



Evaluation on The Use of Antibiotics for Pneumonia Patients

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Abstract

Pneumonia is an acute infectious disease that attacks lung tissue (alveoli) which can be caused by viral, bacterial, or fungal infections. Pneumonia is one of the diseases that have the highest death risk in Indonesia. The first line of treatment for pneumonia is antibiotic therapy. Inappropriate use of antibiotics will increase the possibility of antibiotic resistance. Antimicrobial Control Program (PPRA) is a health surveillance to control the use of antibiotics where the indicator of success is seen from the improvement in the quantity and quality of antibiotic use. Antibiotic control that can be performed is evaluating the use of antibiotics quantitatively and evaluating the suitability of antibiotics. The purpose of this study was to determine the quantity of antibiotic use with the DDD/100 patient-days unit and the suitability of the use of antibiotics based on PPAB. This study was observational, the data were taken retrospectively and analyzed descriptively. The research material used medical record data for pneumonia patients from January to June 2020 at RSUD Bangil. There were 91 research samples obtained by purposive sampling that met the inclusion and exclusion criteria. The data were analyzed quantitatively using the DDD/100 patient-days unit and 90% DU, and the suitability of antibiotics was analyzed using five indicators of the right indication, the right route, the right dose, the right interval, and the right time of administration. The results showed the use of antibiotics with a total value of DDD/100 patient-days of 78.13 DDD/100 patient-days with the highest value on moxifloxacin (39.28 DDD/100 patient-days). Antibiotics included in the 90% segment that need to be controlled are parenteral moxifloxacin (50.27%), ceftriaxone (23.34%), azithromycin (6.83%), oral moxifloxacin (4.62%), and levofloxacin (3.85%). The suitability of antibiotics based on PPAB RSUD Bangil 2019 showed the right indication (51.65%), right route (100%), right dose (87.23%), right interval (48.93%), and right time of administration (10.64). %).

Keywords: Pneumonia; Antibiotics; Hospital

INTRODUCTION

Pneumonia is defined as an infection or acute inflammation of the parenchyma or lung tissue, especially when the alveoli are filled with fluid and puss which will make the patient feel excruciating pain so that it is difficult to breathe due to the reduced oxygen intake (WHO, 2019). Pneumonia can be categorized into two, namely *Community-acquired Pneumonia* (CAP) or community pneumonia and *Hospital-acquired Pneumonia* (HAP) or nosocomial pneumonia. The most common pneumonia which has

the highest mortality rate is the community pneumonia with 27% of the cases are caused by viral pathogens (*human rhinovirus* and *influenza*) and 14% of the cases are caused by bacterial pathogens such as *Mycoplasma pneumoniae*, *Chlamydia pneumoniae*, and *Haemophilus influenzae* (Grief & Loza, 2018). Pneumonia is one of the most frequent reasons for hospitalization (Forum of International Respiratory Societies, 2017).

Pneumonia is included as the top 10 inpatient diseases in hospitals with the case proportion of male

(53,95%) and female (46,07%), with the *Case Fatality Rate* (CFR) of 7,6%. The mortality rate in community pneumonia patients is less than 5% for outpatients and 20% for inpatients (PDPI, 2014). Basic Health Research in 2013 and 2018 stated that the prevalence of Indonesian people who contracted pneumonia based on the diagnosis of health workers according to the province was 1.8% and 2.0% respectively. Meanwhile, the prevalence of pneumonia in East Java Province in 2018 was 1,8% which was an increase from the year 2013 which was 1,7%.

