Prescribing Patterns of Antibiotics for Community-Acquired Pneumonia in Adult in King Saud Hospital

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Authors' contributions

This work was carried out in collaboration between both authors. Author MSS develop the ideas of the research, designed the study, revised and corrected the final draft of the manuscript. Author BAA managed the literature searches, wrote the proposal, performed the statistical analysis and wrote the first draft of the manuscript. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Background: Community acquired pneumonia (CAP) is defined as a presence of symptoms and signs consistent with an acute lower respiratory tract infection associated with new radiographic shadowing for which there is no other explanation (eg, not pulmonary oedema or infarction). CAP was the highest leading cause of hospitalization among Saudi population (18.8%). Antibiotics are key cornerstone of treatment of the bacterial CAP. The inappropriate prescribing pattern of antibiotics leads to drug-resistance and treatment failure.
Objective: The aim of this research study is to determine whether the physicians in King Saud hospital follows the (IDSA/ATS) guidelines or not.
Methods: In this research we employ cross-sectional retrospective survey that has been conducted among patients with community-acquired pneumonia admitted in King Saud hospital in Unayzah city from the period of January 2011 to December 2015.
Results: Total 117 files has been reviewed over the period from January 2011 to December 2015. The majority of the patients were males (57.3%). Community-acquired pneumonia was found to be widely spread among patients aged between 36 and 45-year-old (27.4%), and less common at age

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between 18 and 25-year-old (12.8%). Patient with diabetes, CVD, and respiratory disorder were treated with dual and triple therapy rather than monotherapy. Fluoroquinolones were the most type of antibiotics used (48.7%) followed by macrolides (40.2%). Only 59 (50.4%) patients having written information at point of discharge, whereas 58 (49.6%) had no written information. Macrolide and amoxicillin / clavulanate were the most prescribed antibiotics at the time of discharge hence the ratio is 26.5% and 11.1% respectively.

Conclusion: The hospital does not follow known guideline such as IDSA for treatment of community-acquired pneumonia in adult.

1. INTRODUCTION

Pneumonia is a lung parenchyma infection, while Community - Acquired Pneumonia (CAP) is varied from hospital-acquired pneumonia (HAP) whereas Community-acquired pneumonia develops outside a hospital or care homes. CAP is defined as a presence of symptoms and signs consistent with an acute lower respiratory tract infection associated with new radiographic shadowing for which there is no other explanation (eg, not pulmonary oedema or infarction) [1]. CAP is a leading cause of death in the United States and a primary indication for antimicrobial drug used in inpatient and outpatient settings [2]. Furthermore, CAP is also being consider the main cause of death and illness in the developing countries [3]. According to Gulf Cooperation Council (GCC) the most frequently isolated pathogens are found and responsible for Community-acquired pneumonia are *S. pneumoniae*, *H. influenzae*, and *M. catarrhalis* [4]. CAP were the highest leading hospitalization cause among Saudi population (18.8%) [5].

Antibiotics are key cornerstone for CAP treatment. Whereas inappropriate use of antibiotics is a major factor that leads to increase in resistant bacteria and treatment failure, which prompted the need of using antibiotics judiciously in practice [6]. In addition, this misuse is common and is currently consider to be one of the major public health issues in the Saudi Arabia and worldwide [7]. To tackle bacterial resistance, WHO proposed numerous interventions that prescribers adopt and use for guidelines, based on strong evidence for the use of antibiotics [8]. Antibiotic treatment of CAP has typically begun that empirically based on the most possible pathogens. Therefore, the Infectious Disease Society of America and the American Thoracic Society (IDSA/ATS) have developed a guideline to prevent or decrease resistance, especially drug-resistant S. pneumoniae (DRSP) [9]. Rational drug use take place when the drug prescribed in appropriate, affordable, available, dispensed correctly and correct doses at adequate time intervals [10]. Many studies were conducted to assess antibiotics prescribing pattern for the treatment of CAP and emphasized the importance of implementation of antimicrobial usage guidelines for the treatment of community-acquired pneumonia [11,12]. A study published by Sanjay Kumar et al, illustrates the discrepancy in the prescribing habits of the attending consultants in the treatment of CAP [13]. Generally, misuse of antibiotics is considered high in the Saudi Arabia, which requires immediate intervention [14,15]. Malcolm C et al, reported that patient factors (age, presence of COPD, antibiotic therapy at the time of presentation), physician factors (experience treating pneumonia), and site of presentation are all lead to 50% increase of inappropriate use of levofloxacin compare to other antibiotics [16].

