

EVALUATION OF THE USE OF ANTIBIOTICS USING THE ATC/DDD METHOD IN POST-SURGICAL PATIENTS AT THE INPATIENT UNIT OF RSUD DR. ZAINAL UMAR SIDIKI

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ABSTRACT

In general, the use of antibiotics in health care facilities is more widely used in hospitals, especially in post-surgical patients. Infections that often appear in post-surgical patients are surgical wound infections. Surgical wound infection (ILO) is an infection in the incision area or organ-space that occurs in patients after surgery. Antibiotics are the most widely used drug class in the world due to the high incidence of bacterial infections. One of the most common is resistance to antibiotics.

The purpose of this research To determine the use of antibiotics in post-surgical patients in the inpatient installation of RSUD dr. Zainal Umar Sidiki. Evaluation the use of antibiotics was assessed using the Defined Daily Dose (DDD)/100 bed-days and 90% DU segment.

The results of the evaluation showed that the most widely used antibiotic was ceftriaxone with a value of 27.54 DDD/100 bed-days and quantitative use of antibiotics in post-surgical patients at RSUD dr. Zainal Umar Sidki is 69.77 DDD/100 bed-days and antibiotics that fall into the 90% DU segment are ceftriaxone, cefadroxil, cefixime and ciprofloxacin. While those included in the 10% DU segment were clindamycin, moxifloxacin hcl, cefotaxime, amoxicillin and azythromicin.

Keywords: Post surgery, Antibiotics, ATC/DDD

INTRODUCTION

Infection is one of the problems in the world of health. Infection is still the group that ranks at the top and is the cause of death in developing countries, including Indonesia [2].

Infections that often appear in post-surgical patients are surgical wound infections. Surgical wound infections are caused by bacterial contamination from the surgical site, which can occur in various ways including: damage to the walls of the hollow viscus, normal bacterial flora on the skin and poor sterile surgical technique that can cause exogenous contamination of the surgical team, equipment and the surrounding

environment.]. Antibiotics are the most widely used drug class in the world due to the high incidence of bacterial infections. More than a quarter of hospital budgets are spent on antibiotics.

Surgery is an act of treatment using an invasive method by opening the part of the body to be treated. Generally, the opening of this body part is done by opening an incision. After that, repair measures were carried out which ended with closure and suturing of the wound [17].

World Health Organization (WHO) reported that Surgical Wound Infection (ILO) is a type of HAI (Healthcare-associated infection) that mostly occurs

in developing countries with a combined incidence of 11.8 events out of 100 surgical procedures [8].

Antibiotics are the most widely used drug class in the world due to the high incidence of bacterial infections. More than a quarter of hospital budgets are spent on antibiotics. In developed countries, 13-37% of all patients hospitalized receive antibiotics either alone or in combination, while in developing countries 30-80% of patients hospitalized receive antibiotics [9].

According to resistance data, as many as 70% of bacteria have been resistant to antibiotics that are often used in hospitals. The level of bacterial resistance in Indonesia continues to increase, according to the Antimicrobial Resistance Control Committee from 2013, 2016, to 2019. The resistant bacteria increased from 40%, 60%, and 60.4% in 2019 [1].

A survey conducted at Dr. Hospital. Cipto Mangunkusumo Jakarta showed that 76.8% of the use of antibiotics for surgical prophylaxis was irrational in terms of indication or duration of administration. A similar survey was also conducted by the AMRIN (Antimicrobial Resistance in Indonesia Prevalence and Prevention) study team at RSUD Dr. Soetomo Surabaya and RSUP Dr Kariadi Semarang in 2002 showed 83% of patients received antibiotics and 60% of irrational use of antibiotics. The results of the quality assessment of the use of antibiotics at Dr Kariadi Hospital include 19-76% no indication, 9-45% incorrect (dose, type, and duration of administration) and 1-8% no indication of prophylaxis. In the Department of Surgery the rational use of antibiotics is less than 20% [11].

In general, the use of antibiotics in health care facilities is more widely used in hospitals, especially in post-surgical patients. Antibiotic therapy given to

post-surgical patients is empirical antibiotics that are not based on data on microorganisms and the results of sensitivity tests

Evaluation of the quantity of antibiotic use was carried out to evaluate the type and amount of antibiotics used [1]. To compare the data, WHO has established an Anatomical Therapeutic Chemical (ATC) classification system and measurements with Defined Daily Doses (DDD) as a standard for measuring the quantity of antibiotic use [4].