Pneumonia can be treated with antibiotic therapy. The success of therapy in pneumonia patients depends on the patient factors, the bacteria, and the use of appropriate and adequate antibiotics (PDPI, 2014). Along with the increasing cases of pneumonia, the intensity of the use of antibiotics also increases. This is a global threat to health, especially in terms of bacterial resistance to antibiotics. Many bacteria are resistant to antibiotics. A study stated that the most common bacteria found in patients with pneumonia were Gram-negative bacteria and the most common type was *Acinetobacter baumannii*, followed by *Klebsiella pneumoniae*. In contrast, the most common species of Gram-positive bacteria was *Streptococcus viridans* found at Dr. Soetomo (Yulia et al., 2020). According to the Ministry of Health of the Republic of Indonesia 2011, the use of antibiotics in health facilities is often inappropriate so that it can lead to less effective treatment, increased risk to patient safety, high cost of treatment, and widespread resistance which is shown by antibiotic resistance research on patients with a history of using antibiotics for the last 3 months have been shown to increase a higher probability of resistance compared to patients without a history of antibiotic use during the past 3 months (Alkindi et al., 2019). Meanwhile, antibiotic resistance is influenced by the lack of public knowledge about rational use of antibiotics so that

there are still many patterns of inappropriate use of antibiotics (Arrang et al., 2019). In order to improve patient compliance in using antibiotics, it is necessary to increase patient knowledge. Doctors and pharmacists who play an important role in providing information to patients, health institutions must also provide knowledge about rational antibiotic therapy (Wattiheluw et al., 2020). Therefore, the existence of a public health surveillance agency is needed to control and monitor the use of antibiotics on a regular basis.

Supervision of the use of antibiotics is needed to prevent or reduce the incidence of resistant microbes. One of them is the Antimicrobial Control Program (PPRA), where the quality indicator of success is seen from the improvement in the quantity of antibiotic use evaluated using the DDD (Defined Daily Dose) unit and the quality of antibiotic use evaluated using the Gyssens method (Kementrian Kesehatan RI, 2015). In addition, the evaluation on the quality of antibiotic use can also be done by adjusting antibiotics to the local hospital's Antibiotic Use Guidelines (PPAB), which have been regulated according to the germ map in the hospital. Evaluation of the quantity and quality of antibiotic use in hospitals, especially in pneumonia, has not been widely studied. Research conducted in 2018-2019 on the description of the quantity of antibiotic use in the internal medicine ward of RSUD Bangil showed that the cephalosporin group (51.41%) was the most widely used, while ceftriaxone was the antibiotic with the highest DDD/100 patient-days value, namely 27.79 DDD/100 patient-days, and the research recommended that further research be conducted on the description of the quality of antibiotic use (Rachmawati et al., 2020).

Based on the descriptions above and considering the importance of controlling antibiotic resistance in hospitals, reporting the use of antibiotics on a regular basis, the high pneumonia findings in

Pasuruan district which is reported to reach 80%, and being no data related to the evaluation of the use of antibiotics in inpatient pneumonia patients in RSUD Bangil, this study was conducted to evaluate the quantity and suitability of the use of antibiotics in RSUD Bangil. It is a referral government hospital in Pasuruan Regency, and it has PPRA in the hospital, and the status of the Regional Public Service Agency (BLUD) is the reference for development and health services in the district.

METHOD

This study was conducted in the Medical Records Installation section of RSUD Bangil from December 2020 to January 2021. The study was approved by the Director of RSUD Bangil Number 445.1/3202/424.072.01/2020, and it obtained the Ethical Clearance from the Head of Research Ethics of RSUD Bangil Number 445.1/25/424.072.01/2020. The data were in the form of medical records of pneumonia patients with the code of ICD J18.0 (Bronchopneumonia) and J18.9 (Pneumonia), and the data of antibiotics sales of pneumonia patients from January to June 2020 at RSUD Bangil.

The design of this study was observational, the data were collected retrospectively and analyzed descriptively. The research material used medical record data for pneumonia patients for the period of January to June 2020 at RSUD Bangil.

