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OUTCOME OF EMPIRICAL ANTIBIOTIC PRESCRIPTION FOR THE TREATMENT OF COMMUNITY ACQUIRED PNEUMONIA

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ABSTRACT

Background: One of the primary cause of illness and death in Bangladesh is community acquired pneumonia (CAP). Many hospitals in Bangladesh lack the resources to perform sputum cultures and sensitivity tests, making it difficult to identify the etiological agent of an infection. As a result, antibiotics are prescribed on a "empirical basis" rather than as part of a specific anti microbial treatment. The optimal antibiotic for treating CAP should be chosen using an empirical approach. **Objective:** The purpose of this study is to evaluate the effectiveness of various empirical antibiotic choices in the management of CAP. **Methods:** Eighty-two patients with CAP were included in this prospective observational research at a tertiary medical college hospital in Bangladesh. Inclusion and exclusion criteria were used to choose patients. Chest x-rays confirmed the diagnosis of CAP. The antibiotic was chosen based on clinical experience, which is an empirical method. The majority of patients received a combination antibiotic, whereas the remaining handful received monotherapy. The result served as an evaluation of the empiricism used in selecting the ant biotic. During the research, data were recorded in standardized formats. SPSS was used for the statistical analysis. **Results:** A total of 82 people were treated, and of them, 63 were men and 19 were women. The mean age was 54.4 ± 9.6 years.. The round of antibiotics was supposed to last for a week. There were no unwanted medication reactions. No cases of lung abscess or parenchymal damage to the lungs occurred, and only one patient had paraneumonic effusion. Every single person made a full recovery. **Conclusion:** In many hospitals in Bangladesh, the choice of antibiotic for treating CAP is made on a "empirical" basis. Selecting an appropriate antibiotic requires better sputum culture and sensitivity testing in hospital labs.

KEYWORDS: Community acquired pneumonia, Empirical, Antibiotic.

INTRODUCTION

Pneumonia that develops outside of a hospital or nursing home is known as "community acquired pneumonia" (CAP).[1] It's a global health crisis that's taking lives. Also possible are cardiovascular-related complications. Patients report symptoms such as a persistent cough, high temperature, chills, rigor, exhaustion, dyspnea, and pleuritic chest discomfort.[2] The CURB 65 scoring system and the pneumonia severity index are used in conjunction with clinical judgment to determine whether or not hospitalization is necessary. The contributors of CURB 65 scores include confusion, blood urea > 7 mmol/L, respiratory rate > 30 breaths/min, systolic blood pressure < 90 mm/Hg and diastolic blood pressure < 60 mm/Hg. High respiratory rate (> 30 breaths per minute), and low blood pressure (systolic BP <90 mm Hg, diastolic BP <60 mm Hg) all indicate cardiovascular disease. Five points total, one for each unique character. Patients with scores of 0 or 1 are candidates for outpatient treatment, those with scores of 2 need hospitalization in an inpatient ward, and those with scores of 3 require hospitalization in an intensive care unit (ICU).[3] The elderly have a disproportionately high rate of hospitalization. First, a diagnosis is made based on the patient's history and physical examination in addition to the results of diagnostic tests such a chest x-ray, a complete blood count, a blood sugar reading, a blood culture and sensitivity test, and a sputum culture and sensitivity test. In certain circumstances, even with the most cutting-edge diagnostic tools, no organism is found, and in very few cases are respiratory viruses identified.

Antimicrobial treatment decisions should be based on empirical evidence, according to Principle 3.[4-7] An efficient antibiotic selection is crucial for lowering antibiotic overuse and preventing antibiotic resistance. The term "empirical selection" refers to a decision made on the basis of actual clinical data. Antibiotic treatment should be followed up on regularly.[4] Beta-lactum with macrolide (clarithromycin) or fluoroquinolone (levofloxacin) or doxycycline started within 4-8 hours of admission was related with decreased mortality, according to an empirical meta-analysis.[5,6] After the symptoms have improved and the patient is no longer febrile, the parenteral antibiotic may be switched to an oral antibiotic.[7] Monotherapy with a macrolide (clarithromycin or doxycycline) is an option for treating CAP in the outpatient setting.[8] Patients with comorbidities, such as COPD, may be treated with an oral Beta-lactum with a macrolide (clarithromycin) or a respiratory fluroquinolone (levofloxacin, gemifloxacin, or moxifloxacin). Beta-lactam combined with azithromycin or a respiratory fluoroquinolone is an effective treatment for severe CAP in the intensive care unit.[8] Patients at risk for a pseudomonas infection may be treated with a combination of an aminoglycoside and either an anti-pseudomonal fluoroquinolone (levofloxacin or ciprofloxacin) or a lactum antibiotic (such as piperacillin/tozabactum, imipenem/cilastatin, meropenem, doripenem, or cefepime). Vancomycin or linezolid may be used to treat those at risk of infection with methicillin-resistant Staphylococcus aureus. Patients above the age of 65 may be protected against CAP caused by pneumococci and influenza with vaccinations.[9-11]

