneumonia for op patients is clarithromycin 500mg po bd or azithromycin 500mg po bd, or doxycycline 100mg po bd. If comorbidities with a history of antibiotic use, then respiratory fluoroquinolone such as moxifloxacin 400mg po od or Gemifloxacin 320mg po od, or levofloxacin 750mg po od, or amoxicillin 1 gm tid, or amoxiclav 2gm bd, or ceftriaxone 1-2 gm bd, or cefpodoxime 200 mg po bd, or cefuroxime 500mg po bd plus macrolide antibiotic.

For IP patients (non-ICU) moxifloxacin 400mg IV tid or Gemifloxacin 320mg po od or levofloxacin 750mg po or iv od or ceftriaxone 2gm IV od, cefotaxime 1-2 gm IV tid, or ertapenem 1gm IV od plus macrolide antibiotic. For IP patients (ICU) ceftriaxone 2gm IV od, or cefotaxime 1-2 gm IV tid, or ampicillin/sulbactum 2gm IV tid plus azithromycin or fluroquinolones. Our research aim is to study the antibiotics and its outcomes among children with community-acquired pneumonia.

Methodology

A Hospital Based Prospective Observational Study was carried out with 70 Patients for about 6 months i.e., from June 2018 to December 2018. Inclusion criteria for this research work are Persons who are under the age of 12 and Persons only with Community-Acquired Pneumonia. Persons who give their signed informed consent Persons who are vaccinated with the Pneumonia vaccine. Exclusion criteria are Persons who are above the age of 12. Persons other than CAP and other complications. Patients in the emergency/Casualty department. Patients who are not willing to participate in the study.

All necessary and relevant information was collected on designed patient data collection form which contains demographic details, provisional diagnosis confirmatory diagnosis, radiographic data, social habitats, isolated organism, sensitivity & resistance to various antibiotics, treatment before culture report & after culture report of specimens of patients with CAP in IP general medicine department.

Permission for collecting patient's data was approved from Superintendent of RIMS hospital and Clinical guide of Paediatric ICU department. In addition, we also request Hospital management to permit to utilize the facilities for regular follow ups e prescriptions for undergoing a smooth and sophisticated research work.

Results were represented as frequencies, percentages, mean and medians. Percentage method was used for analyzing the data. Graph pad prism software was applied to analyze the data. In some cases, inferential statistics like Analysis of variance (ANOVA) followed by student 1test, (at 95% confidence interval and $P<0.05$ considered as significant) using SPSS 21.0 software.

RESULTS

Table No. 1: Distribution Based On Gender, Age, Duration Of Stay In Hospital With Community Acquired Pneumonia

S.NO	CHARACTERISTICS	NUMBER OF PATIENTS (N=70)	PERCENTAGE
1	GENDER		
	MALE	44	62.85%
	FEMALE	26	37.15%
2	AGE		
	0-2 Years	61	87.15%
	3-5 Years	6	8.5%
	6-8 Years	3	4.2%
3	DURATION OF STAY		
	3-5 days	39	55.71%
	6-8 days	18	25.7%
	9-11 days	9	12.85%
	12-14 days	4	5.7%
4	SEASONAL INCIDENCE		
	WINTER	36	51.42
	SPRING	23	32.85
	SUMMER	11	15.71

Table No.2: Distribution Based On Diagnostic Tests, Isolated Organisms, And Types Of Organisms.

S.NO.	CHARACTERISTICS	NUMBER OF PATIENTS (N=70)	PERCENTAGE
1	DIAGNOSIS		
	CHEST X-RAY, CBP, CRP	59	84.24
	CBP, CRP	11	15.71
2	WBC COUNT		
	5000-10000	28	40
	10000-15000	34	48.5
	15000-20000	8	11.4
3	RADIOLOGY FINDINGS		
	SINGLE LOBE INVOLVED	55	78.5
	MULTIPLE LOBE INVOLVED	15	21.5
4	SPUTUM TEST		
	PERFORMED	43	61.4
	NOT PERFORMED	27	38.6
5	ISOLATED ORGANISMS		
	BACTERIA	36	83.72
	VIRUSES	2	4.6
	FUNGI	5	11.6
6	BACTERIA TYPES ISOLATED		
	STREPTOCOCCUS PNEUMONIAE	17	44.73
	PSEUDOMONAS AERUGINOSA	12	31.5
	KLEBSELLA PNEUMONIAE	5	13.15
	STREPTOCOCCUS AUREUS	4	10.5