The number of samples obtained was 533 as the total population which was later chosen using purposive sampling method, that is, the determination of sampling that met the predetermined inclusion and exclusion criteria. There were 91 samples that met the inclusion and exclusion criteria. The inclusion criteria were: (1. Patients with a diagnosis of pneumonia in the January-June 2020 period who received antibiotics treatment at RSUD Bangil; (2. Patients with medical records that contained complete data and clear

demographic data such as medical record number, type of gender, age, date of admission & date of discharge from hospital, diagnosis, comorbidities, and profile of antibiotic use (amount of drug, name of antibiotic, dose, interval, duration of administration, and route of administration); (3. Adult patients aged 18 years. The exclusion criteria were: (1. The patient died, was discharged against medical records, or the patient was referred to another hospital; (2. The patient was using antibiotics but for the treatment of other infections.

Data analysis of the quantity of antibiotic usage used the DDD/100 patient-days unit and 90% DU (Drug Utilization) method, while the evaluation of the suitability of antibiotic use was analyzed based on PPAB at RSUD Bangil 2019 with 5 assessment indicators, namely the right indication, route, dose, interval, and duration of administration.

RESULT AND DISCUSSION

Demographics of Patient

The demographics of patients in this study were presented descriptively based on gender, age, type of hospitalization, pneumonia criteria, reasons for leaving the hospital, length of hospitalization, and the presence of comorbidities.

As shown in Table 1, the number of male patients (65,93%) is higher than the number of female patients. Similar to the previous research, pneumonia patients were dominated by male patients (60%) (Ilmi *et al.*, 2020). This can be influenced by the smoking habits of the patients where the prevalence of tobacco consumption according to the 2018 Riskesdas in males (62.9%) is higher than females. This is also supported by a systematic study in Spain which stated its findings that active smoking in males has a direct and indirect effects on pneumonia risk (Almirall *et al.*, 2017). CAP cases are more severe in males than females, leading to higher mortality in males,

Table 1. Pneumonia Patient Demographic Data in January-June 2020 at RSUD Bangil.

Characteristics	Total (n=91)	Percentage (%)
Sex		
Male	60	65,93%
Female	31	34,07%
Age (Years old)		
17-25	4	4,39%
25-35	6	6,59%
35-45	9	9,90%
45-55	19	20,88%
55-65	23	25,27%
>65	30	32,97%
In Patient Category		
Non-ICU Inpatient:		
Regular	89	97,80%
Intensive (HCU)	2	2,20%
ICU Inpatient:		
ICU	0	0%
Pneumonia Criteria		
ICU inpatient:		
VAP Pneumonia	0	0%
Non-ICU inpatient:		
CAP Pneumonia regular inpatient	85	93,40%
CAP Pneumonia regular inpatient atypical germs	4	4,40%
CAP Pneumonia intensive inpatient	2	2,20%
CAP Pneumonia intensive inpatient with ESBL risk	0	0%
Nosocomial Pneumonia with no MDRO risk	0	0%
Nosocomial Pneumonia with MDRO risk	0	0%
Reason for Leaving the hospital		
Doctor's clearance (healed)	51	56,04%
With prescriptions (improving)	40	43,96%
Referred to other hospital	0	0%
Deceased <24 hours	0	0%
Deceased >24 hours	0	0%
Discharge Against Medical Advice (DAMA)	0	0%
Length of stay (Day)		
1-5 days	54	59,34%
6-10 days	35	38,46%
>10 days	2	2,20%

Note: ICU: *Intensife Care Unit*; HCU: *High Care Unit*; CAP: *Community Acquired Pneumonia*; VAP: *Ventilator Associated Pneumonia*; ESBL: *Extended Beta Lactamases*; MDRO: *Multidrug Resistent Organism*.

especially to the elder people (Barbagelata *et al.*, 2020). This shows that the risk factor for male (53.95%) is greater than female in contracting pneumonia (PDPI, 2014). The most common age group experiencing pneumonia were patients aged >65 years old. The older the age, the greater the risk factor for experiencing pneumonia. This is similar to the 2013 & 2018 Riskesdas data regarding the highest pneumonia cases occurring in the 65-74 years age

group. In 2018, age 70 years and over occupies the highest position of death due to pneumonia (Our World Data, 2019). The anatomical and functional changes in the respiratory system along with the increasing age can contribute to an increase in the frequency of pneumonia and lung disease (Hasan & Maranatha, 2019). Data were taken during the COVID-19 pandemic, but in this study, the majority of patients underwent regular non-ICU hospitalization

