

Tinjauan Umum Pemanfaatan Antibiotik pada Pasien Bedah Menggunakan Metode ATC/DDD dan DU90% di Rumah Sakit Otanaha

Overview of Antibiotic Utilization for Surgical Patients Using ATC/DDD and DU90% Methods at Otanaha Hospital

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Abstrak

Salah satu tindakan medis dalam upaya penyembuhan penyakit adalah pembedahan. Namun, tindakan ini berisiko menimbulkan infeksi sehingga antibiotik sering digunakan sebagai upaya pencegahan. Menurut studi Antimicrobial Resistance in Indonesia (AMRIN), sekitar 42% penggunaan antibiotik pada pasien bedah terindikasi tidak tepat, yang dapat meningkatkan risiko terjadinya resistensi. Untuk menekan angka resistensi antibiotik, World Health Organization (WHO) merekomendasikan penggunaan metode Anatomical Therapeutic Chemical (ATC)/Defined Daily Dose (DDD) dalam mengevaluasi penggunaan antibiotik, yang juga dapat dikombinasikan dengan metode Drug Utilization (DU) 90%. Penelitian ini bertujuan untuk mengetahui gambaran penggunaan antibiotik pada pasien bedah dengan metode ATC/DDD dan DU 90% di RSUD Otanaha, Kota Gorontalo. Desain penelitian ini adalah deskriptif kuantitatif dengan pengumpulan data secara retrospektif. Data penelitian berupa rekam medis pasien bedah yang menggunakan antibiotik serta memenuhi kriteria inklusi dan eksklusi pada periode Januari–Desember 2024. Jumlah sampel yang diperoleh adalah 474 rekam medis. Hasil penelitian menunjukkan bahwa total penggunaan antibiotik sebesar 97,11 DDD/100 bed-days. Antibiotik dengan nilai DDD tertinggi adalah seftriakson (45,88 DDD/100 bed-days), sedangkan yang terendah adalah azitromisin (0,12 DDD/100 bed-days). Antibiotik yang termasuk dalam segmen DU 90% adalah seftriakson, metronidazol oral maupun parenteral, sefoperazon, meropenem, dan sefiksime. Kesimpulannya, tingkat konsumsi antibiotik pada pasien bedah di RSUD Otanaha masih tergolong cukup tinggi. Oleh karena itu, hasil penelitian ini diharapkan dapat menjadi dasar bagi pihak rumah sakit dalam memantau penggunaan antibiotik pada pasien bedah sehingga efektivitas penggunaannya dapat ditingkatkan.

Kata Kunci: Antibiotik ATC/DDD DU 90% Pasien Bedah

Abstract

One of the medical actions to cure a disease is surgery, but in this action the patient is prone to infection. Antibiotics are often used to prevent infection. According to the Antimicrobial Resistance in Indonesia (AMRIN) study, 42% of antibiotic use is indicated to be inappropriate in surgical patients which causes the risk of resistance. To reduce the incidence of antibiotic resistance, the World Health Organization (WHO) recommends the Anatomical Therapeutic Chemical (ATC)/Defined Daily Dose (DDD) method to evaluate antibiotic use and this method can also be used in conjunction with the 90% Drug Utilization (DU) method. This study aims to determine the description of antibiotic use in surgical patients using the ATC/DDD and DU 90% methods at Otanaha Hospital, Gorontalo City. This research design is descriptive quantitative research with retrospective data collection. This research data is all medical record data of surgical patients who use antibiotics and have met the inclusion and exclusion criteria in the period January–December 2024. A total sample of 474 medical record data was obtained. The results showed that the total use of antibiotics was 97.11 DDD/100 bed-days, with the highest DDD value in the use of ceftriaxone antibiotics 45.88 DDD/100 bed-days and the least was azithromycin 0.12 DDD/100 bed-days and antibiotics included in the DU 90% segment were ceftriaxone antibiotics, metronidazole by oral and parenteral routes, cefoperazone, meropenem and cefixime. In conclusion, the consumption rate of antibiotic use in surgical patients at Otanaha Regional General Hospital is still quite high. Therefore, it

is hoped that the results of this study can help the hospital in monitoring the use of antibiotics in surgical patients so as to increase the effectiveness of their use.