Table No.3: Distribution Based On Antibiotic Regimen And Empherical Therapy With Complications And Treatment For Complications.

S. NO.	CHARACTERISTICS	NUMBER OF PATIENTS (N=70)	PERCENTAGE
1	ANTIBIOTIC REGIMEN		
	AMIKACIN+CEFTRIAXONE	28	40
	AMIKACIN+PIPTAZ	15	21.6
	AMIKACIN+AMOXICILLIN	3	4.2
	CEFTRIAXONE	7	10
	VANCOMYCIN + MEROPENEM	1	1.4
	PIPTAZ+VANCOMYCIN	1	1.4
	PIPTAZ+CEFOTAXIME	2	2.8
	CEFTRIAXONE+PIPTAZ + AMIKACIN	8	11.4
	PIPTAZ+CEFTRIAXONE	5	7.1
2	EMPIRICAL THERAPY		
	MONOTHERAPY	7	10
	DUAL THERAPY	55	78.5
	TRIPLE THERAPY	8	11.4
3	COMPLICATIONS		
	SEPTICEMIA	11	15.7
	PLEURAL EFFUSION	4	5.7
	BOTH	7	10
	NO COMPLICATIONS	48	68.5
4	ANTIBIOTICS PRESCRIBED FOR COMPLICATIONS		

	CEFTRIAXONR+PIPTAZ + AMIKACIN	8	72.7
	CEFTRIAXONE+PIPTAZ	3	27.2

DISCUSSION

According to the Indian Academy of Pediatrics consensus guidelines for Community-Acquired Pneumonia (CAP), a prospective observational study has been conducted in RIMS to understand about disease, its complications, and Empirical treatment in this research study, we have mainly concentrated on type of antibiotic regimens used according to the severity of patient and complications involved addition, we have concentrated on different parameters like lab investigations, diagnosis, gender, age, pattern of antibiotic regimen, complications, antibiotics prescribed for pneumonia complications, length of the stay, seasonal incidence of CAP. For confirmatory diagnosis chest x-ray and sputum tests are performed. The obtained results of our study were compared with the results of other researched literature.

At first, we started with a simple parameter i.e., Patient's gender, males (62.85%) are being more affected with CAP than females (37%) and literature like Javier de-Miguel-Díez et al,[8] has got the same results.

In our study we conclude that patients with age group of 0-2 years are more affected i.e.,87.3 % and 8.5% of patients were affected between 3-5 years, and 4.3% of patients were affected between 6-8 years, but literature of Shally Awasthi et al,[9] had concluded that Community-Acquired Pneumonia (CAP) is the leading cause of mortality in children younger than five years of age in developing countries, including India.

In our study, minimum duration of hospitalization for CAP patients was 3 days and the maximum duration was 14 days. 39 patients had 3-5 days of hospital stay, 18 patients had 6-18 days of hospital stay, 9 patients had 9-11 days of hospital stay, 4 patients had 12-14 days of hospital stay and the same conclusions was given by Alexandre Cannesson and Narcisse Elenga et al,[10].

Seasonal variation in the incidence of disease in general, and of infectious diseases in particular. 36 patients had the incidence of CAP during the winter season, 23 patients had incidence of CAP during spring season, 11 patients had the incidence of CAP during summer season. This analysis was supported by the D. Lieberman et al,[11].

In our research study, patients who were recruited according to so inclusion criteria have undergone radiological examinations such as Chest X-ray, CBP, and CRP which constitutes 84.28%, 11 patients were assessed by CBP, CRP which constitutes 15.72%, this result is supported by Tim Lynch et al,[12].