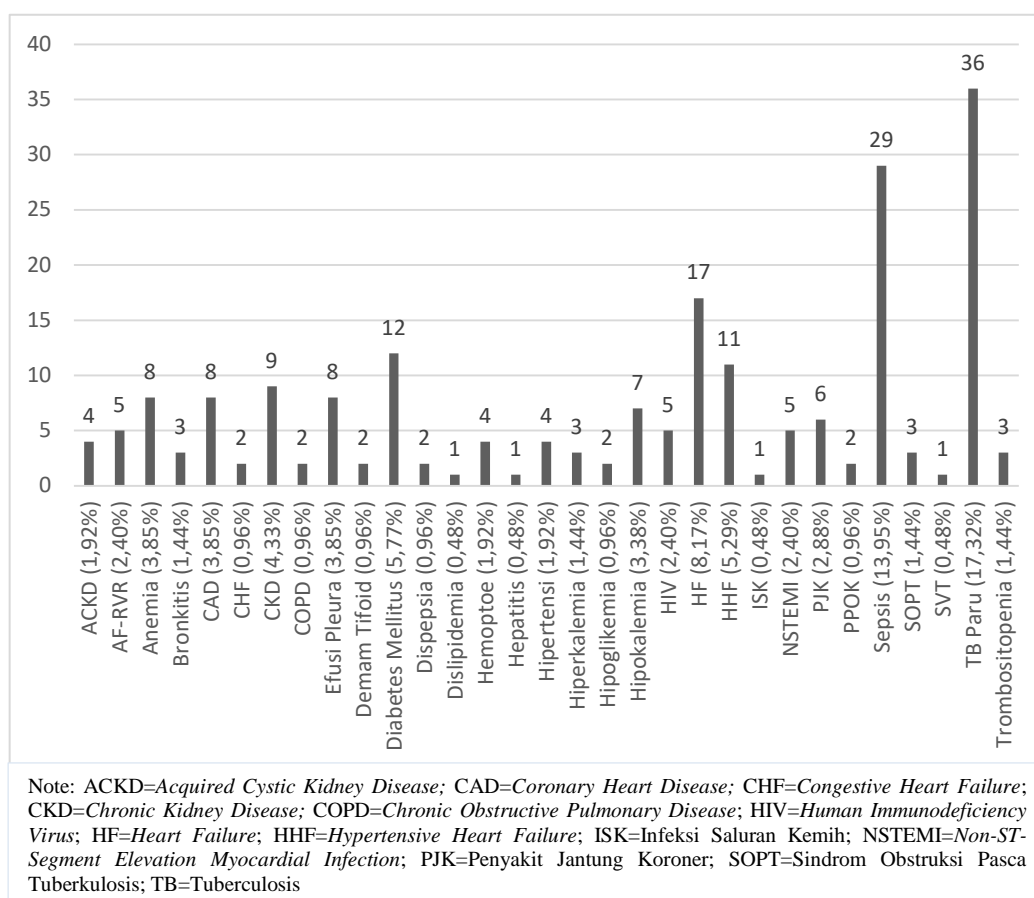


Figure 1. Comorbidity of Pneumonia Patient at RSUD Bangil

(97.80%) with criteria for CAP pneumonia or community pneumonia as many as 85 cases. There were no patients with a diagnosis of COVID-19 pneumonia, seen from Swab Test data showing negative results. Comorbidities influence the condition and choice of antibiotic therapy in pneumonia patients (Figure 1). The most comorbid for infectious diseases was Tuberculosis (17.32%), while for non-infectious diseases was heart failure (8.1%). High comorbidities in pneumonia with Pulmonary Tuberculosis can be minimized by increasing self-care behavior through family nursing care, and health workers are expected to provide counseling and explanations for TB sufferers to improve adherence in taking medication (Muhtar, 2016 and Putri et al., 2020). Comorbidity is associated with the risk of pneumonia where in patients with cardiovascular disease the risk of pneumonia increases 3 times (Tambun et al., 2019).