Keywords: *Antibiotics ATC/DDD DU 90% Surgical Patients*

BACKGROUND

One of the medical solutions to cure a disease is surgery. Surgery is a treatment procedure with the stages of opening or displaying the body part being treated (Arif et al., 2020). In surgery patients are prone to infection or commonly referred to as surgical wound infection. Based on data from the World Health Organization (WHO) in 2019, surgical wound infections occur in 2-5% of the 27 million patients operated on each year and constitute 25% of all nosocomial infections. While in Indonesia itself it is estimated to be around 2.3-18.3% and is the most common nosocomial infection, accounting for 38% of HAs (Healthcare-associated infection) (Chairani et al., 2019).

The class of drugs that are often used for infectious events are antibiotics. More than a quarter of the hospital budget is spent on the cost of antibiotic use (Mahmudah et al., 2016). In Indonesia itself, the prevalence of antibiotic use is still quite high, which is around 40%-60% (Tansri & Makmur, 2024). The Antimicrobial Resistance in Indonesia (AMRIN) study conducted at Dr. Kariadi Hospital and RSUD Dr. Soetomo showed that 42% of antibiotic use in hospitals indicated inappropriate use in surgical patients. This inappropriate use is what causes antibiotic resistance (Pratama et al., 2019). To reduce the incidence of antibiotic resistance in hospitals can be done by evaluating the use of antibiotics both qualitatively and quantitatively. The World Health Organization (WHO) has recommended the ATC (Anatomical Therapeutic Chemical) and DDD (Defined Daily Dose) systems as global standards for evaluating antibiotic use quantitatively. The purpose of using the ATC/DDD method is to measure the intensity of drugs consumed so that drug use can be monitored properly (Pratama et al., 2019). In addition, the ATC/DDD method can be combined with the Drug Utilization 90% (DU 90%) method. The DU 90% method shows the grouping of drugs that fall into the 90% segment of the use of a drug and the assessment of drugs that fall into the 90% segment is needed to evaluate drug use control and drug planning and procurement (Mahmudah et al., 2016).

In general, monitoring the use of antibiotics is needed to reduce the incidence of antibiotic resistance. In Gorontalo Province, there is an Antimicrobial Resistance Control Implementation program organized by the Gorontalo Provincial Health Office. This program is carried out with the hope of strengthening resistance control in all hospitals in Gorontalo Province one of which is Otonaha Regional General Hospital. This study aims to determine the description of antibiotic use in surgical patients using the ATC DDD and DU 90% methods at Otonaha Regional General Hospital, Gorontalo City.

METHODS

The research flow should be presented in this section, accompanied by a figure description. The figure description must be included as part of the figure caption, not embedded within the figure itself. The methods used to conduct and complete the research must also be clearly described in this section.

RESULTS AND DISCUSSION

Results

This study was conducted by collecting medical records data from surgical patients at the Otonaha Regional General Hospital in Gorontalo City. The patient data used were from inpatients who underwent surgery during the period of January to December 2024. Sampling was conducted using purposive sampling until 474 medical records that met the inclusion and exclusion criteria were obtained.

Table 1. Characteristics of surgical patients receiving antibiotic therapy

Characteristics	Kategori	Quantity	Percentage (%)
Gender	Male	206	43%
	Female	268	57%
Age	18-25 Years	67	14%
	26-35 Years	77	16%
	36-45 Years	72	15%
	46-55 Years	148	31%
	56-65 Years	110	23%
	Diabetic Ulcer	162	34,2%
Diagnosis	Tumor	88	18,6%
	Appenditis	29	6,1%
	Inguinal Hernia	16	3,4%
	Salivary Gland Abscess	8	1,7%
	Necrotizing Fasciitis	8	1,7%

Internal Haemorrhoids	7	1,5%
Open Wound	7	1,5%
Pneumonia	6	1,3%
Otitis Media	6	1,3%
Nephrolithiasis	6	1,3%
And others	131	27,6%

Based on table 1 data on the characteristics of surgical patients who received antibiotic therapy at Otanaha Hospital in 2024 consisted of 3 categories, namely based on gender, patient age and based on patient diagnosis. The characteristics of patients based on gender showed that there were 206 male patients (43%) and 268 female patients (57%). Characteristics of patients based on age showed that the age range of most surgical patients was in the age range of 46-55 years, amounting to 148 patients (31%) and the age range of the least surgical patients in the age range of 18-25 years, amounting to 67 patients (14%). Patient characteristics based on diagnosis obtained the most common diagnosis found in surgical patients is diabetic ulcers as many as 162 cases (34.2%).