The use of the ATC/DDD method can be integrated with 90% drug utilization (DU 90%). DU 90% is a method that shows the grouping of drugs that fall into the 90% usage segment. DU 90% can be used to assess drug use by sorting the percentage of use in the study period from the largest to the smallest which is then taken as the 90% segment with the most use. Assessment of drugs that fall into the 90% segment is needed to emphasize this drug segment in terms of evaluation, control of use and planning of drug procurement [18].

The purpose of this study was to evaluate the use of antibiotics in post-surgical patients in the inpatient installation of RSUD dr. Zainal Umar Sidiki by using the ATC / DDD method in the period January to December 2019. This research is expected to increase awareness of the use of antibiotics by both health workers and local governments as an effort to increase the rationality of using antibiotics.

RESEARCH METHODS

This research is a type of descriptive observational research with a quantitative approach. Patient data collection was carried out retrospectively by examining the medical record data of post-surgery patients at the inpatient installation of RSUD dr. Zainal Umar

Sidiki who received antibiotic therapy from January to December 2019.

The design of this study used a retrospective cross-sectional design to determine the quantity of antibiotic use in units of DDD/100 bed-days in postoperative patients. This research was conducted at the dr. Zainal Umar Sidiki in the medical record section starting from March 2021 to June 2021.

The subjects in this study were all medical record data of post-surgical patients who used antibiotics in the inpatient installation of RSUD dr. Zainal Umar Sidiki in 2019. The postoperative patient population in 2019 was 300 patients.

The sampling technique used is Simple Random Sampling. The sample size in this study was determined based on the Slovin formula which obtained a sample of 75 samples.

The criteria for research subjects in this study were post-surgical patients who received antibiotics and adults aged 18 years who had complete medical record data including patient identity (name, age, and date of admission and discharge from the hospital), diagnosis, description of antibiotic use (type, dose, route of use of antibiotics, and total use of antibiotics), and length of hospitalization. The criteria included in the exclusion criteria were: short-term antibiotic therapy was discontinued because the patient was forced to go home or requested it himself, referred or the patient died, and antibiotics that did not have an ATC code in the WHO index.

The data obtained were processed using the DDD/100 days of hospitalization method for quantity assessment. The DDD code of each antibiotic used during the study period is accessed through http://www.whooc.no/atc_ddd_in dex/ The data obtained was then

calculated using the DDD unit/100 days of hospitalization, which was obtained by dividing the total drug use in the study period (in DDD units) by the total days of hospitalization per 100. The data obtained from the medical record data of postoperative patients were then processed using Microsoft excel 2010 for calculating DDD value/ 100 bed-days

The segment with the most use of antibiotics was determined based on the 90% DU method, by sorting the percentage of use in the study period from the largest to the smallest, then the 90% usage segment was taken.

RESEARCH RESULT

Quantitative evaluation of antibiotic use was analyzed using the ATC/DDD system recommended by the World Health Organization (WHO). The results of the analysis showed that the use of antibiotics in DDD units/100 days of hospitalization. Medical record data of post-surgical patients in the period January to December 2019 contained 75 documented samples.

In this study, patient characteristics were found which included gender, age and type of surgery. The results obtained indicate that the female sex is 60 samples (80%) while the male is 15 samples (20%), the age in the study is the most aged with a range of 18 years to 30 years compared to other age ranges. The types of surgery in this study were general surgery with 33 samples (44%) and caesarean section with 42 samples (56%). This can be shown in table 1.

Table 1. Characteristics of postoperative

No.	Characteristic s	Amount	Percentag e (%)
1	Gender		
	Man	15	20%
	Woman	60	80%
2	Age		
	18-30 Years	37	49.3%

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31-45 Years	24	32%
46-60 Years	11	14.7%
60 Years	3	4%
3 Type of Surgery		
General Surgery	33	44%
SC surgery	42	56%

Source: Data processed, 2021

The data on the number of patients and the number of days of hospitalization were obtained from the medical records of post-surgery patients at dr. Zainal Umar Siki. The number of patients is the total number of patients undergoing hospitalization at the hospital, while the number of Length of Stay (LOS) in this study was obtained from the division between days of stay and the number of inpatients. Total LOS data is needed to calculate the use of antibiotics with DDD units/100 bed-days.

