Research Article
DOI : 10.33751/jf.v13i2.8942

FITOFARMAKA: Jurnal Ilmiah Farmasi
Vol.13, No.2, December 2023 : 115-120
p-ISSN : 2087-9164 e-ISSN : 2622-755X

Rationalization of Empiric Antibiotics Therapy in Patients *Hospital Acquired Pneumonia* at the East OKU Regional General Hospital

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Submit: September 22th, 2023 Revised: December 7th, 2023 Accept: December 16th, 2023

ABSTRACT

The use of antibiotics requires special attention to improve the quality of therapeutic results and prevent antimicrobial resistance. Through judicious administration of antibiotics, it is hoped that there will be an impact on the quality of treatment and control of microbial resistance. The method used in this research is descriptive analysis with a cross-sectional and retrospective research design, collecting data from medical record at East OKU Hospital for the period of 2016-2022. The analysis of the rationalization of the use of empiric antibiotics therapy showed that 65 % fell into the rational category, 35 % were irrational and had a total defined daily dose (DDD) value of 70.96 DDD/100 days of hospitalization.

Keywords: *Rationality; pneumonia; hospital acquired pneumonia (HAP); empiric antibiotics*

INTRODUCTION

The acute respiratory tract is a disease that attacks lung tissue. The disease is most common forms of pneumonia with symptoms like fever, chills, sweating, and a cough with yellow phlegm or has pus or blood streaks. The WHO report states that the global incidence of pneumonia is 9.2 million deaths in a 1 year period throughout the world, 92 % of which were recorded in Asia and Africa. Based on 2018 Basic Health Research (Riskesdas) data, it shows that in South Sumatera the prevalence of pneumonia reached 2.3 % (Riskesdas, 2018).

An evaluation of the rationality of antibiotic use in Tulungagong in pneumonia patients in 2020 showed that the appropriate use of antibiotics was 47 cases or 42.34 %, the inappropriate use of antibiotics was 64 cases or 57.66 %. It can be seen that to evaluate the rationality of antibiotic use in pneumonia patients, the accuracy rate for evaluating the correct type of antibiotic, dose, frequency of use, and duration of use reached 81.93 % (Ilmi, 2020).

The use of antibiotics requires special attention to prevent antimicrobial resistance and improve the quality of treatment results. Assessment of antibiotic use is one indicator of controlling antibiotic resistance which will provide information about logical antibiotic prescribing and is expected to have an impact on the quality of treatment and control of microbial resistance (Kemenkes RI, 2015).

A major threat to global health is antibiotic resistance. One of the causes of this occurrence is the widespread and inappropriate or irrational use of antibiotic drugs, resulting in the risk of resistance, increased patient morbidity and mortality, increased treatment costs and therapeutic failure (Ilmi, 2020). If antibiotic resistance is not detected and remains pathogenic, recurrent diseases will occur and be difficult to treat. Irrational use of antibiotics can have negative consequences.

This study was the first study in East OKU Hospital that assessed the rationalization of antibiotic use in HAP patients. Therefore, based on the explanation of the research results above, the researcher wants to know the rationality of empirical antibiotics in *Hospital Acquired Pneumonia* (HAP) patients at East OKU Hospital. This study can provide information about the rationality of antibiotic use with HAP diagnoses, as input regarding antibiotic rationality in HAP patients in order to control the risk of antimicrobial resistance.

METHOD

This type of research is observational descriptive analytic with a cross sectional and retrospective research design with collecting data from patient medical record data for the period from January 2016 until December 2022 at East OKU Hospital. The population was calculated from the number of samples using the Lemeshow formula with the result of 100 HAP patients. The study inclusion criteria included patients diagnosed with HAP at East OKU Regional Hospital, patients who received empiric antibiotics and had complete medical records. Meanwhile, the exclusion criteria in this study were patients who had a culture test, no outcome data at the end of treatment, illegible medical records and treatment in the ICU <48 hours.

Data collection used in this research used a sampling study method based on inclusion and exclusion criteria. Patient demographics (age, gender, admission and discharge dates, empiric antibiotic therapy, treatment history, radiographic examination results) were recorded from medical records. The data obtained was then evaluated based on the guidelines used, namely the Indonesian Lung Doctors Association (PDPI, 2003), *Infectious Disease Society of America/American Thoracic Society* (IDSA/ATS), Nosocomial Pneumonia Diagnosis and Management Guidelines in Indonesia (PDPI, 2003), the Japanese Respiratory Society (Society, 2004).

RESULTS AND DISCUSSION

The results of this study obtained medical record data from patients (Table 1). Based on the inclusion criteria, results were obtained from 100 patient medical records at East OKU Hospital for the 2016-2022 period.