The results of an observational Systematic Review study on 2731 records from an electronic database stated that functional disorders, COPD (Chronic Obstructive Pulmonary Disease), chronic bronchitis, asthma, and a history of CAP are clear risk factors for community pneumonia (Almirall et al., 2017). Of the 91 patients, there were 51 patients leaving the hospital due to doctor's permission (56.04%) and the remaining 40 patients leaving the hospital because their condition improved with a doctor's prescription (43.96%). These data indicates that patients should be discharged as soon as possible if the clinical condition is stable, improving, or there are no medical problems, and the environment is safe to continue treatment at home (PDPI, 2014). In terms of the length of hospitalization, most patients (54) stayed for 1-5 days (59.34%). The length of days of hospitalization can affect the quantity of antibiotic use in the hospital.

Antibiotics Usage Profile

In this study, there were 11 types of antibiotics with various groups (Table 2). All antibiotics used were empirical antibiotic therapy. Empirical therapy can be changed to definitive therapy if the type of causative bacteria is known through microbiological examination or bacterial culture results. These data show that moxifloxacin (38.52%) and the cephalosporin group were the most widely used antibiotics. Similar to the 2015 study at the Klaten "x" hospital, it showed ceftriaxone (17.39%) was the most widely used antibiotic (Safitri, 2015). Meanwhile, the antibiotics in 130 unspecified pneumonia patients hospitalized in non-ICU in the Pulmonary Room of RSUD Tulungagung for the period January-June 2017 were levofloxacin IV (62.71%), ceftriaxone (27.21%) and cefotaxime (5.67%) (Ilmi et al., 2020). Ceftriaxone is a third-generation cephalosporin antibiotic that contains β lactam ring in its structure. It works by inhibiting the synthesis of bacterial cell walls by inhibiting the tetrapeptide cross-linking process. The cells will rupture/lysis occurs due to the low osmotic pressure of the fluid in the bacteria's body (Gallagher & MacDougall, 2011). Factors that affect the cephalosporin group such as ceftriaxone are used the most because they have a broad spectrum of effectiveness on Gram-negative bacteria and Gram-positive bacteria, making it very suitable for empirical therapy in pneumonia patients whose cause is unknown. Some health centers use ceftriaxone, which is reported to be effective in the treatment of severe pneumonia. In addition, ceftriaxone has a longer half-life so it can be given once a day. Supported by research in Kilimanjaro, Tanzania, that ceftriaxone is an empiric therapy choice with high use (51.1%) in hospitals because it is used as a life-saving drug for patients fighting severe infections such as pneumonia (Sonda Id et al., 2019). The second factor, based on the bacterial map at RSUD Bangil, ceftriaxone has

10% susceptibility to Gram-positive bacteria such as *Streptococcus spp* which is suitable for the therapy of pneumonia in which one of the causative bacteria is *Streptococcus pneumoniae*.

The most widely used antibiotics after discharge from the hospital were cefixime 100 mg (27.5%) and cefixime 200 mg (30%) in oral preparations with a dosage regimen of 2 x 200 mg a day. This antibiotic is called replacement therapy or replacement therapy which is done by changing the injection drug to oral. Switch therapy can be given if hemodynamically stable, clinical symptoms improve, able to take oral, & normal gastrointestinal function (PDPI, 2014)

Table 2. Type of Antibiotics used on pneumonia patients in January-June 2020 period

