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Research Article

Rational Use of Antibiotics for Community Acquired Pneumonia in Thi-Qar's Hospitals

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A B S T R A C T

Introduction: The hospital and laboratory findings of all adult patients who were hospitalized in Thi-Qar's hospitals were reviewed during the period (1 November 2020 to 30 August 2021) with a clinical feature of community acquired pneumonia.

Objective: Evaluation based on differentiation of community acquired pneumonia from other types, location of therapy, treatment strategy, and duration of therapy.

Methodology: We identified potential cases ranging in age from 23 to 75 years at the time of admission. The hospitals findings were requested and reviewed for eligibility. All data were collected by the Case Information Sheet (CIS) project, a general practice research database containing data from hospital patient records of about 42 patients in the Thi-Qar's hospitals and the details of the database have been described. The Case Information Sheet contains coded and anonymous data on patient demographics, symptom, and treatment including their indications and dosage regimen.

Results: The study revealed that 19% were known to have CAP, the others (81%) had probability to have HCAP. All patients were treated as an inpatient (ward). It was found that 22% of patient should receive either macrolide or doxycycline, but their treatment was different, and 52% should be treated as an inpatient with moderately sever condition.

Conclusion: The study concluded that 40% of patients should be treated as an outpatient, 36% of patients should be treated as either outpatient or inpatient, and 24% of patients should be treated as inpatients. Also, 59% of patients had received over treatment, 24% had received under treatment, and just 9% complied with the guideline therapy. Finally, the duration of therapy was complied with the guideline therapy.

Keywords: Antibiotics, Community Acquired Pneumonia, Hospital Acquired Pneumonia

Introduction

Pneumonia is defined an infection of the one or both lung sac, when patients are infected with pneumonia these sacs will be filled with secretions like fluids or pus that led to cough. The causative microorganisms that are responsible for pneumonia are including the following bacteria, viruses, and fungi that sometimes cause pneumonia.

Pneumonia is often classified into many types of classification sometimes classified based on where it was acquired either in hospital or from the community.[1]

The main causative microorganisms of pneumonia are Streptococcus pneumonia, H. influenzae & Moraxella catarrhalis and other respiratory viruses may also cause pneumonia in adults. MRSA is an important cause of severe, necrotizing pneumonia.[2] Data collected from the United Kingdom were suggested that an estimated from 5 to 11 cases from 1000 adults suffered from community-acquired pneumonia (CAP) per year, accounting for around five to twelve % of all lower respiratory tract infections. It occurs at all age groups but is more common to occur at the extremes of age worldwide, CAP continues as still the most causative for death in children more than any other disease.

Most cases are spread by droplet infection and, whilst CAP may occur in previously healthy individuals, several factors may impair the effectiveness of local defenses and predispose to CAP. Streptococcus pneumoniae remains the most common infecting agent. The likelihood that other organisms may be involved depends on the age of the patient and the clinical context. Viral infections are important causes of CAP in children, and their contribution to adult CAP is increasingly recognised.

Mycoplasma pneumoniae is the most common cause of pneumonia in young persons and it is rare in older persons, while H. influenzae is more common in older persons, especially when there is underlying lung disease. And regarding Staphylococcus aureus is most common following an episode of influenza. Some of the occupations are associated with exposure to certain bacteria.[3]

Methodology

The hospital and laboratory findings of all adult patients who were hospitalized in Thi-Qar hospitals were reviewed during the period (1 November 2020 to 30 August 2021) with a clinical feature of community acquired pneumonia.

Potential cases were identified, aged 23 to 75 years at the time of admission. The hospitals findings were requested and reviewed for eligibility.

All data were collected by the Case Information Sheet (CIS) project, a general practice research database containing data from hospital patient records of about 42 patients in the Thi-Qar's hospitals and the details of the database have been described. The Case Information Sheet contains coded and anonymous data on patient demographics, Symptoms, and treatment including their indications and dosage regimen.

Ethical Approval

This study received ethical approval from the The University of Thi-Qar/College of pharmacy Research Ethics Committee (Approval No. IRB01092023), dated (01/09/2023). All procedures involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee.

Symptoms[4]

CAP symptoms are summarized below adults mostly have few and low severe signs including fever or hypothermia, shivering, sweating, Cough with or without sputum, chest pain, dyspnea, fatigue, myalgia, abdominal pain, loss of appetite and headache.

Scores system in CAP of the severity of illness[4]

1. CURB-65(tables 1 and 2)
2. Pneumonia severity index

- Evaluates 20 patient features
- Assesses mortality risks, same to that of CURB-65
- Has estimated ability like that of CURB-65 but preferred in patients with lower risk.