1.1 Objective

General: The aim of this study is to evaluate the prescribing pattern of antibiotics for the treatment of community acquired pneumonia in adult in King Saud hospital (KSH).

Hypothesis: According to the research problem statement we constructed our research hypothesis that determine whether the physician in King Saud hospital follows the (IDSA/ATS) guideline or not.

Ho: (IDSA / ATS) Guidelines has not been followed by the physicians of King Saudi Hospital for CAP treatment.

Ha: King Saudi Hospital Physicians appropriately following the guidelines of (IDSA / ATS) for CAP treatment.

1.2 Significance of the Study

This study has been conducted in order to evaluate the prescribing pattern of antibiotics in King Saud hospital to support health-care providers and policy makers in a way to reduce drug-resistance, treatment failure and financial cost.

2. RESEARCH METHODS

2.1 Study Population and Location

The study was conducted in King Saud hospital. King Saud hospital is a tertiary hospital located in Unayzah city, Kingdom of Saudi Arabia in 2016. The study conducted on patients aged more than 18 years with a primary diagnosis of community-acquired pneumonia and admitted to the hospital during January 2011 to December 2015 was reviewed.

2.2 Research and Design Sample Size

A cross-sectional retrospective survey was conducted on 117 patients with community-acquired pneumonia caused by bacterial infection. Convenient sampling technique was applied to the recruit sample of the study. While demographic and clinical data has been collected retrospectively from patient medical records who had been admitted to KSH during January 2011 to December 2015. After we contact with the hospital administration and the ministry of health administration, they said that there is no local guideline to be followed. So, the assessment of antibiotics prescribing for adult and elderly was carried out based on the (IDSA/ATS) guideline.

2.3 Inclusion Criteria

Patients aged more than 18 years, with a primary diagnosis of community-acquired pneumonia (CAP) caused by bacterial infection.

2.4 Exclusion Criteria

Patients, age less than or equal to 18 years has diagnosed with community-acquired pneumonia caused by viruses or fungi or do not diagnosed with community-acquired pneumonia.

2.5 Data Collection Form

Data was extracted from patient's medical record using a detailed data collection form. Whereas, form includes space for demographic profile, diagnosis, history of use of antimicrobials before the hospital admission (if data available), duration of hospitalization, initial antimicrobials treatment, duration of antimicrobial treatment at the hospital, change in antimicrobials during treatment period, investigations, and clinical findings from hospital admission until discharge and antimicrobials prescribed at the time of discharge.

2.6 Data Analysis

In this research study the collected data has been analyzed by using the SPSS software (version 21), the chosen level of level of significance is ≤ 0.05.

2.7 Research Approval

The research proposal has been ethically approved by Qassim Research Ethics Committee.

3. RESULTS

3.1 Demographic Data

A total of 117 files from King Saud hospital were reviewed retrospectively. The majority of the patients are males (57.3%), while females are (42.7%). Most of patients' age ranged from 36 to 45 (27.4%) years of both genders. Table 1 below shows the demographic data of participants.

Table 1. Demographic information

Gender	Frequency (%)
Male	67 (57.3)
Female	50 (42.7)
Total	117 (100)
Age	
18-25	15 (12.8)
26-35	21 (17.9)
36-45	32 (27.4)
46-55	30 (25.6)
>55	19 (16.2)
Total	117 (100)