Type of Antibiotics	Category	Σ (n)	%
Moxifloxacin	Fluoroquinolones	203	38,52%
Ceftriaxone	Cephalosporin III	182	34,54%
Ceftazidime	Cephalosporin III	24	4,55%
Cefuroxime	Cephalosporin II	23	4,36%
Metronidazole	Nitroimidazole	20	3,80%
Meropenem	Carbapenem	16	3,04%
Cefotaxime	Cephalosporin III	11	2,09%
Azithromycin	Macrolides	16	3,04%
Levofloxacin	Fluoroquinolones	16	3,04%
Clindamycin	Lincosamides	8	1,52%
Cefixime	Cephalosporin III	8	1,52%
Total		527	100%

The benefits of switching therapy are improving patient comfort and mobility, reducing side effects of parenteral use of antibiotics, reducing length of hospitalization, reducing administration costs, and short recovery time (Irawan et al., 2019).

Quantitative Evaluation of Antibiotic Use

Quantitative evaluation using the DDD/100 patient-days unit aims to determine the assumption of the average daily maintenance dose of antibiotic use in adults (Kementrian Kesehatan RI, 2011). The quantity of antibiotic use in pneumonia patients for the January-June 2020 period at RSUD Bangil was 78.13

DDD/100 patient-days with a total LOS of 499 days. 78.13 DDD/100 patient-days means that every one patient receives 78.13 DDD antibiotics per day of hospitalization. The highest value of DDD/100 patient-days was on the antibiotic moxifloxacin, which was 39.28 DDD/100 patient-days. The drug consumption data presented in the DDD is only a rough estimate of consumption and is not a definite picture of actual use (Kementrian Kesehatan RI, 2015). Another similar study, namely pneumonia patients at the RSUD Jombang in 2019, obtained a total value of DDD/100 patient-days of 83.25 DDD/100 patient-days (Ambami, 2020). When compared, the total value of DDD/100 patient-days at RSUD Bangil is smaller than the total value of DDD/100 patient-days at RSUD Jombang. The DDD value can be said to be good if the DDD/100 patient-days value is smaller, which means that the quantity of antibiotic prescribing in hospitals is done wisely and selectively. However, if the value of DDD/100 patient-days is greater, it shows the quantity of antibiotic use is not good which can lead to antibiotic resistance, so it can be said that the quantity of antibiotic use at RSUD Bangil is better. Moxifloxacin as the antibiotic with the highest quantity of use can be influenced by several factors including having a pattern of activity as a bactericidal Concentration Dependent, killing power against bacteria depending on antibiotic levels (Kementrian Kesehatan RI, 2011), high bioavailability in the body of 99% so that it becomes the antibiotic of choice for pneumonia patients (PDPI, 2014), and is the drug of choice for pneumonia patients with kidney disorders or patients who did not improve after receiving levofloxacin (PPAB RSUD Bangil, 2019).

The high quantity of antibiotic use needs to be controlled in terms of prescription and usage to prevent the occurrence of resistance. Antibiotic controls that have proven to be effective in managing

the use of antibiotics more rationally include enforcement of policies that prohibit over-the-counter antibiotics, antimicrobial stewardship programs, active participation of doctors in antibiotic audits, use of valid rapid point-of-care tests, promotion of delayed antibiotic prescribing strategies, improvement of communication skills with more pragmatic patient, and study performance in primary care (Lior and Bjerrum, 2014). The antibiotics included in the 90% segment in this study were parenteral moxifloxacin (50.27%), ceftriaxone (23.34%), azithromycin (6.83%), oral moxifloxacin (4.62%), and levofloxacin (3, 85%). Antibiotics included in the 90% segment are indirectly antibiotics that need to be controlled. With a 90% DU calculation, it is hoped that these antibiotics can be used more wisely and selectively. This information is expected to be used by health workers to reduce the risk of antibiotic resistance.

Evaluation on the suitability of antibiotics use

Evaluation on antibiotic suitability is carried out to reduce the use of injudicious and non-selective antibiotics, and to support one of the health programs in Indonesia, namely the Antimicrobial Control Program (PPRA). Evaluation on the suitability of the use of antibiotics in pneumonia patients at RSUD Bangil was assessed based on PPAB at the hospital.