OBJECTIVE

The focus of this research was to highlight the importance of using an empirical approach when selecting an antibiotic. In terms of the antibiotic's efficacy as a single agent or in combination therapy, the best medicine available should be selected for the treatment of CAP, and this decision should be made on an individual basis for each patient.

METHOD

This prospective observational research was conducted from August 1, 2022, to January 31, 2023, in the medicine ward of the Tertiary Medical College Hospital in Khulna, Bangladesh. In all, 82 male and female adults with CAP from the general public were included. Inclusion and exclusion criteria were used to choose patients.

Patients who had community-acquired pneumonia were included in this analysis. Patients with preexisting conditions such as pulmonary TB, pleural effusion from tuberculosis, bronchogenic cancer, cardiac failure, renal failure, or being pregnant were also excluded. Each participant gave their written agreement before being enrolled. Each patient had a thorough medical history and physical examination. To meet the criteria for CAP, a patient must have two or more of the following acute illness symptoms and signs: fever, cough, sputum, dyspnea, chest pain, features of consolidation on examination of the chest, and presence of radiological features of consolidation in chest x ray. Severity of CAP Capture Mini mental state score 8, blood urea > 7mmol/1, respiratory rate > 30 breaths per minute, systolic BP > 90 mm Hg, diastolic BP 60 mm Hg, age > 65 years; these factors were used to determine CURB 65 scores. Five points total, one for each unique character. It is advised that patients with scores of 0 or 1 get outpatient treatment, those with scores of 2 receive inpatient ward care, and those with scores of 3 receive inpatient intensive care unit (ICU) care. The patient's pulse, body temperature, and chest x-ray results were all documented.

From patient histories and medical records, we were able to identify the presence of co-morbid illnesses such as asthma, COPD, hypertension, diabetes, and the use of steroids or other immunosuppressants. The rustiness or purulence of sputum was noted and documented. Due to a lack of resources, a sputum culture and sensitivity test were not performed. Each patient's antibiotic was chosen on an "empirical basis," drawing on prior experience and observation in the treatment of CAP patients.

Patients were usually given a regimen that included injection of Ceftriaxone 1g 12 hourly + Oral Clarithromycin 500 mg 12 hourly and injection of Ceftriaxone 1g 12 hourly + Levofloxacin 500 mg once daily, injection of Ceftriaxone 1g 12 hourly + Moxifloxacin 400 mg tablet once daily, injection Amoxicillin + Clavulanic acid 1.2g 8 hourly + Oral Clarithromycin 500 mg 12 hourly, or Amoxicillin + Clavulanic acid 1.2g 8 hourly + Levofloxacin 500 mg or Moxifloxacin 400 mg tablet once daily. The duration of antibiotic therapy was extended to seven days. Patients did not report any negative medication reactions. Clinical characteristics and chest x-ray results were tracked again after 7 days to document treatment efficacy. After 14-21 days later, there is no sign of lung consolidation on a chest x-ray. Lung parenchyma was unharmed, and no abscesses developed.

The results were used to assess the efficacy of the antibiotics used on an impromptu basis in each patient. During the research, data were recorded in standardized formats. SPSS was used for the statistical analysis.

RESULTS

82 patients were enrolled in this study. 63 (76.83%) were male and 19 (23.17%) were female. Age was from 21 to 82 years. Mean age was 54.4 ± 9.6 years. Highest number of patients-22 (26.83%) were in 61-70 years age group and 19 (23.17%) patients were of 51-60 years old. (Table-I).

Table I: Age and sex distribution of the patients.

Age group	Male, total number	Female, total number	Total number	%
21-30	4	2	6	7.31
31-40	6	2	8	9.76
41-50	8	8	16	19.51
51-60	19	0	19	23.17
61-70	20	2	22	26.83
71-80	5	5	10	12.19
81-90	1	0	1	1.23

28 (34%) patients were without any co-morbidities 92.69% patients had co-morbidities such as diabetes mellitus (34%), immunosuppression due to steroid intake (19%), hypertension (17.69%), smoking habit and (4%). (Table-II)

Table 2: Co-morbidities of the patients.