The results obtained showed that the number of pneumonia patients at East OKU Hospital was predominantly male. This is supported by research conducted by Lanke in 2015 at General Hospital. DR. R.D Kandou Manado, the highest prevalence of pneumonia in men is 55 %, while in women it is 45 % (Lanke, 2015). The results of this study are in accordance with the PDPI which shows that the proportion of men suffering from pneumonia is higher than women (PDPI, 2014). This can be influenced by the environment, most smokers are men so they are more exposed to pollution from cigarette smoke which contains chemicals such as carbon monoxide, tar and ammonia which can cause smokers to develop respiratory tract infections (Wahid, 2013).

Table 1. Characteristics of HAP patients at East OKU Regional Hospital (2016-2022)

Characteristics		Amount (%)
Gender		
	Man	55
	Woman	45
Age		
	17-25 years old	14
	26-35 years old	19
	36-45 years old	19
	46-55 years old	15
	56-65 years old	22
	>66 years	11
Occupation		
	Farmer	37
	College student	6
	Housewife	18
	Civil servant	11
	Labourer	10
	Entrepreneurs	7
	Student	5
	Self-employed	6
Comorbidities		
	HAP	39
	HAP + PP	61

Based on age characteristics, data obtained from 17-25 years old was 14 %, 19 % aged 26-35 years old, 19 % 36-45 years old, 15 % 46-55 years old, 22 % 56-55 years old, and 22 % >66 years as much as 11 %. This is in line with PDPI which states that the risk factor for pneumonia is that it occurs in patients aged 60 years. Increasing age can result in loss of elasticity and reduced lung function due to degenerative processes (aging) as well as a decrease in the body's resistance to infection (Ministry of Health of the Republic of Indonesia, 2013).

Based on the diagram of HAP pneumonia patients in East OKU Regional Hospital for the period 2016-2022 based on the patient's occupation above, it shows that 37 % of pneumonia patients in East OKU Regional Hospital are farmers, this is in accordance with data from the East Ogan Komering Ulu Central Bureau of Statistics which states that the number of farmers is high, namely 59.05 % in 2021. Dust contributes greatly as a cause of respiratory disorders and diseases in humans. This is influenced by particle size, shape, concentration, solubility, chemical properties and length of exposure (Wardhana, 2001). Dust inhaled by workers can cause a decrease in lung function until the advanced stage, which risks causing a decrease in lung elasticity so that the volume of air storage decreases (Marsam, 2003). In the comorbidity group, 61 % had comorbidities and 39 % of patients did not have comorbidities.

Table 2. Empirical Antibiotic Regimen Data in HAP Patients at East OKU Hospital for the period 2016-2022

Antibiotics	Group	Amount (%)
Ceftriaxone	Cephalosporin G3	57
Levofloxacin	Fluorokuinolon	20
Ceftazidim	Cephalosporin G3	13
Ciprofloxacin	Quinolones	10

Based on (Table 2), the profile of antibiotic use included third generation cephalosporins, namely Ceftriaxone 57% and Ceftazidime 13 %, fluoroquinolones namely Levofloxacin 20 % and Ciprofloxacin 10 %. Cephalosporin antibiotics are more widely used as empiric antibiotics. This group was chosen because it is active against Gram-positive and negative bacteria, so it is effective in inhibiting bacterial growth.

Table 3. DDD result/100 days of care

Antibiotics	ATC code	DDD WHO	DDD/100 Hospital Days
Ceftriaxone	J01DD04	2	29,12
Levofloxacin	J01MQ12	0,5	25,66
Ceftazidim	J01DD01	4	10,10
Ciprofloxacin	J01MA02	1	6,08
Amount			70,96

According to the World Health Organization (WHO), the classification system and ATC can be used to quantitatively assess antibiotic use using DDD, which is the average maintenance dose for the primary indication in adults. DDD only applies to drugs that already have an ATC (Anatomical Treatment Chemistry) code. Being able to reflect drug doses worldwide without considering ethnic, national, or international differences, this unit has advantages (WHO, 2015). DDD is a technique for transforming and normalizing data on drug quantities into rough estimates of drug consumption in a healthcare setting (WHO, 2012). Based on the data obtained (Table 3), there are 4 types of antibiotics prescribed. Evaluation of antibiotic use was carried out using the ATC/DDD method, and only antibiotics that had ATC and DDD codes were analyzed.

