

# Study on the Inaccuracy of Prophylactic Antibiotic Use and Analysis Causes of Surgical Site Infection of Surgical Patients at the Depok City Hospital for January-March 2020 Period

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**Abstract:-** Surgery Site Infection [SSI] is an infection of the incision or organ that occurs after surgery. Efforts to prevent this infection are becoming increasingly important with an increasing number of operations. Prophylactic antibiotics are often considered the most effortless prevention of SSIs. However, inaccuracy in its use can be a risk factor for the occurrence of SSI. This study was aimed to analyze the inaccuracy of prophylactic antibiotic use in surgical patients at the Depok City Hospital in the period January-March 2020. This study was conducted observational with a cross-sectional descriptive study design and retrospective data collection. The inaccuracy study of prophylactic antibiotics using the Gyssens method yielded 138 samples [99.28%] in category VI, 83 samples [60.14%] in category IVa, and 52 samples in category IVb [94.54 %]. There are no samples in groups IVb to IIc. Since all of the samples were not delivered on time in Category I, the study ended there with a total of three samples [100 %]. Meanwhile, for the period from 1 January to 19 March 2020, the incidence of infection in the surgical area in surgical patients at the Depok City Hospital was 2.87%.

**Keywords:-** *Surgical Site Infection; Prophylaxis; Gyssens.*

**Abstract:-** Upaya pencegahan terhadap infeksi daerah operasi (IDO) menjadi semakin penting sejalan dengan meningkatnya jumlah operasi. Pemberian antibiotik profilaksis seringkali dianggap sebagai pencegahan IDO yang paling mudah dilakukan. Namun ketidaktepatan dalam penggunaannya dapat menjadi faktor risiko penyebab terjadinya IDO. Tujuan penelitian ini adalah untuk menganalisis ketidaktepatan penggunaan antibiotik profilaksis pada pasien bedah di RSUD Kota Depok pada periode Januari-Maret 2020. Penelitian ini dilakukan secara observasional dengan disain penelitian deskriptif cross sectional retrospektif, sedangkan analisis dilakukan menggunakan metode Gyssens. Hasil penelitian menunjukkan pada kategori VI sebanyak 138 sampel (99,28%), kategori V sebanyak 83 sampel

(60,14%) kategori IVa sebanyak 52 sampel (94,54%). Untuk kategori IVb sampai IIc memiliki nilai yang sama yaitu sebanyak 0 sampel. Kategori I semua sampel tidak tepat waktu pemberian sehingga analisa berakhir pada kategori I dengan jumlah 3 sampel (100%). Sedangkan angka kejadian infeksi daerah operasi pada pasien bedah di RSUD Kota Depok periode 1 Januari -19 Maret 2020 sebanyak 2,87%.

**Keywords:-** *Gyssens, Infeksi Daerah Operasi, Profilaksis.*

## I. INTRODUCTION

Surgical site infection (SSI) is the highest adverse event affecting patient safety worldwide. Out of every 100 hospitalized patients worldwide, at least 1 patient has this infection [19]. The incidence of SSI is actually higher in Southeast Asian countries than in America, Europe and Australia. This condition encourages countries in Southeast Asia to pay attention to various specific risk factors and develop effective prevention strategies, so that they will have a more efficient cost impact [12].

The incidence of surgical site infection (IDO) in Indonesia is quite varied. Some data are summarized as in 2014 there was an increase in the incidence of SSI after cesarean section at the RSCM as much as 2.32% with a maximum threshold of 2% (Judge, 2017). Then a study at RSI Sultan Agung Semarang showed that the incidence of SSI was 7 patients (4.0%) out of 177 patients [14]. Research in July-October 2018 at Fatmawati Hospital showed that the SSI rate for orthopedic surgery was 3.9% of the total sample of 770 patients [3]. A study on digestive surgery patients at the Palembang MMC Hospital reported an incidence of SSI of 17.5% [2].

Several previous studies conducted in hospitals both at home and abroad have identified risk factors that can increase the incidence of SSI in surgical patients. One of the risk factors considered important is the use of prophylactic

antibiotics [21]. The use of prophylactic antibiotics is an important milestone in the prevention of surgical site infection which is quite easy to do [17]. However, inappropriate use of prophylactic antibiotics can be ineffective and even dangerous and cause severe infections [7].