3.2 Presence and Types of Comorbidity

A Total 55 (47%) patient had comorbidity. Patients with diabetes, CVD, and respiratory disorder were treated with dual and triple therapy rather than monotherapy. Fig. 1 shows the type of comorbidity.
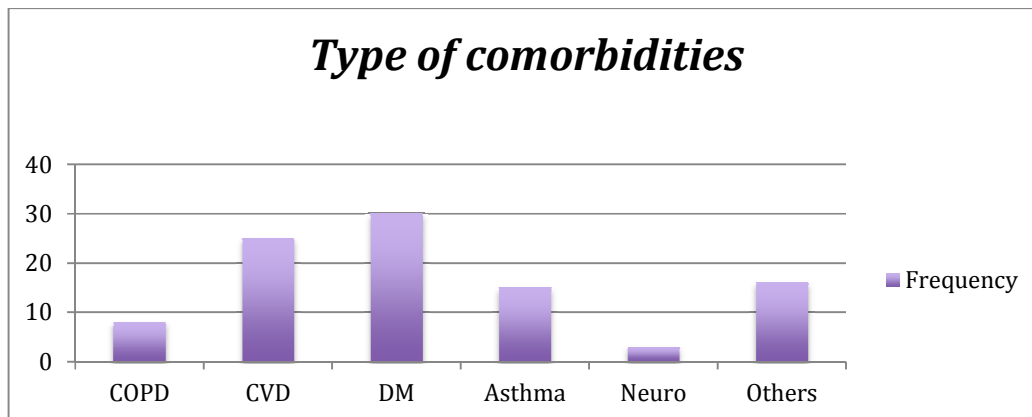
Type of comorbidities

Fig. 1. Type of comorbidity

Table 2. Radiological and sputum culture finding

Test	Frequency	Percent %
Radiological		
Single	90	76.9
Multi	27	23.1
Sputum culture test		
Yes	50	42.7
No	67	57.3
Type of bacteria		
Streptococcus pneumoniae	22	18.8
Mycoplasma pneumoniae	13	11.1
Haemophilus influenzae	7	6
Escherichia coli	2	1.7
Pseudomonas aeruginosa	2	1.7
Others	4	3.4

3.3 Radiological Finding and Culture

Most of the patients (76.9%) had single lobe infiltration. Whereas, one fourth (23.1%) of the patients had multi-lobe infiltration. The most common isolated bacteria were *Streptococcus pneumoniae* and *Mycoplasma pneumoniae* (18.8%) and (11.1%) respectively. Table 2 above shows radiological and sputum culture finding.

3.4 Hospitalizations

In this research survey it has found that majority of patients (53%) are already hospitalized for 2-7 days. On the other hand, patient with comorbidity or severe condition tends to be hospitalized more than 7 days. Fig. 2 shows duration of hospitalization.

3.5 Empirical Therapies

Total 57 (48.7%) patients out of 117 are treated with dual therapy, while only 9 (7.7%) of

the patients has triple therapy [Fig. 3]. Only 16 (44.4%) patients aged 18 to 35-year-old were diagnosed with low severity CAP, and no comorbidities were treated orally with amoxicillin/ clavulanate or amoxicillin/ clavulanate plus azithromycin. Fluoroquinolones are the most antibiotics prescribed (48.7%), followed by nacrolide (40.2%), cephalosporin (34.2%), amoxicillin/ clavulanate (23.1%), aminoglycoside and carbapenems being the lowest prescribed (6%) and (5.1%) respectively. Table 3 shows type of antibiotics prescribed.