Evaluation of the use of empiric antibiotics in hospitalized HAP patients showed a total DDD/100 treatment day of 70.96 with the total number of treatment days for all patients in the 2016-2022 period being 752 days. If the total value of DDD/100 treatment days is greater than this indicates high use of antibiotics, so it could be an indication of irrational drug use (Sari and Safitri, 2016). The highest antibiotic use was Ceftriaxone with a value of 29.12 DDD/100 inpatient days.

The antibiotic use segment is determined using DU 90 % by sorting the cumulative percentages from the highest to lowest and then taking the 90 % segment. The greater the variety of types of antibiotics used, the greater possibility that the antibiotics used will become resistant (Mahmudah, et al., 2016). DU 90 % in antibiotic use for the 2016-2022 period shows that ceftriaxone and levofloxacin are antibiotics with high use while other antibiotics are antibiotics with low use.

Table 4. Drug Utilization (DU) 90 % result of Antibiotics Use

Antibiotics	OF (%)	Cumulative DU	Segment DU (%)
Ceftriaxone	41,04	41,04	90
Levofloxacin	36,16	77,2	
Ceftazidim	14,23	91,43	10
Ciprofloxacin	8,57	100	

Correct Diagnosis is based on correct diagnosis. If the diagnosis is not made correctly, the choice of drug will be forced to depend on the wrong diagnosis, as a result the drug used will not be prescribed according to its intended purpose (Ministry of Health, 2011). In (Table 4), the rationality of using antibiotics for correct diagnosis is 100%.

Table 5. Proper Evaluation of Drugs

Antibiotics	Appropriate	Not exactly
Ceftriaxone	57	0
Levofloxacin	20	0
Ceftazidim	2	11
Ciprofloxacin	10	0
Amount	89	11

The results obtained showed that the correct medication was 89% of empirical antibiotic use. The results can be seen in (Table 5). Pada pasien diagnosa *Hospital Acquired Pneumonia* diberikan seftasidim. Referring to ATS/IDSA 2004, states that initial antibiotic therapy empirically for HAP in patients without risk factors, early onset and all degrees of disease is given third generation Cephalosporin antibiotics namely Cephalosporins, cefotaxime or Betalactam antibetalactamase namely Amoxicillin clavulanate or Respiratory quinolones namely Levofloxacin, Moxifloxacin.

Table 6. Evaluation of Correct Dosage

Antibiotics	Appropriate	Not exactly
Ceftriaxone	57	0
Levofloxacin	20	0
Ceftazidim	13	0
Ciprofloxacin	10	0
Amount	100	0

The results of the study found that the correct dose for antibiotic use was 100% (Table 6). A drug dose that is too high can cause blood levels of the drug to exceed the therapeutic threshold, leading to toxicity. The use of substandard drugs can have a significant impact on patients. If the prescribed dose is inappropriate/unsatisfactory, the patient will not receive appropriate treatment for their disease. This may lead to disease-related complications (WHO, 2015).

Table 7. Accurate Evaluation of Delivery Time

Antibiotics	Appropriate	Not exactly
Ceftriaxone	38	19
Levofloxacin	16	4
Ceftazidim	12	1
Ciprofloxacin	10	0
Amount	76	24

The results of the study showed that the correct duration of antibiotic use was 76%. As seen in (Table 7). Patients who receive appropriate, optimal and adequate empirical antibiotics, the cause is not P.aeruginosa and the patient's clinical response is good and the clinical picture of infection is resolved, and the duration of treatment, 7 days of treatment or 3 days without fever. If the cause is P.aeruginosa and Enterobacteriaceae, the duration of treatment is 14 - 21 days (PDPI, 2003). The duration of antibiotic administration for pneumonia patients is also determined by the patient's condition. Administration of antibiotics can be stopped in 3-5 days for patients without immune deficiency conditions or structural respiratory disease, 7

days for patients with immune deficiency and/or structural respiratory disease 10-14 days (or more) for patients with poor clinical response, immune deficiency (Cosgrove, et al., 2015).

CONCLUSION

The characteristics of pneumonia patients are most common in men (55 %) compared to women (45 %), and most often occur in the age range 56-65 years (22 %). Based on research results, the use of empirical antibiotics during the 2016-2022 period has a total DDD value of 70.96 DDD/100 days of care. The highest DDD value for antibiotics was ceftriaxone, namely 29.12 DDD/100 days of hospitalization. The segments included in the 90 % DU are Ceftriaxone and Levofloxacin. The pattern of antibiotic use that is most widely used is the antibiotic ceftriaxone (57 %) with evaluation of the accuracy of antibiotic use, namely correct diagnosis (100 %), correct indication (89 %), correct dose (100 %), and correct duration of administration (76 %).

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