Table 2. Days of hospitalization for surgical

No. Month	Number of Passes	Number of bed-days (Days)	Average LOS (Day)
1 January	6	27	4.5
2 February	6	30	5
3 March	8	36	4.5
4 April	5	30	6
5 May	9	44	4.8
6 June	5	20	4
7 July	7	28	4
8 August	5	23	4.6
9 September	6	25	4.2
10 October	6	31	5.2
11 November	6	33	5.5
12 December	6	42	7
Total	75	369	59.3
Average	6.25	30.75	4.9

Source: Data processed, 2021

Based on table 2 shows that the average LOS is 4.9 days or it can be interpreted that each post-surgery patient is hospitalized in dr. Zainal Umar Sikiki

for 4 days from the total number of patient care days, which is 369 days.

Based on the results of the patient characteristics and LOS data above, the highest quantity of ceftriaxone was obtained, which indicates that the use of ceftriaxone is the highest compared to other antibiotics as shown in Table 3.

Table 3. Quantity of Antibiotic Use with DDD/100 bed-days

Types of Antibiotics	Atc-Code	Total usage (grams)	DDD Definitive (grams)	Real maid service	DDD/100 Bed-days	%
Ceftriaxone 1 gram	J01 DD04	204	2	102	27.54	39.47
Cefadroxil 500 mg	J01 DB05	189	2	94.5	25.51	36.57
Cefixime 100 mg	J01 DD08	9.2	0.4	23	6.21	8.90
Ciprofloxacin 500 mg	J01 MA02	2.8	0.4	7	4.05	5.80
Clindamycin 500 mg	J01 FF01	0.5	0.3	1.67	3.04	4.35
Moxifloxacin Hcl 400 mg	J01 MA14	15	1	15	1.89	2.71
Cefotaxime 1 gram	J01 DD01	13.5	1.2	11.25	0.54	0.77
Amoxicillin 500 mg	J01 CA04	8	4	2	0.54	0.77
Azithromycin 500 mg	J01 FA10	3	1.5	2	0.45	0.45
Total					69.77	100

Source: Data processed, 2021

Based on the pattern of antibiotic consumption shown in Table 4, it can be seen which antibiotics are included in the 90% Drug Utilization segment. Classes of antibiotics that fall into the 90% Drug Utilization segment in order from largest to smallest in a row are Ceftriaxone, Cefadroxil, Cefixime, Ciprofloxacin, Clindamycin,

Moxifloxacin hcl, Cefotaxime, Amoxicillin and Azithromycin.

Total DDD/100 bed-days for all inpatient surgical patients after the percentage of use is made then sorted from the largest to the smallest percentage to find out which types of drugs are in the 90% usage segment or often referred to as 90% Drug Utilization (DU 90%).

Antibiotics that are included in the DU segment 90% of use are antibiotics that are often prescribed by doctors for treatment, in other words, these antibiotics are often used in hospital treatment. Meanwhile, antibiotics that are included in the 10% DU segment are antibiotics that are not often prescribed for treatment

Table 4. Consumption patterns of antibiotics

Type of antibiotic	DDD/100 bed-days	%	DU segment 90%
Ceftriaxone 1 gram	27.54	39.47	90%
Cefadroxil 500 mg	25.51	36.57	
Cefixime 100 mg	6.21	8.90	
Ciprofloxacin 500 mg	4.05	5.80	10%
Clindamycin 500 mg	3.04	4.35	
Moxifloxacin Hcl 400 mg	1.89	2.71	
Cefotaxime 1 gram	0.54	0.77	
Amoxicillin 500 mg	0.54	0.77	
Azithromycin 500 mg	0.45	0.45	

Source: Data processed, 2021

DISCUSSION

Evaluation of the use of antibiotics in quantity is done by calculating the

DDD (Defined Daily Doses) per 100 days of hospitalization that has been recommended by WHO. DDD is assumed to be the value of the average daily maintenance dose used for the main indication in adults. DDD is only assigned to drugs that have an ATC code while Drug Utilization 90% (DU90%) can be used to assess the quality of drug use.

Quantity assessment of the use of antibiotics is carried out by calculating DDD (Defined Daily Doses) per 100 days of hospitalization which has been recommended by WHO. Assessment of the quantity of antibiotic use from 75 samples of postoperative patients obtained from the calculation of DDD/100 days of hospitalization. The smaller the quantity of antibiotics used shows that doctors are more selective in prescribing antibiotics so that they are closer to the principle of rational use of antibiotics.

The results of the study on patient characteristics which include gender, age and type of surgery. Gender data showed that female patients were 60 patients (80%) larger than male patients, namely 15 patients (20%). This is because the presence of infectious diseases can attack anyone, regardless of gender. Both male and female sexes have the possibility to undergo surgery based on the case they experience.

