



Qualitative Evaluation on the Use of Pneumonia Antibiotics for Covid-19 Patients at X Hospital Bali in 2020

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Abstract

Coronavirus disease-19 (Covid-19) is a pandemic that has caused various complications, including pneumonia. One of the therapies used in Covid-19 with pneumonia complications is antibiotics. Antibiotics must be used appropriately to prevent antibiotic resistance. A method to reduce the number of antibiotic resistances is evaluating the use of antibiotics qualitatively using the Gyssens method. Therefore, this study aims to describe the profile and rationality of using pneumonia antibiotics for adult Covid-19 patients at X Hospital from January to December 2020. The data was collected retrospectively on adult patients using the patient's medical record data, and the sample was determined using the purposive sampling technique. There were 117 samples of medical record data processed in this study. This study concluded that the use of antibiotics for patients with Covid-19 disease consisted of single antibiotic usage, i.e., azithromycin in 82 (70.09%) cases, and levofloxacin in 30 (25.64%) cases, and switched antibiotics usage, i.e., azithromycin to levofloxacin in 5 (4.27%) cases. The rationality of using antibiotics using the Gyssens methods was 90.60% with rational or appropriate antibiotics use (category 0). Moreover, there was 9.40% irrational drug use (category I-VI), comprising antibiotics for a longer time than it should be, in 11 cases.

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INTRODUCTION

Corona Virus Diseases 19 (Covid-19) is a disease caused by a mutated virus of the coronavirus type. The World Health Organization (WHO) named the new virus as Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2). The SARS-CoV-2 virus infects the lower respiratory tract of humans with mild symptoms but eventually becomes deadly diseases such as hyper inflammation and respiratory dysfunction. This virus spreads between humans, and the number of cases increases over time. Covid-19 is proliferating and causing many cases in various countries¹. Based on WHO data in February 2020, 65 countries were infected with the coronavirus. According to WHO, as of March 2nd, 2020, 90,308 people were infected with Covid-19. The prevalence of Covid-19 morbidity in Southeast Asia as of November 15th, 2020, was recorded at 53.7 million confirmed cases and 1.3 million mortality cases. The Covid-19 morbidity rate in Indonesia as of November 18th, 2020, was 478,720, and the mortality rate was 15,503².

Covid-19 attacks the respiratory tract and causes several complications, one of which is pneumonia. Pneumonia is an infectious disease affecting the lower respiratory tract with signs and symptoms such as coughing and shortness of breath. The most common cause is bacterial infection with *Streptococcus pneumoniae*, *Legionella pneumophila*, or *Klebsiella* sp. One of the treatments that can be given to Covid-19 cases with accompanying pneumonia is antibiotics³. Antibiotics for Covid-19

patients with concomitant pneumonia are first given as empiric antibiotics for 5-10 days. The use of empirical antibiotics in cases of pneumonia includes macrolides (azithromycin) or fluoroquinolones (levofloxacin)⁴. A retrospective cohort study⁵ of 191 patients in Wuhan showed that 95% of Covid-19 pneumonia patients were given antibiotic therapy. Antibiotics for patients need special attention because the tendency of excessive and inappropriate use will cause unexpected therapeutic effects to be achieved.

Antibiotic resistance is a global problem. Cases of antibiotic resistance need to be suppressed, one of which is by evaluating the use of antibiotics. Evaluation of the use of antibiotics can be done by two methods: qualitatively and quantitatively. A qualitative evaluation of the use of antibiotics was carried out by assessing the accuracy of using the Gyssens method. The Gyssens method is a tool that is widely used in various countries to evaluate the quality of antibiotic use. The Gyssens method is commonly used in the qualitative evaluation of antibiotic use. Research evaluating the use of antibiotics qualitatively using Gyssens as an evaluation method. The Gyssens method can assess the rational use of antibiotics (category 0) and the appropriate use of antibiotics irrationally (category I-IV). The Gyssens method assesses the accuracy of antibiotic use, such as accuracy of indication, accuracy of selection based on effectiveness, toxicity, price, spectrum, duration of administration, dose, interval, route, and time of administration⁶.

The evaluation of the use of antibiotics using the Gyssens method is classified into 13 categories, consist of category 0: antibiotics are used appropriately or rationally; category I: antibiotics are used inappropriately; category IIA: the dose of antibiotics used is not right; category IIB: the interval between antibiotics used is not appropriate; category IIC: the route or method of administration of antibiotics used is not appropriate; category IIIA: antibiotics are used too long; category IIIB: antibiotics are used too short; category IVA: other antibiotic options are more effective; category IVB: other antibiotic options are safer or have a lower level of toxicity; category IVC: there are other cheaper antibiotics; category IVD: there are other antibiotics with a narrower spectrum; category V: there is no indication for antibiotic use; and category VI: The data used in this study were complete. The evaluation was carried out according to the order of the Gyssens groove⁶.