Table 1.CURB-65 Scoring

CURB-65[a]	
Symptom	**Points**
Confusion	1
Urea>19mg/dl	1
Respiratory rate ≥ 30 breaths/minute	1
SBP<90mm Hg, DBP ≤ 60mm Hg	1
Age ≥ 65 yr	1

[a]CRB-65(without a blood urea nitrogen concentration) is useful in a primary pratice setting.
DBP=diastolic blood pressure; SBP= systolic blood pressure.

Table 2.CURB-65 Location of Therapy

CURB-65		
Score	**Risk of Death at 30 Days (%)**	**Location of Therapy**
0	0.7	Treat as outpatient
1	2.1	Treat as outpatient
2	9.2	Outpatient or inpatient
3	14.5	Inpatient (± ICU)
4	40.0	Inpatient (±ICU)
5	57.0	Inpatient (±ICU)

ICU = intensive care unit.

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Hospital-acquired pneumoniae (HAP)

Define it as a cough with pus in sputum along with X-ray confirming consolidation in patients who are less than two days of their first day of admission to hospital or who have been in a healthcare setting within the last three months.

Hospital-acquired pneumonia is the 2nd most common type of hospital-acquired infection after urinary tract infection and carries is significant mortality risk, especially in the adult patients or those who have comorbidities like stroke, lung diseases or diabetes mellitus. In HAP, the causative microorganisms differ from those causing CAP.[5]

Clinical Presentation and Diagnosis

Hospital-acquired pneumonia is diagnosed based on the X-ray investigations and clinical examination. Patients must have new or progressive infiltrates on X-ray examination in addition to 2 of 3 of the following: fever more than 38°C, leukopenia and pus in sputum. Patients will have declines in oxygen saturation, but these finding are less specific for determining the need for empiric antimicrobial agents.[6-8]

Clinical Data

Medical findings were abstracted to determine the demographic, history, and clinical data that available to the physicians who admitted the patients at the time that a clinical diagnosis of pneumonia was done. These included age, gender, admission and discharge time, marital status, residence, body mass index, pneumonia vaccination, monthly income, physical activity, educational level, and job.[9-11]

Medical history was ascertained, including smoking habit, alcohol abuse, and history of other diseases.

Because the nature of the causative organisms is uncertain, prompt empiric treatment therefore often requires the selection of the therapy for a patient according to the severity of the conditions which determined by using CURB-65 scoring.

Patient Characteristics

Differentiation of CAP from other types

Of the 42 patients, 8 (19%) were known to have CAP, the others 34 (81%) had a probability to have HCAP (fig. 2). This classification was based on-risk factors of having HCAP as illustrated in table 3. It was found also that some patients have more than one risk factor to be categorised as having HCAP.

Patient name:		**Age**:	**Sex**:	F
Date of admission: / /		**Date of discharge**: / /		
Marital status:	S	**Residence**:	city center / country side	vill age
Weight: kg	**Tall**: cm	**Pneumonia vaccination:**	Y	N
Monthly income:	< 500000 ID	>500000 ID	**Alcohol consumption**:	
Smoking habit:	sm oker / heavy smoker / non smoker		**Physical activity**:	
Educational level:		**job:**		

CURB-65 Scoring

Symptom	Points
Confusion	1
Urea > 19 mg/dL	1
Respiratory rate ≥ 30 breaths/minute	1
SBP < 90 mm Hg, DBP ≤ 60 mm Hg	1
Age ≥ 65 yr	1
Total	

Treatment

1-
2-
3-
4-
5-
6-
7-

Location of therapy	ward	ICU

The patient receipt antibiotic therapy (within the past 3 months)?	Y	N
The patient hospitalized for two days or more in the past three months?	Y	N
The patient had residence in nursing home or long-term care facility?	Y	N
The patient receipt IV antibiotic therapy, chemotherapy?	Y	N
The patient had wound care in the past three months?	Y	N
The patient had attendance in the hospital or hemodialysis clinic in the past 30 days?	Y	N

Figure 1.Case Information Sheet

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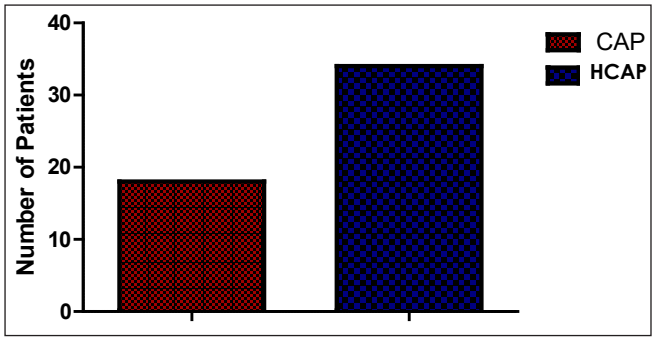