3.6 Change of Antibiotics during Hospitalization

Out of 117 patients only 25 (21.4%) patients had antibiotics change according to the culture and sensitivity results, while 92 (78.6%) patients had no change. Fig. 4 shows the frequency of antibiotics changes.
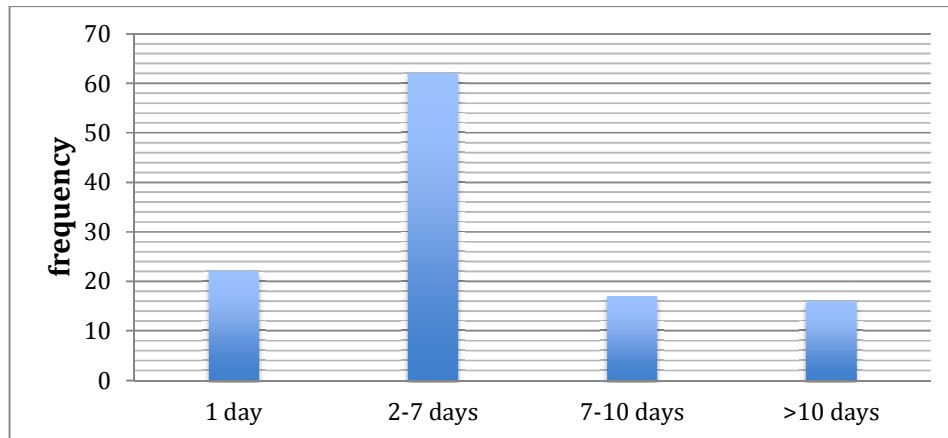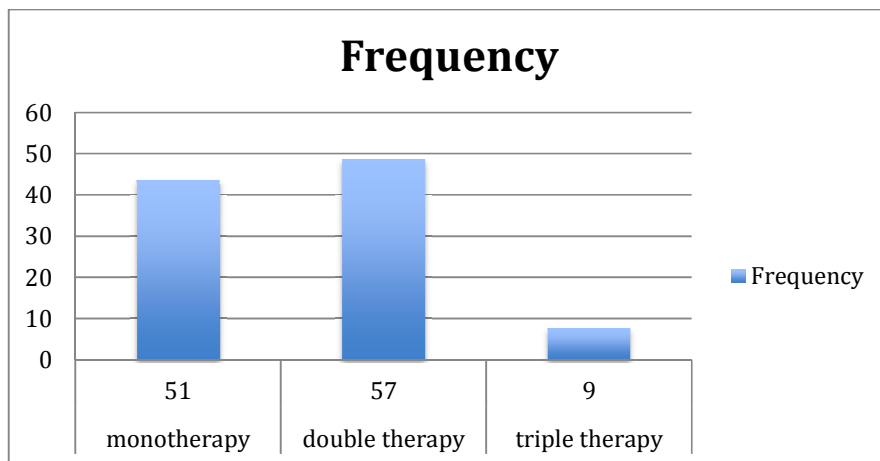
Fig. 2. Duration of hospitalization

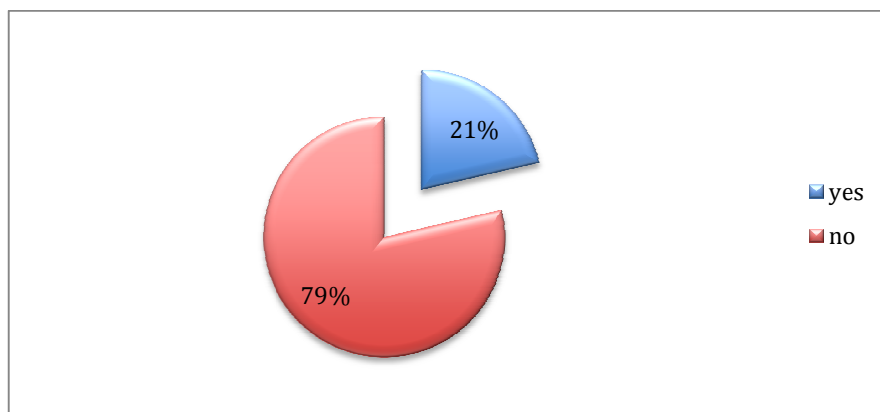**Fig. 3. Type of empirical therapy**

Fig. 4. Frequency of Antibiotics change at discharge

3.7 Medications at Discharge

At the timing of patient discharge, out of 117 patients only 59 (50.4%) patients has given written information. The most antibiotics prescribed at discharge time are macrolide 31 (26.5%), amoxicillin/clavulanate 13 (11.1%), and 8 (6.8%) that have cephalosporin and

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fluoroquinolone. Table 4 shows the prescribed antibiotics at discharge.

Table 3. Type of empirical antibiotics prescribed

Drugs	Frequency	Percent %
Macrolide	47	40.2
Amoxicillin/clavulanate	27	23.1
Ceftriaxone	40	34.2
Cefuroxime	2	1.7
Fluoroquinolones	57	48.7
Carbapenems	6	5.1
Aminoglycoside	7	6
Others	7	6

Table 4. Antibiotics prescribed at discharge

Antibiotics	Frequency	Percent %
Macrolide	31	26.5
Cephalosporin	8	6.8
Amoxicillin/clavulanate	13	11.1
Fluoroquinolone	8	6.8
Others	3	2.6

4. DISCUSSION

The current study indicates that the KSH does not follow certain guideline and the pattern of prescribing is not according to the known international guidelines such as IDSA guidelines for treatment of community-acquired pneumonia in adult. The present study found that the majority of the community-acquired pneumonia patients aged between 36 and 45 years old and most of them are male, which is consistent with study results that obtained in King Fahad hospital at Qassim region [17].