The proper indication in this research was whether the indication on the patient and antibiotics used were according to the recommendation of the PPAB at RSUD Bangil (Table 5). Forty-seven patients (51,65%) were proper indication with the majority indication being CAP pneumonia regular inpatient. Only these patients (47 patients) carried out to the next evaluation on proper indication. There was a discrepancy in patients taking meropenem, which should be used for pneumonia patients at risk for ESBL (Extended Spectrum Beta Lactamase). Meanwhile, according to the American Thoracic

Society, meropenem is used for CAP pneumonia with a risk of *Pseudomonas* infection. The results of bacterial culture became the limitation so that the assessment was only seen from empirical therapy. Levofloxacin was chosen as pneumonia therapy because of its susceptibility to Gram-negative bacteria such as *Enterobacteriaceae* (44%), *Burkholderia cepacia* (46%), *Stenotrophomonas spp.* (50%), and Other non *Enterobacteriaceae* (44%). While in Gram-positive bacteria, 10% was susceptible to *Streptococcus spp.* Ceftriaxone has a susceptibility

value to *Streptococcus spp.* 10% and *Enterobacteriaceae* 50% (PPAB RSUD Bangil, 2019).

Proper route. The 47 samples showed 100% proper route which means that all patients received a proper route of antibiotics. Parenteral route (P) is used the most because it has the fastest therapy response, it is easy to administer to patients having difficulty in swallowing, it has a higher bioavailability than the oral route (O), and it is safe for patients with gastrointestinal problems (Stein, 2015).

Table 3. Value of DDD/100 patient-days

ATC Code	Antibiotics	Total (gram) Antibiotics	DDD standard WHO	TOTAL LOS	DDD/100 patient-days
J01DC02	Cefuroxime (P)	22 g	3 g	499 days	1,47
J01DD01	Cefotaxime (P)	12 g	4 g		0,60
J01DD02	Ceftazidime (P)	24 g	4 g		1,20
J01DD04	Ceftriaxone (P)	182 g	2 g		18,24
J01DD08	Cefixime (O)	1,6 g	0,4 g		0,80
J01DH02	Meropenem (P)	26 g	3 g		1,74
J01FA10	Azithromycin (O)	8 g	0,3 g		5,34
J01FF01	Clindamycin (O)	6,6 g	1,2 g		1,10
J01MA12	Levofloxacin (P)	7,5 g	0,5 g		3,01
J01MA12	Levofloxacin (O)	0,5 g	0,5 g		0,20
J01MA14	Moxifloxacin (P)	78,4 g	0,4 g		39,28
J01MA14	Moxifloxacin (O)	7,2 g	0,4 g		3,61
J01XD01	Metronidazole (P)	11,5 g	1,5 g		1,54
J01XX01	Fosfomycin (P)	66 g	8 g		1,65
		387,3 g			78,13

Proper dose indicates that only 41 patients (87,23%) had the proper dose. The accuracy of the dose is related to the concentration dependent, using the right dose so that the levels in the body are maximized and the antibiotic works optimally (Kementrian Kesehatan RI, 2011). Inaccurate dose can affect the success of antibiotics, if the dose is too low, the effectiveness of antibiotics is not achieved or less than optimal. If the dose is too high, there will be a possibility of toxicity.

Proper interval was given to 23 patients (48.93%), 17 patients (36.17%) were not proper, and 7 patients (14.90%) were not evaluated because the patient's medical record data did not record the time of

administration so that an assessment could not be made. The lack of data on the time of administration to these patients was caused by the limitations of recording in the medical record, so it was necessary to study and integrate data with health workers at RSUD Bangil, especially notes on the timing of antibiotics. The accuracy of the interval is related to the duration of antibiotics in the body, Time Dependent (Kementrian Kesehatan RI, 2011). Improper intervals will give bacteria the opportunity to adapt and recognize antibiotics so that when the antibiotic is used its effectiveness is reduced or even not at all in other words resistance has occurred.