Data on patient characteristics based on age, there is an age range of 18-30 years, the age range of the most surgical patients found is 37 patients (49.3%), this is due to the large number of surgical patients undergoing caesarean section at RSUD dr. Zainal Umar Sidiki. The optimal reproductive age for a mother is between 20-35 years [19].

In addition to age, the type of surgery that is mostly performed by inpatient surgical patients at RSUD dr. Zainal Umar Sikiki in 2019, namely

caesarean section (sc). This shows that the caesarean section is mostly done because there are problems that occur in the normal delivery process, not because it was planned before the delivery process. Patients who have undergone caesarean section are susceptible to infection, 5 to 20 times greater risk of infection compared to women who have a vaginal delivery [20].

Based on the results of the LOS data, it shows that the average LOS is 4.9 days or it can be interpreted that each post-surgery patient is hospitalized in dr. Zainal Umar Sidiki for 4 days from the total number of patient care days, which is 369 days.

According to the Ministry of Health in 2011 the length of use of antibiotics for infectious diseases is 3 to 7 days [1]. Research conducted by Mochamad Aleq Sander on rational antibiotics in surgery in 2012 showed that there was very little data that explained the duration of proper antibiotic administration. Most surgical infections can be treated effectively with antibiotics for 5-7 days. In cases of peritonitis, antibiotics can be discontinued after clinical improvement, normal leukocytes, and good digestive function. If within 4-5 days there is no clinical improvement it is necessary to consider the possibility of treatment failure [21].

In this study, the average hospitalization was found from medical record data by post-surgery patients at the Regional General Hospital dr. Zainal Umar Sidiki is 4 days. When compared with the length of use of antibiotics according to the 2011 Ministry of Health, the results are not appropriate. These inconsistent results can lead to resistance and reduce the effectiveness of therapy.

Based on the table above, it shows the type of antibiotic, ATC code, total use, definitive DDD, real DDD, DDD/100

days of hospitalization and percentage. Total drug use is obtained from the multiplication between drug dose, usage rules and duration of drug use. Definitive DDD is the value of a drug that has been defined in WHO. For example, the definitive DDD value of amoxicillin is 1.5 grams. Real DDD is the total use of antibiotics during the study period, which is obtained from the division between the total use of a drug and the definitive DDD value of the drug that has been determined by WHO.

In this study, 9 antibiotics were used by post-surgical patients at dr. Zainal Umar Sidiki with a total of 69.77 DDD/100 days of hospitalization. This can be interpreted that among 100 patients who are hospitalized there are about 69 patients who receive 1 DDD antibiotic class of drugs. The largest use of antibiotics was Ceftriaxone at 27.54 DDD/100 bed - days, followed by cefadroxil at 25.51 DDD/100 bed-days. This is the same as the 2019 study by Nisa, where the use of antibiotics in caesarean section patients, namely Ceftriaxone, was 32.95 DDD/100 bed-days [5]. Based on Nurul's research in 2016 it was also known that the most widely used antibiotic used was ceftriaxone with a value of 46.52 DDD/100 patients/day [6].

According to the POM RI in 2015, first - generation cephalosporins are antibiotics that are active especially against gram-positive bacteria. This group is effective against most *Staphylococcus aureus* and *Streptococcus* including *Streptococcus pyogenes*, *Streptococcus viridans* and *Streptococcus pneumoniae*. This drug is indicated for urinary tract infections that do not respond to other drugs or respiratory tract infections, sinusitis, skin and soft tissue infections [22].

Second generation cephalosporins when compared with the first generation,

second generation cephalosporins are less active against gram positive bacteria, but more active against gram negative bacteria, for example *Hemophilus influenzae*, *Pr. mirabilis*, *Escherichia coli* and *Klebsiella* [22]

The third generation cephalosporins, have a wider activity than the second generation cephalosporins, the group is much more active against *Enterobacteriaceae*. Ceftriaxone has a longer half-life than other cephalosporins, so once a day is sufficient. It is indicated for severe infections such as septicemia, pneumonia and meningitis [12].

The selection of antibiotics used by postoperative patients is based on the type of surgical wound. The most common bacteria found in clean wounds were *Staphylococcus aureus* and *Staphylococcus epidermis* or aerobic gram-positive bacteria. while in clean contaminated wounds, the most common bacteria found were *Streptococcus*, *enterococcus*, anaerobic, aerobic, gram negative. Ceftriaxone and ceftizoxime are the third generation antibiotics that are most often used for both types of wounds.