In our study we concluded that the WBC count ranges 28 patients lies in the range between 5000-10000 cells/mm3 constituting of 40%, 34 patients lie in the range between 10000-15000 cells/mm3 constituting of 48.5%, 8 patients lies in the range between 15000-20000 cells/mm3 constitute of 11.5%, coincided with Tim Lynch et al,[12].

In our research study, patients who are recruited according to inclusion criteria have undergone radiological examination such as Chest XRAY 55 patients had single lobe infiltration constituted 78.5% remaining 15 patients had multiple lobe infiltration constituted 21.5% and compared with Tim Lynch et al., literature got the same results.

In our study, 43 patients had undergone a sputum culture test constituted 61.5% and 27 remaining patients did not undergo a sputum culture test constituted 8.5%.

In our study, patients with a clinical diagnosis of community-acquired pneumonia were selected. Of them, subjects had undergone sputum culture tests. We conclude that bacteria were most isolated microorganisms constituting for 84% followed by Fungus constituted 12% and virus constituted 4%, this result is supported by E Lahti et al,[13] Literature.

In a bacterial sample, it was found that Streptococcus pneumoniae was isolated in 17 patients constituted 47%, Pseudomonas aeruginosa was isolated in 12 patients constituting for 34%, Klebsiella pneumonia was isolated in 5 patients constituted for14%, Streptococcus aureus was isolated in 2 patients, constituted for 15% and the same conclusions were given by E Lahti et al, literature.

In our study, the microbial etiology was determined based on sputum culture test, the four most frequent pathogens were Streptococcus pneumoniae (17 patients [47%]), pseudomonas aeruginosa (12 patients [34%]), klebsiella pneumonia (5 patients [14%]), streptococcus aureus (4 patients [5%]). In a total of 36 bacterial samples these are the organisms isolated and a similar conclusion was given by Mauricio ruiz, santiago ewig et al,[14] Literature.

In our study we conclude that the most widely used antibiotic combination is AMIKACIN AND CEFTRIAXONE constituted 40%, followed by AMIKACIN+PIPTAZ constituted 22%, 3 patients were prescribed with Literature like Bhishma Pokhrel et al,[15] gave the same conclusions.

In our study, we concluded that,7 patients received Mono antibiotic therapy constituted 10%, 55 patients received a Dual antibiotic regimen constituted 78.5% and 8 patients treated with a Triple antibiotic regimen constituted 11.5% found the same pattern of results in the literature of Bhishma Pokhrel et al,[15] Gave the evidence that matches our study.

In our study, we concluded that patients with septicemia complication 11(16%), patients with pleural effusion complication 4(6%), patients with both septicemia and pleural effusion 7(10%), and 48(68%) had no complications that are supported by Sushant Patil et al,[16] literature

CONCLUSION

We concluded from this research work is that Male patients had higher incidence rates of occurring CAP when compared to Female patients. Maximum number of patients who were diagnosed with CAP belongs to below 5 years age group. The complications observed in children are pleural effusion and septicaemia. The most commonly prescribed treatment regimen during hospitalization for CAP is amikacin and ceftriaxone with less duration of hospital stay. Streptococcus pneumoniae and Pseudomonas Aeruginosa were the most common causative micro-organisms for CAP. In patients with Atypical Pneumonia, Triple antibiotic regimen was preferred over Dual therapy; also have higher Duration of Hospitalizations.

LIMITATIONS

As, the study duration was limited for 6 months. Patients required for our study was less. In our study majority of CAP patients had less than 5 days of hospital stay. In this regard, Microbiology Department should be strengthened in such a way that patients collect their sputum test reports within 24 to 48 hours. The X-ray reports are directly communicated through mobile phones rather than submitting the reports manually to the patients. To see the results. Decisions or confined to hospital formulary while prescribing antibiotics to CAP patients rather than prescribing correct antibiotics or broad-spectrum antibiotics.

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