Hospital X in Bali was chosen because it is one of the hospitals that organizes the Antibiotic Resistance Control Program. In addition, Hospital X also received an excellent predicate and was recognized internationally. Therefore, researchers want to know the application of pneumonia antibiotics in Covid-19 patients at this hospital that can be used to maintain the quality of antibiotic use and prevent antibiotic resistance. This study aims to describe the profile of pneumonia antibiotic use in adult Covid-19 patients at Hospital X in Bali for the January to December 2020 period and describe the rationality of using pneumonia antibiotics in adult Covid-19 patients using the Gyssens method at Hospital X in Bali for the January to December 2020 period.

MATERIALS AND METHODS

Materials

The materials used include medical record data from adult patients treated at the Inpatient Installation at Hospital X Bali from January to December 2020.

Methods

This descriptive study involved patients who met the inclusion criteria: adult patients diagnosed with Covid-19 pneumonia, receiving antibiotic therapy, complete data including completeness of patient data (age, gender, date of hospital admission), medical record number, and antibiotic data (drug name, strength, dose, frequency, interval, route and duration of administration) as well as hospital discharge data. The exclusion criteria were patients who were forced to return home, patients who died, patients who were referred to other hospitals, and patients in self-isolation. Based on patient medical record data, the patient population is 370 people. Next, a sampling process was carried out using a purposive sampling technique to determine the sample based on inclusion and exclusion criteria, then 117 patients were selected as the sample. Based on an ethical study by the Universitas Islam Negeri Maulana Malik Ibrahim Health Research Ethics Commission no. 014/EC/KEPK-FKIK/2021, this research has met the requirements or is ethically feasible.

RESULTS AND DISCUSSION

Patient demographic results based on gender are presented in **Table I**. There were 85 male and 32 female patients from the total sample. Male patients who experience more Covid-19 may occur because men tend to do more activities outside the home than women, thereby increasing the possibility of being exposed to the Covid-19 virus. This is by other research that males are more likely to experience Covid-19 (51%) than females (49%). Another factor in the large number of males compared to female patients is also influenced by the high percentage of men who smoke. Smokers tend to experience decreased lung function compared to non-smokers. Another study⁷ reported that half of the male population were smokers and experienced decreased lung function, making them more susceptible to respiratory tract infections. In addition, men have higher enzyme levels in their blood than women. Enzymes are the key factor for Covid-19 infecting humans. Another factor that influences the results is genetic factors. Men have XY chromosomes, while women have XX. According to Antao and Pinheiro⁸, the X chromosome contains microRNA, which plays a role in immune function. Therefore, the lack of an X chromosome in men makes them more vulnerable than women regarding the immune system.

In terms of age, it is known that the incidence of Covid-19 at X Hospital was least experienced by patients in the 18 to 25 years age range, only contributing 3.42% of the total cases. Meanwhile, the highest incidence of Covid-19 was experienced by patients in the 56 to 65 years age range with a contribution of 29.06%. This is in accordance with the guidelines of the Indonesian Lung Doctors Association, which states that the risk factors for Covid-19 patients are more common in patients aged over 60 years⁴. The percentage in the 18 to 25 years age range is lowest due to differences in immune response with other age ranges. At the age of 18 to 25 years, most people tend to have a good immune response, so they can respond better if foreign microorganisms enter the body. The percentage in the age range 56-65 years is the highest because there are several biological, physical, and social changes in patients over 60 years, which can affect several aspects of life, including health. In addition, several changes in the elderly have consequences that cause decreased lung compliance, decreased body endurance, and impaired temperature regulation responses⁹.

Table I. Patient demographics.

Characterize	Amount	Percentage (%)
Age		
18-25	4	3.42
26-35	22	18.80
36-45	25	21.37
46-55	32	27.35
56-65	34	29.06
Total	117	100
Gender		
Male	85	72.65
Female	32	27.35
Total	117	100

Covid-19 patients with pneumonia complications at Hospital X are given antibiotic therapy. The type of antibiotic used is a broad-spectrum antibiotic. The administration of broad-spectrum antibiotics considers the treatment area, which is thought to contain several types of bacteria. Apart from that, in a pandemic situation and poor patient hygiene, it is also feared that broad-spectrum antibiotics will be needed before further testing is carried out. The profile of antibiotic use in Covid-19 patients at Hospital X in 2020 is presented in **Table II**. Based on the data, it can be seen that the single antibiotic most commonly used was the macrolide, azithromycin, in 82 cases (70.09%). On the other hand, fluoroquinolone, levofloxacin was used in 30 cases (25.64%). The use of azithromycin is higher than levofloxacin because azithromycin is the first line used in cases of Covid-19 accompanied by pneumonia. Azithromycin is an antibiotic that can prevent severe respiratory tract infections due to pneumonia, while levofloxacin is an antibiotic that has a broad spectrum against several bacteria. Levofloxacin is used as monotherapy compared with azithromycin, which is often used in combination. Thus, it is known that levofloxacin has better effectiveness than azithromycin¹⁰.