Proper duration of administration showed that 5 patients (10.64%) had the proper duration of administration, 18 patients (38.30%) and 24 patients (51.06%) had no record of the duration of administration which became the limitation in this study, namely the administration of cefuroxime and ceftriaxone for pneumonia patients at PPAB RSUD Bangil 2019 was not known so that an assessment could not be carried out. The duration of administration for pneumonia patients can vary

according to the patient's physiological state and the presence of comorbidities. The inaccuracy of the duration of administration is also influenced by the length of hospitalization of the patient which is short compared to the recommended duration of antibiotic administration. Suggestions that can be given to overcome the limitations of recording in medical records is to integrate data electronically (Sanjaya & Oktavia, 2015).

Table 4. Properness of Antibiotics Use Based on PPAB RSUD Bangil 2019

Evaluation	Total (n=91)	Percentage (%)
Proper Indication		
Proper	47	51,65%
Improper	44	48,35%
Evaluation	Total (n=47)	Percentage (%)
Proper Route		
Proper	47	100%
Improper	0	0%
Proper Dose		
Proper	41	87,23%
Improper	6	12,77%
Proper Interval		
Proper	23	48,93%
Improper	17	36,17%
Not evaluated	7	14,90%
Proper Duration of Administration		
Proper	5	10,64%
Improper	18	38,30%
Not Evaluated	24	51,06%

Table 5. Antibiotics Recommendation Based on PPAB RSUD Bangil 2019

Indication	Antibiotics Recommendation	Proper	Improper
CAP Pneumonia Regular inpatient	Levofloxacin, Ceftriaxone, Cefuroxime, or Cefoperazone (Moxifloxacin administered to patients with kidney disorder or patient not improving after taking Levofloxacin)	43	43
CAP Pneumonia Regular inpatient Atypical germs	Azithromycin, Clarithromycin, or Doxycycline	3	0
CAP Pneumonia Intensive inpatient	Levofloxacin, Moxifloxacin, Ampicillin-Sulbactame + Levofloxacin, Ceftriaxone + Levofloxacin, or Ceftriaxone+ Azithromycin	1	1
Total (91 patients)		47 patients	44 patients
Percentage (100%)		51,65%	48,35%

The duration of antibiotic administration is at most 1-3 days, this can be influenced by the duration of antibiotic administration for empirical therapy which is within 48-72 hours (Kementerian Kesehatan RI, 2011), and the patient is immediately discharged if the clinical condition is stable, improving or there are no medical problems and the environment is safe to continue treatment at home (PDPI, 2014). The replacement therapy strategy is combined with a short length of hospitalization so that the benefits of therapy can be seen (Irawan et al. al., 2019). The short length of hospitalization causes the duration of antibiotic use to be short and can reduce hospital administration costs.

CONCLUSION

The most used antibiotics for pneumonia patients in RSUD Bangil based on DDD/100 patient-days are fluoroquinolone and cephalosporin as Watch group antibiotics in AWaRe classification by WHO. This group includes antibiotic classes that have higher resistance potential which need to be prioritized as key targets of stewardship programs and monitoring. A successful antibiotic strategy is not only about controlling the number, but also about monitoring the proper use of antibiotics to improve antibiotic treatment, increase access and reduce antimicrobial resistance. Having this information in RSUD Bangil related to the quantity and quality of antibiotic use, it is expected to be an evaluation for the future the selection and use of antibiotics can be wiser and more selective in prescribing antibiotics by updating germ maps regularly to reduce antibiotic resistance.

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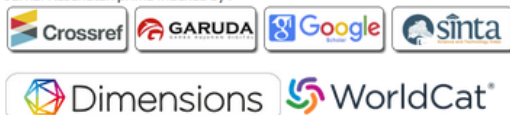
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