Figure 2.Types of pneumonia with their cases number

Table 3.Number of patients had health care associated pneumonia' risk factor

No.	Possible cause	Number of patients
1	Received antibiotic therapy within the past 3 months	26
2	Hospitalised for two days or more in the past three months	22
3	Had residence in a nursing home or long-term care facility	1
4	Receipt IV antibiotic therapy or chemotherapy	8
5	Had wound care in the past three months	7
6	Had attendance in the hospital or haemodialysis clinic in the past 30 days	4

Location of Therapy

According to CURB-65 Scoring, the treatment of patients was classified into either outpatient or inpatient, and the inpatient class was sub-classified into either inpatient (ward) or inpatient (± ICU), as illustrated in Table 4.

The patients in the study were all treated as an inpatient (ward), whereas the data summarised in Table 4 showed that 17 (40%) of patients should be treated as an outpatients, 15 (36%) patients should be treated as either outpatients or inpatients according to patient conditions, and 10 (24%) patients should be treated as inpatients (± ICU)

Table 4.CURB-65 and therapy location

CURB-65 score	Number of patients	Location of Therapy
0	1	Out patient
1	16	Out patient
2	15	Outpatient or in patient
3	7	In patient ± I.C. U
4	3	In patient ± I.C. U
5	0	In patient ± I.C. U

Treatment Strategy

According to the treatment guidelines that were collaborated on between the Society of Infectious Diseases of America and the American society of thoracic which correlate between the location of therapy and severity of the disease, it was found that:

Outpatient treatment

Among the patients that should be treated as an outpatient, the treatment guideline should be as the following:

The patients who was healthy previously and have not used antibiotic in the last 3 months

1. Macrolides (clarithromycin or azithromycin when Haemophilus influenza is suspected)
2. Doxycycline

Patients who have comorbidities (COPD, DM, CRF, CHF, cancer, or immunocompromised) or newly antibiotic therapy (within the last 3 months)

1. Respiratory fluoroquinolones (moxifloxacin, gemifloxacin, or levofloxacin [750 mg])
2. Macrolides (or doxycycline) with high-dose amoxicillin (1000 mg three times per day) or Amoxiclav (2000 gm twice daily) or a cephalosporin (ceftriaxone, cefuroxime, or cefpodoxime)

It was found that 9 (22%) of patient should receive either macrolide or doxycycline but their treatment was as the following

1. 3 (33%) of them was treated with ceftriaxone
2. 2 (22%) of them was treated with ceftriaxone + levofloxacin
3. 2 (22%) of them was treated with ceftriaxone + Azithromycin
4. 1 (11%) of them was treated with ceftriaxone + meropenem
5. 1 (11%) of them was treated with meropenem + vancomycin+ amikacin

It was found that 8 (19%) of patient should receive either respiratory fluoroquinolone or macrolide with Amoxicillin or Amoxicillin/ clavulanate or a cephalosporin, but their treatment was as the following

1. 4 (50%) of them was treated with ceftriaxone + Azithromycin, i.e., comply with the treatment guideline
2. 3 (37.5%) of them was treated with ceftriaxone alone
3. 1 (12.5%) of them was treated with ceftriaxone + levofloxacin

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Inpatient with moderately sever condition

It was found that 22 (52%) should be treated as an inpatient with moderately sever condition, the treatment guideline should be as the following:

1. Fluoroquinolones (moxifloxacin, Gemifloxacin [oral only], or levofloxacin [750 mg])
2. Ampicillin, ceftriaxone, or cefotaxime (ertapenem in selected patients) + macrolides (or doxycycline)

It was found that:

1. 3 (14%) of them was comply with treatment guideline
2. 7 (32%) of them was treated with ceftriaxone alone or cefotaxime alone
3. 4 (18%) of them was treated with meropenem alone
4. 3 (14%) of them was treated with ceftriaxone +levofloxacin
5. 4 (18%) of them was treated with meropenem + either azithromycin or levofloxacin or ceftriaxone or vancomycin
6. 1 (4%) of them was treated with cefixime + levofloxacin

Inpatient with sever condition

It was found that 3 (7%) patients should be treated as empirical therapy of patients who was hospitalized with severely diagnosed pneumoniae that need intensive care unit treatment (that may need additional antibiotic when Pseudomonas or [MRSA] is suspected)