The guidelines used for the use of prophylactic antibiotics should be the main focus carried out in every health service unit, one of which is the hospital [6; 9;10]. In this study, Depok City General Hospital was chosen as the research location, Depok City Hospital was a health service unit and the only government-owned hospital in Depok City. Along with its development, the number of operations/surgical actions is quite high, which is around 10-20 operations per day, while research and reporting data for the incidence of infection in the operating area and analysis of inappropriate use of prophylactic antibiotics in Depok City Hospital are still limited. Because of this, researchers are encouraged to find out the inappropriate use of prophylactic antibiotics and the effectiveness of these antibiotics in reducing mortality or morbidity caused by infection at the surgical site. The final result of this study is expected to help Depok City Hospital in improving the quality of its services, thereby protecting health human resources, patients and the community from infections related to health services.

## II. METHODS

### Research Design

The research design used is descriptive cross sectional, retrospective. Data collection was carried out retrospectively, namely research based on medical records, looking back until the time the event occurred. The research data is a total sampling of all medical records (secondary data) of patients who received surgical prophylactic antibiotics at the Depok City Hospital in the period January-March 2020 that met the inclusion and exclusion criteria.

### Inclusion Criteria

- 1) Medical record data of patients at the inpatient installation of Depok City Hospital who underwent surgical procedures during the January-March 2020 period.
- 2) Medical record data of patients undergoing surgery/surgery who received prophylactic antibiotic therapy.
- 3) Patient medical record data that has complete medical record data, which includes patient identity, age, preoperative diagnosis, name of operation, date of operation, prophylactic antibiotic therapy given, dose and time of antibiotic administration.

### Exclusion Criteria

Subjects who have met the inclusion criteria above are not included in this study if:

- 1) Medical record data of surgical patients who did not receive prophylactic antibiotics
- 2) Patient medical record data with incomplete medical data

- 3) Patient's medical record data that cannot be followed up for 30 days (the first day is calculated from the day the surgical procedure was performed) due to lack of control, or missing medical record data.

### Sample Size

The size of the sample to be taken is known by first calculating the minimum number of samples analyzed from several literature reviews. Data on the proportion of inappropriate use of prophylactic antibiotics from the literature are listed in Table 1.

Calculation of the minimum sample (n) using the formula below with the degree of confidence to be used is 95% and the desired absolute precision is 5% [13].

$$n = \frac{\left\{ z_{1-\alpha/2} \sqrt{2\bar{P}(1-\bar{P})} + z_{1-\beta} \sqrt{P_1(1-P_1) + P_2(1-P_2)} \right\}^2}{(P_1 - P_2)^2}$$

$$\bar{P} = (P_1 + P_2)/2.$$

Information:

n = minimum sample size

P1= the proportion of inappropriate use of prophylaxis using SSI

P2= proportion of appropriate prophylactic use experiencing SSI

d=precision

Z1- $\alpha$ /2 = based on the desired degree of confidence.

The degree of confidence that is often used is

90% value of Z1- $\alpha$ /2 is 1.64

95% value of Z1- $\alpha$ /2 is 1.96

99% Z1- $\alpha$ /2 value is 2.58

$\beta$ : the test power is 80% so that Z1- is 0.84.

From the results of the calculation of the minimum number of samples, the largest is 70 samples. If it is assumed that the number of medical record samples of surgical patients experiencing SSI with inappropriate and appropriate use of prophylactic antibiotics, the estimated minimum total sample size is 140 samples.

### Work procedures

Sampling that will be carried out in this study is total sampling, namely medical records of surgical patients in January-March 2020 and then taken according to the minimum sample and those that meet the inclusion and exclusion criteria. The working procedure can be seen in Figure 2.

Data analysis

a. Univariate analysis

This analysis was conducted to obtain a description/description of each variable. Each variable, both dependent and independent, will be measured in terms of amount and presentation.

#### b. Assessment of inappropriate use of prophylactic antibiotics

The use of antibiotics was analyzed based on the Gyssens flow chart including the dose and interval of antibiotics, duration of antibiotic administration, effectiveness and toxicity of antibiotics, price, spectrum and indications for use of antibiotics. The flow of Gyssen analysis can be seen in Figure 2.

### III. RESULTS AND DISCUSSION

During the period from January 1 to March 19, 2020, 543 operations have been carried out at the Depok City Hospital. From the total number of samples, 150 medical records were taken to meet the minimum number of samples that had been determined, then 11 samples were excluded because they did not meet the inclusion criteria, namely 2 medical record samples and no operating report data, 1 sample was not given prophylactic antibiotics and 7 medical record samples were surgery on the same patient so that one is taken. So the total sample used is 140 samples. The characteristics of surgical patients receiving prophylactic antibiotic therapy are listed in Table 2.

The distribution of surgical procedures, urological surgery is the largest compared to other surgical procedures. A total of 27.14% of urological surgical procedures were performed, followed by oncology surgery of 24.28%. The description of the number of surgical procedures in urological and oncological surgical procedures can be seen in Figure 3 and Figure 4.