Table 2. Length of stay of surgical patients

LOS	Quantity	Percentage (%)
2 days	35	7,4%
3 days	63	13,3%
4 days	144	30,4%
5 days	104	21,9%
6 days	62	13,1%
7 days	31	6,5%
8 days	22	4,6%
> 9 days	13	2,7%
Total LOS	2.275	

Based on table 2 the results show that the length of treatment of surgical patients ranges from 2-13 days. With details of Length of Stay (LOS), namely 2 days as many as 35 patients (7.4%), 3 days as many as 63 patients (13.3%), 4 days as many as 144 patients (30.4%), 5 days as many as 104 patients (21.9%), 6 days as many as 62 patients (13.1%), 7 days as many as 31 patients (6.5%), 8 days as many as 22 patients (4.6%) and 9 days as many as 13 patients (2.7%). The total Length of Stay (LOS) of patients was 2,275.

Table 3. Profile of antibiotic use in surgical patients

Drug Group	Antibiotic Type	ATC Code	Dosage Form
Cephalosporins	Ceftriaxone	J01DD04	Injection
	Cefoperazone	J01DD12	Injection
	Cefixime	J01DD08	Oral
	Ceftazidime	J01DD02	Injection
	Cefotaxime	J01DD01	Injection
	Cefadroxil	J01DB05	Oral
Quinolone	Ciprofloxacin	J01MA02	Injection
	Ciprofloxacin	J01MA02	Oral
	Levofloxacin	J01MA12	Injection
	Levofloxacin	J01MA12	Oral
Imidazole	Metronidazole	J01XD01	Injection
	Metronidazole	P01AB01	Oral
B Lactam	Meropenem	J01DH02	Injection
Macrolides	Azitromicin	J01FA10	Injection
	Azitromicin	J01FA10	Oral
Linkosamide	Clindamycin	J01FF01	Oral

Based on table 3, the results show that there are 6 types of antibiotic groups used by surgical patients at Otanaha Hospital in 2024. The antibiotic drug groups include cephalosporins, quinolone, imidazole, B lactams, macrolides, and linkosamides. With a total of 16 types of antibiotic drugs used.

Table 4. Quantity of use and DU90% profile of antibiotics in surgical patients

No	Antibiotic Type	Route	Total Usage (gram)	WHO Standard DDD (gram)	DDD/100 bed-days	DU %	DU Segment
1	Ceftriaxone	P	2.294	2	45.88	47,25	90%
2	Metronidazole	P	464	4	26,45	27,24	
3	Metronidazole	O	25,2	0,4	5,73	5,90	
4	Cefoperazone	P	24	4	4,64	4,78	
5	Meropenem	P	36	4	2,96	3,05	
6	Cefixime	O	49	2	2,55	2,63	
7	Azithromycin	O	32.4	0,8	2,26	2,33	10%
8	Ciprofloxacin	P	26	1	1,62	1,67	
9	Levofloxacin	O	2,25	0,5	1,2	1,24	
10	Ciprofloxacin	O	15	0,5	1,04	1,07	
11	Cefadroxil	O	992	1,5	0,98	1.01	
12	Clindamycin	O	286,5	2	0,9	0,93	
13	Cefotaxime	P	222	3	0,36	0,47	
14	Ceftazidime	P	1,5	0,5	0,24	0,25	
15	Levofloxacin	P	17	0,3	0,18	0,19	
16	Azithromycin	P	27	1,2	0,12	0,12	
Total					97,11	100%	

Based on table 4 above, the total DDD value in this study was 97.11 DDD/100 days of hospitalization and the most widely used antibiotic use was ceftriaxon (45.88 DDD/100 days of hospitalization) and the least was azithromycin (0.12 DDD/100 days of hospitalization). Antibiotics included in the 90% DU segment were ceftriaxone, metronidazole by oral and parenteral routes, cefoperazone, meropenem and cefixime. While those included in the 10% DU segment were azithromycin by oral and parenteral routes, ciprofloxacin by oral and parenteral routes, levofloxacin by oral and parenteral routes, cefadroxil, clindamycin, cefotaxime and ceftazidime.

DISCUSSION

Characteristics of surgical patients based on gender

Based on the results of research from medical record data of surgical patients, it shows that patients with female gender are more than men, namely 268 female patients (57%) and 206 male patients (43%). The characteristics of patients based on gender in a study conducted by Basany et al (2020), obtained the most results in male patients, namely 57%. Different results were found in a study conducted by Nisak et al (2022), where the results showed that women outnumbered men by 80%. According to a study conducted by Rucker et al (2019), explained that gender does not affect the incidence of surgery this is because both men and women have the risk to undergo surgery, depending on the type of case they experience. In this study, female gender was found more because the most common surgical procedure performed was diabetic ulcer surgery. Women have a greater risk of suffering from diabetes mellitus because physically women have a greater chance of increasing body mass index premenstrual syndrome (Rita, 2018).