1. Ampicillin /sulbactam plus either a respiratory quinolone or azithromycin.
2. Ceftriaxone plus either a respiratory quinolone or azithromycin
3. Cefotaxime plus either a respiratory quinolone or azithromycin

It was found that

1. 2 (67%) of them was treated with meropenem alone
2. 1 (33%) of them was treated with meropenem + vancomycin + ceftazidime + azithromycin. The result can be summarized as in fig. 3

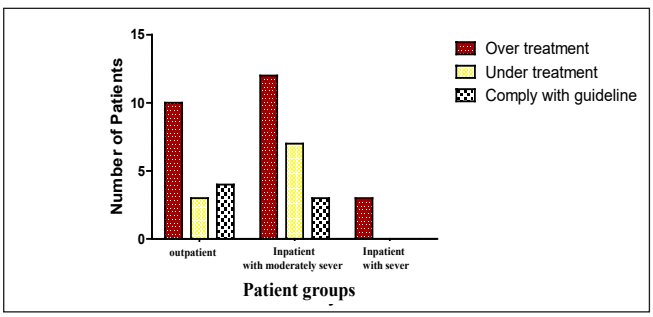

Figure 3.Classification of patients according to treatment strategy

Duration of therapy

It was found that the mean residence time in hospital was 4.78±2.987, and this duration was agreed with the standard treatment which stated that it should be 5 days with 2–3 days afebrile with no more than one sign of clinical instability.

Results & Discussion

The findings of this study provide valuable insights into the management of community-acquired pneumonia (CAP) and healthcare-associated pneumonia (HCAP) in a clinical setting. The differentiation between CAP and HCAP is critical, as HCAP is associated with a higher risk of multidrug-resistant (MDR) pathogens and requires a different therapeutic approach.[12] In this study, 81% of patients were classified as having HCAP based on risk factors such as recent antibiotic use, hospitalisation, or residence in long-term care facilities. This aligns with existing literature, which highlights that HCAP patients often have multiple risk factors, increasing their susceptibility to MDR pathogens.[13]

The CURB-65 scoring system was used to determine the appropriate location of therapy (outpatient vs. inpatient). However, discrepancies were observed between the recommended and actual treatment settings. For instance, 40% of patients who should have been treated as outpatients were instead admitted as inpatients. This could reflect clinical judgment based on comorbidities or severity not fully captured by CURB-65, which has limitations in predicting outcomes in certain populations.[14] Additionally, the overuse of inpatient care may contribute to increased healthcare costs and resource utilisation.

Regarding treatment strategies, significant deviations from the ATS/IDSA guidelines were noted. For outpatients, only 22% received guideline-recommended macrolides or doxycycline, while the majority were treated with broader-spectrum antibiotics like ceftriaxone. This overuse of cephalosporins and carbapenems may contribute to antibiotic resistance, a growing global concern.[15] Similarly, for inpatients with moderately severe conditions, only 14% received guideline-compliant therapy, with many receiving monotherapy or inappropriate combinations. This underscores the need for improved adherence to evidence-based guidelines to optimise patient outcomes and reduce resistance.

The treatment of severely ill patients also showed deviations, with most receiving meropenem alone or in combination with other antibiotics. While meropenem is effective against MDR pathogens, its overuse can exacerbate resistance.[16] The study highlights the importance of tailoring therapy based on local resistance patterns and patient-specific factors.

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The mean hospital stay of 4.78 days aligns with the recommended 5-day treatment duration for CAP, provided patients are clinically stable.[12] This suggests that, despite deviations in antibiotic choice, the duration of therapy was appropriate.

Conclusion

This study reveals significant gaps in the adherence to ATS/IDSA guidelines for pneumonia management, particularly in differentiating CAP from HCAP and selecting appropriate treatment regimens. The overuse of broad-spectrum antibiotics and deviations from guideline-recommended therapy may contribute to antibiotic resistance and suboptimal patient outcomes. These findings underscore the need for:

- **Enhanced Education and Training:** Physicians should receive ongoing education on evidence-based guidelines and the importance of antibiotic stewardship.
- **Local Guidelines:** Development of local treatment protocols that consider regional resistance patterns and patient demographics.
- **Antibiotic Stewardship Programs:** Implementation of programs to monitor and optimize antibiotic use, reducing the risk of resistance.
- **Improved Diagnostic Tools:** Better tools to differentiate CAP from HCAP and identify MDR pathogens early during treatment.

By addressing these issues, healthcare systems can improve the management of pneumonia, reduce antibiotic resistance, and enhance patient outcomes.

Conflict of Interest: None

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Declaration of Generative AI and AI-Assisted Technologies in the Writing Process: None

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