In this study, an analysis of the inappropriate use of prophylactic antibiotics used in surgical procedures was carried out. The Gyssens groove method was used to measure the inappropriate use of prophylactic antibiotics given to surgical patients. The data and analysis of its use are described in Table 3.

The results of the analysis category VI regarding the completeness of the data, from 139 samples there was 1 sample that did not have data on the timing of prophylactic antibiotics so that it could not be used for the next category analysis. So that 138 samples were obtained which were included in the category V analysis.

In category V data analysis is the accuracy of indications of prophylactic antibiotics. This means that the criteria in the sample are adjusted to the use of prophylactic antibiotics that are indicated or meet the recommendations. This analysis is based on the guidelines of Permenkes No. 2406 of 2011 namely the use of prophylactic antibiotics is only given in clean contaminated surgery classes, namely operations performed on the digestive, respiratory, biliary, urinary, reproductive tracts except ovaries or operations without significant contamination [9;10]. The use of prophylactic antibiotics outside the clean contaminated surgery class is considered inappropriate, because in the clean surgery class, the operation is carried out in areas with no infection preoperative conditions, contaminated and dirty surgery classes require antibiotic therapy instead of

prophylaxis In this class of surgery there has been a large number of bacterial colonization or an infection that has not yet appeared clinically. The number of samples that fit in this category is 55 samples and is used for the analysis of the next category.

The analysis in category IVa is whether there are alternative antibiotics that are more effective than the prophylactic antibiotics given. In 55 samples obtained appropriate surgical procedures prophylactic use according to Bratzler guidelines only on colorectal procedures [4]. In sample analysis, all surgical procedures used the prophylactic antibiotic ceftriaxone, while those contained in the ceftriaxone antibiotic guidelines were only recommended for colorectal surgery procedures [4]. The results of sample analysis showed that the prophylaxis used was appropriate, namely the combination of ceftriaxone with metronidazole, so that in this category there were only 3 samples for which there was no more effective prophylactic alternative, so all three were categorized as IVb.

Analysis in category IVb whether there are alternative antibiotics that are less toxic, from the results of the analysis there were no other prophylactic antibiotics that were less toxic so that these 3 samples passed to the next category.

Analysis in the IVc category is there an alternative with a cheaper price, the results of the analysis of the prophylactic antibiotics used are correct, meaning that there is no cheaper alternative. Furthermore, in category IVd the number of samples used is still the same, namely 3 samples. Analysis in category IVd whether there is an alternative with a narrower spectrum, the results of the analysis are that there is no alternative with a narrower spectrum, so proceed to the next category.

Analysis in the next category is the duration of antibiotic administration. The results of the analysis in category IIIa did not give antibiotics too long and in category IIIb the antibiotics were not too short so that they continued in category II. The results of the analysis in categories IIa to IIc are that prophylactic administration has the right dose, the right interval and the right route of administration. So that further analysis continues in category I.

The results of the analysis showed that the remaining 3 samples did not show the right time of administration. Overall, the first dose of prophylactic antibiotics was started within 60 minutes before the surgical incision [4; 11]. In the analysis of 3 samples of medical records, all three prophylactic antibiotics were given at the same dose, namely ceftriaxone 1 g and metronidazole 500 mg given at 3 hours, 1 hour 30 minutes and 5 hours before surgical incision. The antibiotic ceftriaxone at a dose of 1 g is administered 30 to 60 minutes before surgery [4]. While metronidazole is given at the start of surgery up to 60 minutes before surgery [4]. The results of the analysis in this category of 3 samples were not correct, so that Gyssens' analysis stopped at category I, which was not timely giving 3 samples of medical records.

The next analysis is to observe medical record samples for monitoring/supervision of the occurrence of SSI cases. Such monitoring is related to the development and decline in the level of IDO. Surveillance procedures or SSI surveillance according to the CDC-NHSN are divided according to the type of surgical procedure. The monitoring period is divided into 30 and 90 days [5].

Monitoring was carried out for up to 30 days on each medical record sample undergoing appendectomy, cesarean, head and neck, prostate, colorectal, thoracic, bone and joint, and ovarian operations. Meanwhile, monitoring for up to 90 days was carried out on breast surgery, ORIF, and herniotomy. From the results of these observations, obtained 4 samples of medical records (2.85%) which showed the criteria for infection in the operating area. Three samples underwent appendectomy and one sample underwent urological surgery. When compared with the incidence of SSI at other hospitals in Indonesia, the percentage of SSI incidence at the Depok City Hospital is lower. In the study of infection in the operating area at Fatmawati Hospital in the July-October 2018 period, it was found that 3.9% (30 samples from a total of 770 patients) [3]. At the Sultan Islamic Hospital in Semarang in the period November 2014 to February 2015 there were 7 patients (4.0%) out of 177 patients [15].