For diagnosis of community-acquired pneumonia, all (117) patients underwent for chest x-ray imaging. Most of the patients (76. 9%) found to have single lobe infiltration which is consistent to results reported in a similar study conducted in New Delhi (66%) [10]. Regarding CAP severity, this study found that majority of the patients had low severity (47%). Single lobe infiltration affects CAP severity, which influence the type of treatment. Fifty out of 117 patients (42.3%) had culture and sensitivity tests. *S. pneumoniae* and *M. pneumoniae* are the most reported pathogen (18.8%) and (11.1%) respectively. *S. pneumoniae* and *M. pneumoniae* are also the most common isolated pathogen in study conducted in Saudi Arabia [17]. The high

prevalence of *S. pneumoniae* and *M. pneumoniae* in this study conforms to the high prevalence of this infection world- wide [18].

The present study also found that diabetes mellitus and cardio vascular diseases were the most coexisting morbidities (25.6%) and (21.3%) respectively. This result is similar to that of a study conducted in Saudi Arabia [16]. On the contrary, a study conducted in New Delhi reported that respiratory disorder was the most common comorbidity [10].

The current study showed that patients with comorbidity such as respiratory disease, diabetes mellitus, and cardio vascular diseases are treated with dual or triple therapy more than patients without comorbidity. This is evident from the finding that the dual therapy is the most used regimen (48.7%) especially when comorbidity exist.

Regarding the type of antibiotics, fluoroquinolones are prescribed more frequently (48.7%) in KSH. Fluoroquinolones should be saved for old, very ill and/or penicillin allergic patients. In contrary, study conducted in Turkey, Beta-lactam antibiotic is the most commonly prescribed [19]. Another study conducted in Canada reported that macrolide (36%) are the most prescribed antibiotics (Malcolm, & Marrie, 2003). Both data in two studies that conducted in Turkey and Canada are reasonable according to (IDSA/ATS) guideline, which recommends either macrolide or B-lactam as first line in low sever CAP.

The present study showed that the antimicrobial regimen is changed in only 25 (21%) patients during their stay in the hospital. Most of change occurs due to worsening of condition or after culture and sensitivity test. The result is quite similar to the study conducted in New Delhi where 21 patients had antibiotics change during hospitalization [10]. The present study indicates that the antibiotics at discharge has prescribed only for 59 (50.4%) patients. While macrolide (26.5%) and amoxicillin/clavulanate (11.1%) assumes to be the most prescribed antibiotics. Whereas amoxicillin/ clavulanate and cephalosporin shown to be the most prescribed antibiotics at discharge as shown in other similar study [10].

The present study showed that most of the patients who diagnosed with low severity CAP, without comorbidities such as chronic heart,

lung, liver or renal disease; diabetes mellitus; alcoholism; malignancies; asplenia; immunosuppressing conditions or use of immunosuppressing drugs; and no history of antibiotics use during the past three months, have been treated in KSH with fluoroquinolones or macrolide plus B-lactams. Whereas, the IDSA guideline recommends to teat such patients either with a macrolide alone or doxycycline as those patients consider to be at a low risk for developing drug resistant. This study also found that some patients in KSH diagnosed with moderately severe CAP or CAP with comorbidities or history of antibiotics use during the previous three months have been treated with carbapenems rather than a respiratory fluoroquinolone or macrolide plus B-lactams as the IDSA guideline recommends.

5. LIMITATIONS OF THE STUDY

The research data were collected retrospectively from the patient files. Thus, the previous antibiotics history was not reached in all patients due to poor documentation. We also could not assess the outcomes of CAP patients treated at KSH due to retrospective nature of the study.

6. CONCLUSION

The hospital does not implement any guideline for treatment of community-acquired pneumonia in adult. Fluoroquinolone used in 50% of patient's sample. While increase in fluoroquinolones prescribing could cause a major problem in future. Therefore, urgent intervention should be taken to prevent resistance in future.

CONSENT

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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