Characteristics of surgical patients based on age

The results showed that the age range 46-55 years was the age range of the most surgical patients found, namely 148 patients (31%) and the least in the age range 18-25 years, namely 67 patients (14%). The results showed that the most surgical samples were at the age of 46-55 years and at the age of 56-65 years. This is due to the large number of surgical patients who experience diabetic ulcers. In research conducted by Utami & Rini (2022), explained that one of the risk factors for diabetic foot ulcers is age. Generally, patients aged > 40 years are the largest age group that will experience diabetic ulcers, this occurs because at that age the body's function physically decreases due to the aging process and there is a decrease in secretion.

Characteristics of surgical patients based on diagnosis

From the results of the research that has been done, the diagnosis of diabetic ulcers is the most common diagnosis found, namely 162 cases (34.2%) In a study conducted by Rahmawati (2022), it was explained that the main cause of diabetics being hospitalized was diabetic foot ulcers. Poor glycemic control is one of the main factors for diabetic ulcers in patients with diabetes mellitus. Jalilian et al (2020), also explained in their research, about 25% of people with diabetes will develop diabetic foot ulcers in their lifetime. Diabetic foot ulcers occur due to lack of HbA1c control, obesity or overweight and increased duration or length of diabetes.

Length of Stay (LOS)

The results showed that during the period January-December 2024, the total number of days of hospitalization (Length of Stay) of 474 patients was 2,275. Based on the formula set by WHO, the result of the DDD value/100 days of care will be smaller if the total LOS value is greater (Aulia, 2017). In this study, the highest LOS value was at 4 days of patient care with a percentage of 30.3%, followed by 5 days of care at 21.8% and the lowest length of stay was > 9 days at 2.7%. The length of days of hospitalization of surgical patients in the study Azyenela et al (2022), obtained the results of the length of the most days of hospitalization, namely on 4 days of treatment with a percentage of 30.51% and the second most on 3 days of treatment which amounted to 27.69%. In the study Abqariah et al (2024), explained that there are several factors that can affect the length of stay, including age, gender, nutritional status, patient knowledge, pre and post operative medical conditions such as anemia, diabetes, hepatitis, renal failure, anesthesia scores, intraoperative fatigue, and elective or emergency surgery and nosocomial infections can also increase the length of stay of patients.

Antibiotic Use Profile in Surgical Patients at Otanaha Regional General Hospital

Based on the results of the research that has been done, there are 6 types of antibiotic groups used by surgical patients at Otanaha Regional General Hospital in 2024. Of the 6 groups of antibiotics, the cephalosporin group is the most widely used group in prescribing. The use of antibiotics in surgical patients is used for prophylactic and therapeutic purposes. The use of prophylactic antibiotics aims to prevent the occurrence of infectious complications after surgery, while the use of therapeutic antibiotics aims to treat infectious diseases that have known the type of bacterial infection or those that have not known the type of bacterial infection (Permenkes RI, 2021).

Quantity of Antibiotic Use with the ATC/DDD Method

The World Health Organization (WHO) has recommended the ATC/DDD method as a method to evaluate the use of drugs, one of which is antibiotic drugs, the DDD value is defined as the average maintenance dose per day as the main indication in adults. The amount of antibiotic use in a hospital can be calculated using the DDD method with the unit DDD/100 days of hospitalization which describes the number of patients who get a daily dose (DDD) for certain indications. This method is used to convert and standardize drug quantity data into a rough estimate of drug use in a health service (Fazriyah, 2017).

The quantity of antibiotic use in surgical patients during the period January-December 2024 in units of DDD/100 days of care is shown in table 4. The DDD value was 97.11 DDD/100 days of hospitalization. This can be interpreted that among 100 days of hospitalization there are about 97 patients getting 1 DDD of antibiotic class drugs. These results are lower than the research conducted by at RSUA Surabaya which amounted to 102.93 DDD/100 bed-days. The large value of the total DDD/100 bed-days means that it shows the high level of use of the antibiotic, while the smaller the DDD value means the smaller the risk of resistance (Herdianti et al., 2020). However, the results obtained by researchers cannot be compared with the selectivity of other hospitals due to differences in the calculation method of Length of Stay (LOS).