The use of prophylactic antibiotics cefotaxime and ceftriaxone (third generation cephalosporin) is in accordance with the general ASHP Therapeutic Guidelines [3] which recommends the use of cephalosporins. Third generation cephalosporin antibiotics (cefotaxime and ceftriaxone) have activity against anaerobic bacteria so they can protect patients from surgical wound infections [3].

WHO Guidelines for safe surgery in 2009 and Antimicrobial prophylaxis in surgery in 2013 recommend the use of second-generation cephalosporins (cefprocid and cefotetan) because they have better activity against anaerobic bacteria. However, due to the

unavailability of these antibiotics in Indonesia and the very high price, it is not affordable for patients who are mostly from the lower classes [13] [14].

According to the Ministry of Health Regulation in 2011, macrolide antibiotics are antibiotics that are active against gram - positive bacteria. However, the antibiotic azithromycin has greater activity, besides being able to inhibit gram-positive bacteria, azithromycin can also inhibit gram-negative bacteria.

Azithromycin is one of the macrolide antibiotics used in dr. Zainal Umar Sidiki in post-surgery patients. The results showed that the use of antibiotics azithromycin 500 mg which is the least used by post-surgical patients in the inpatient installation of RSUD dr. Zainal Umar Sikiki, North Gorontalo Regency, which is 0.45 DDD/100 bed-days. The antibiotic azithromycin is used for the diagnosis of pneumonia and typhoid fever, so that the antibiotic azithromycin is used less than other antibiotics [22].

There were 9 types of antibiotics consumed in post-surgical patients in the period from January to December 2019 with 4 types of antibiotics that were included in the DU segment, 90% of which were used the most, namely ceftriaxone, cefadroxil, cefixime and ciprofloxacin. The large variety of types of antibiotics causes the incidence of antibiotic resistance to be susceptible and increases the chances of the emergence of resistance to the antibiotics used. Antibiotics that fall into the DU segment 90% of use are antibiotics that are often prescribed by doctors for treatment, in other words, these antibiotics are often used in hospital treatment and are generally of the broad-spectrum type (ceftriaxone).

Antibiotics that are included in the DU segment 90% of use are antibiotics

that are often prescribed by doctors for treatment, in other words, these antibiotics are often used in hospital treatment. Meanwhile, antibiotics that are included in the 10% DU segment are antibiotics that are not often prescribed for treatment.

By looking at the use of antibiotics in the 90% DU segment, these results show that the highest use of antibiotics is the cephalosporin class of antibiotics, namely ceftriaxone. This can be used as one of the inputs for hospitals regarding the procurement of high antibiotics so that they are always available at the Hospital Pharmacy Installation, but still pay attention to the use of drugs so that they remain rational and adjusted to the patient's needs.

Antibiotics that enter the 90% DU segment are very important to monitor their use to prevent resistance. Pharmacists as medical personnel who are authorized in administering drugs, need to properly control the delivery of antibiotics. One of the policies to reduce the incidence of resistance is to limit the use of antibiotics so that the trend of antibiotic use can be replaced in a certain period [7].

The use of antibiotics should be minimized in the management of infections. The smaller the DDD value, the lower the possibility of resistance. The small quantity of antibiotic use shows that doctors are increasingly selective in choosing therapy for patients, so that they are closer to the principle of wise use of antibiotics [15].

Before starting therapy with antibiotics it is very important to ascertain whether an infection is really present. This is because there are several disease conditions and drugs that can give symptoms/signs similar to infection. In addition, the use of antibiotics without evidence of infection can increase the incidence of resistance and the potential

for adverse drug reactions experienced by patients. Evidence of infection can be in the form of signs of infection such as fever, leukocytosis, inflammation at the site of infection, production of infiltrates from the site of infection, or culture results [16].

CONCLUSION

The use of antibiotics in postoperative patients in the inpatient installation of RSUD dr. Zainal Umar Sidiki showed that the antibiotics included in the 90% DU segment were ceftriaxone, cefadroxil, cefixime and ciprofloxacin. While those included in the 10% DU segment were clindamycin, moxifloxacin hcl, cefotaxime, amoxicillin and azythromicin.

The most widely used antibiotics in post-surgical patients in the inpatient installation of RSUD dr. Zainal Umar Sidiki is ceftriaxonewith a value of 27.54 DDD/100 bed-days

Quantitative evaluation of the use of antibiotics in post-surgical patients with the ATC/DDD method obtained a total value of DDD/100 bed-days of 69.77 DDD/100 bed-days where this value cannot be said to be rational or appropriate because the higher the DDD value the greater the risk of occurrence resistance.

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