Antibiotic replacement is carried out to reduce antibiotic resistance and encourage wise use of antibiotics. This antibiotic replacement can be done if the patient experiences an adverse change in condition due to the response to previous treatment or if there is a change in the microbiological response. According to Indonesian Lung Doctors Association¹¹, changing

treatment to another antibiotic can be done after the first 48-72 hours of treatment. Based on this theory, it is not permissible to change the type of antibiotic used during this period unless previous therapy worsens the patient's condition or specific culture results have been obtained. There were five cases (4.27%) of replacement of antibiotics in Covid-19 patients at Hospital X in 2020.

Table II. Antibiotic use profile.

Administration of Antibiotics	Antibiotics	Amount	Percentage (%)
Single	Azithromycin	82	70.09
	Levofloxacin	30	25.64
Replacement antibiotics	Azithromycin to levofloxacin	5	4.27
Total		117	100

The results of the evaluation of the use of pneumonia antibiotics in Covid-19 patients using the Gyssens method at Hospital X in 2020 are presented in **Figure 1**. Based on the data, it is known that there were 11 cases of antibiotic use for too long duration out of a total of 117 antibiotic prescriptions. There is a ratio of 9.64 : 1 between the rational use of antibiotics and cases of prolonged use of antibiotics. The number of cases of antibiotic use for 11 days was one case; during 12 days, there were four cases; for 13 days, there were two cases; and over 14 days, there were four cases. Using antibiotics for too long can cause the patient's condition to become non-progressive.

If the first-line antibiotic does not provide a good therapeutic effect beyond the point of use, then levofloxacin can be given as a follow-up antibiotic. This follows the Indonesian Lung Doctors Association recommendation⁴, which states that levofloxacin can be given if further infection is known. Furthermore, if the administration of levofloxacin has reached the limit of use but does not show signs of improvement in the patient's condition, then a combination of antibiotics can be given according to the guidelines. This aims to improve patient recovery and reduce the possibility of side effects from long-term use of antibiotics. Administration of antibiotics must be carried out by the drug formulary because the use of antibiotics for an inappropriate period will cause tolerance to microorganisms and resistance¹².

In the research of Widyati *et al.*¹³ at Dr Ramelan TNI AL Hospital Surabaya, 126 patients were referred to the ICU because of Covid-19 with severe pneumonia. Antibiotics were given to 87 (70.16%), and 37 patients (29.84%) did not receive antibiotics. Evaluation of the quality of antibiotic use in pneumonia patients using the Gyssens method found that 81 cases (43.55%) were used rationally, and 53 cases (28.49%) were used irrationally. Meanwhile, Rusmini's research¹⁴ at H. Abdul Moeloek Hospital found that 44.7% of antibiotic use was rational and 55.3% was irrational. Therefore, the irrational use of antibiotics in hospitalized pneumonia patients is still relatively high.

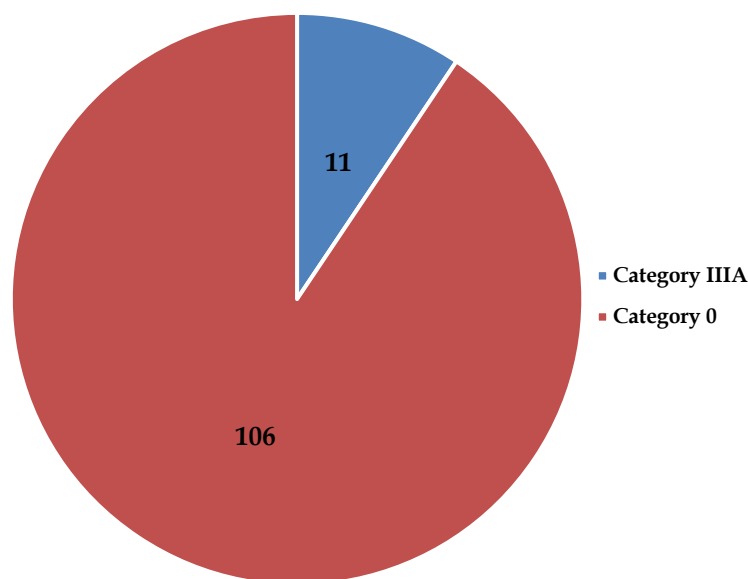


Figure 1. Evaluation results by Gyssens category.

CONCLUSION

The profile of pneumonia antibiotic use for adult Covid-19 patients in the Inpatient Installation of Hospital X Year 2020 consisted of the use of macrolide (azithromycin) with 70.09% and fluoroquinolone (levofloxacin) with 25.64%. In addition, there was a change in antibiotics from azithromycin to levofloxacin by as much as 4.27%. Furthermore, the rationality of the use of pneumonia antibiotics for adult Covid-19 patients in the Inpatient Installation of Hospital X Year 2020 based on the Gyssens category were 90.60% included in category 0 (appropriate or rational use of antibiotics) and 9.40% included in category IIIA (antibiotics are used too long).

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AUTHORS' CONTRIBUTION

All authors have an equal contribution in carrying out this study.

DATA AVAILABILITY

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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