The highest antibiotic use in surgical patients at Otanaha Hospital in 2024 was ceftriaxon. The DDD calculation for the antibiotic ceftriaxon reached 47.25 DDD/100 bed-days which indicates that there are 47 patients consuming 1 DDD of ceftriaxon every day. Ceftriaxon has a broad spectrum of activity and is effective for the treatment of infections caused by various Gram positive and Gram negative bacteria. The mechanism of action of ceftriaxon as an antibiotic is by inhibiting microbial cell wall synthesis through inhibiting the action of the third stage transpeptidase enzyme in cell wall formation. Ceftriaxon has a very long half-life of about 8 hours so that it can be given once a day and is effective to be given as a surgical prophylaxis undergoing surgical procedures with a clean contaminated class (Fazriyah, 2017).

Studies conducted by Ridwan et al (2019) at RSUD Dr. H. Slamet Martodirdjo Pamekasan, found the highest antibiotic use in ceftriaxon which amounted to 37.56/100 days of care. The use of ceftriaxon antibiotics is the most widely used antibiotic in surgical procedures. The high use of ceftriaxon antibiotics is because this antibiotic is included in the generation III cephalosporin group which works by inhibiting bacterial cell wall synthesis and is a broad-spectrum antibiotic so that it can be used for most infections, large. In addition, ceftriaxon antibiotics also have a long half-life and have a relatively safe side effect profile (Syafitri & Yerlina, 2024).

The use of ceftriaxon antibiotics is also given together with metronidazole antibiotics both by oral and parenteral routes. In the study explained that the use of ceftriaxon with metronidazole is widely used because these two classes of drugs are indicated for several surgical diagnoses due to several mixed infections such as intra-abdominal and genitourinary. Metronidazole can be used for its ability to fight anaerobic bacteria such as *B. fragilis* encountered in some surgeries, and other bacteria such as trichomoniasis, *Helicobacter pylori*, and bacterial vaginosis. However, the single administration of metronidazole is less effective for use with an infection rate of 10%, but when metronidazole is combined with ceftriaxon or other cephalosporin groups the infection rate after surgery is reduced to 3-6% (Fazriyah, 2017).

In this study, the selection of antibiotic drug use was also carried out based on the patient's diagnosis and the type of surgery performed. The most common surgical cases in this study were diabetic ulcer cases. The use of antibiotics in this case was the antibiotic ceftriaxon combined with metronidazole. According to research conducted by Sari et al (2018), the combination of generation III cephalosporins with metronidazole is effective as empirical therapy in lower limb infections because it will broaden the spectrum of antibacterial activity so that it can fight gram- positive bacteria and gram-negative bacteria and anaerobic bacteria.

DU 90% Profile

Antibiotics that are included in the 90% usage segment indicate that the antibiotics are most widely used and antibiotics that are included in the 10% usage segment indicate that the antibiotics are least used in prescribing. In a study conducted by Rusliansyah et al (2020), explained that antibiotics included in the DU 90% segment are very important to monitor their use to prevent resistance. One of the policies in reducing the incidence of resistance is limiting the use of antibiotics so that it can replace the trend of antibiotic use in a certain period.

Based on the results of the research that has been done, there are several types of antibiotics that are included in the 90% segment including ceftriaxone, metronidazole with oral and parenteral routes, cefoperazone, meropenem and cefixime. These results can be used as input for hospitals regarding the high procurement of antibiotics so that they are always available at the Hospital Pharmacy Installation, but still pay attention to the use of drugs to remain rational and tailored to patient needs. The data obtained in the DU 90% segment can be used to measure antibiotic consumption in hospitals and subsequent drug procurement and is needed as a basis for making antibiotic use policy programs (Azyenela et al., 2022).

CONCLUSION

Based on this study it can be concluded that the DDD value of antibiotic use in surgical patients during the period January-December 2024 amounted to 97.11 DDD/100 days of care, with the highest DDD value in the use of ceftriaxon antibiotics 45.88 DDD/100 days of care and the least was azithromycin 0.12 DDD/100 days of care. Antibiotics included in the 90% DU segment are ceftriaxone, metronidazole by oral and parenteral routes, cefoperazone, meropenem and cefixime.

RECOMMENDATIONS

The shortcomings of this study are that this study only describes the use of antibiotics quantitatively, so it is necessary to conduct further research in the form of qualitative use in order to obtain maximum results and make appropriate interventions so that antibiotic use is more controlled so as to minimize the incidence of antibiotic resistance.

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