	Number	Percentage (%)
Chronic obstructive pulmonary disease	6	7
Asthma	8	10
Smoking	4	4
Diabetes mellitus	28	34
Immunosuppression	15	19
Hypertension	14	17.69
Parapneumonic effusion	1	1
No Co-morbidity	6	7.31
Total	**82**	**100**

Highest number of patients 44 (55%) received dual therapy with Oral co-amoxiclav plus oral Clarithromycin. Dual therapy with inj. Ceftriaxone plus oral Clarithromycin was used in 12(15%) patients. Inj. Ceftriaxone plus Cloxacillin was used in 10 (12%) and inj Ceftriaxone plus oral Linezolid was used in 2(2%) patients.

Table III: Empirical selection of antibiotic.

	Number	Percentage (%)	Recovery	Death
Inj. Ceftriaxone	12	15	12	0
Inj. Ceftriaxone plus oral Clarithromycin	12	55	12	0
Oral co-amoxiclav plus oral Clarithromycin	44	55	44	0
Inj. Ceftriaxone plus oral Cloxacillin	10	12	10	0
Inj. Ceftriaxone plus oral Linezolid	2	2	2	0
Inj. Meropenem	2	2	2	0
Total	82	100	82	0

Monotherapy with single antibiotic was used in 5 (6.09%) patients, dual therapy with two anti biotic was used in 65 (79.23%) patients. Triple antibiotic was used in 12 (14.63%) patients. (Table-IV).

Table IV: Number of antibiotics used for each patient.

Number of antibiotic used	No of Patient	Percentage (%
Mono therapy	5	6.09
Dual therapy	65	79.23
Triple therapy	12	14.63
Total	82	100

DISCUSSION

Even at academic medical centers, access to sputum for culture and sensitivity (c/s) testing is limited in Bangladesh. Consequently, the antibiotic used to treat CAP is chosen on the basis of past experience rather than theory. The empirical antibiotic selection trend for the treatment of CAPD was tracked in this investigation. By keeping an eye on the result of therapy, we assessed the antibiotic's efficacy. S. pneumoniae, S. pyogenes, S. aureus, and K. pneumoniae were all found in the sputum of CAP patients who underwent a culture and susceptibility test at the Bangladesh institute for research and rehabilitation in diabetes, endocrine, and metabolic disorders (BIRDEM) in Bangladesh. Ceftriaxone,

meropenem, coamoxiclav, clarithromycin, and linezolid were all effective against these microorganisms.[12] The Chinese research found that Levofloxacin was used as a single empirical antibiotic in 15% of cases with CAP.[13] Therefore, the microorganisms that cause CAP and the antibiotics that are used to treat it vary depending on location. Antibiotic therapy for CAP is often initiated by empirical selection in the United States, with further adjustments made using the sputum c/s test findings. Most patients should be treated with either macrolide or doxycycline monotherapy, with either levofloxacin or moxifloxacin as a second-line option.[14]

Guidelines and patient subgroups in outpatient settings might have different recommendations for antibiotic selection. Cohort studies and observational studies have shown that beta lactams and the combination of beta lactam and macrolides are better on the ward and in the intensive care unit. Hospitalized CAP patients were randomly assigned to receive either a beta lactam antibiotic alone, a beta lactam antibiotic plus a macrolide, or levofloxacin alone. Beta lactam was shown to be superior in patients with a CURB 65 score of 0–1. Patients with a CURB 65 score of 3.14 or higher, indicative of a severe case of community-acquired pneumonia, were shown to benefit most from therapy with a combination of beta lactum and macrolide. To effectively treat CAP in low-resource hospital settings, empirical antibiotic selection is crucial. In 14 instances (18%), we utilized only one medication. There were 56 instances where dual treatment was administered (68%), and 12 cases when triple antibiotics were used (14%). Since the CAP-causing microbe was never isolated, a combination of antibiotics had to be employed.

This study's enrollment was tiny, and it was conducted at a single location, thus it has certain restrictions. We excluded individuals with severe CAP who were being treated in an ICU from our analysis. A better understanding of the result of empirical selection of antibiotic in CAP patients will be revealed by a multi-center research with a large number of patients, including ICU patients.

CONCLUSION

Most hospitals in Bangladesh, even big teaching hospitals, treat CAP using an antibiotic chosen on the basis of doctors' prior knowledge and experience with the disease in the region. Despite the success, antibiotic abuse and overuse contribute to the problem of antibiotic resistance. Therefore, hospital labs need to be better equipped to conduct sputum for culture and sensitivly test.

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