#### IV. CONCLUSION

The results of the inaccuracy analysis of the use of prophylactic antibiotics using the Gyssens flow chart method concluded in category VI of 1.42%, category V 68.11%, category IVa 94.54%, categories IVb, IVc, IVd, IIIa, IIIb, IIa, IIb, IIc is 0% and category I is 100%. The number of infections in the operating area in surgical patients at the Depok City Hospital for the period January 1 -19 March 2020 was 4 samples from 139 medical record samples with a percentage of 2.87%. As for the results of the qualitative analysis on the four samples with SSI cases, the factors causing infection in the operating area were due to inappropriate use of prophylactic antibiotics at the time of administration. Another cause is patient compliance to take medication which is still lacking. In addition, comorbidities are also a risk factor for the occurrence of SSI.

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**Table 1.** Proportion of inappropriate use of prophylactic antibiotics.

| Tempat                  | Periode             | Proporsi P1 (%) | Proporsi P2 (%) | Min sampel (n) | Reff               |
|-------------------------|---------------------|-----------------|-----------------|----------------|--------------------|
| <b>RSI Sultan Agung</b> | Nov 2014 – Feb 2015 | 4               | 19,7            | 70             | Megawati dkk, 2015 |
| <b>RS Fatmawati</b>     | Juli-Okt 2018       | 3,9             | 19,5            | 66             | Asrawal dkk, 2019  |
| <b>RS MMC Palembang</b> | 2019                | 52,63           | 17,54           | 28             | Amelia dkk, 2019   |

**Table 2.** Characteristics of surgical patients for the January-March 2020 period at the Depok City Hospital

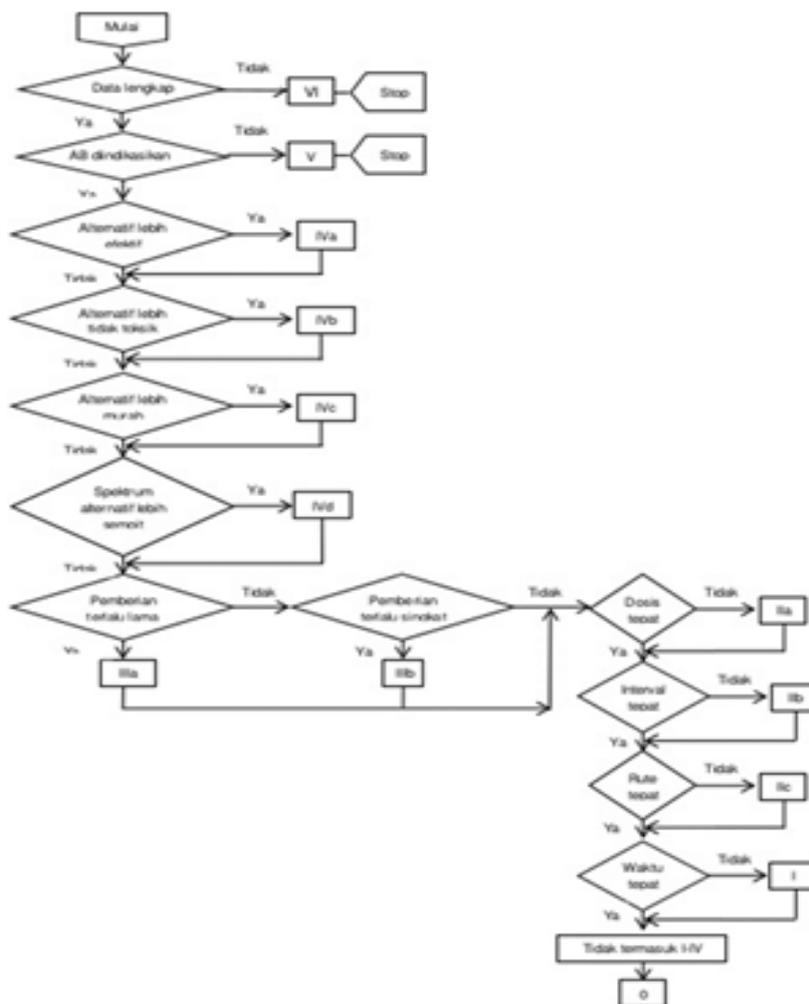
| Karakteristik             | Jumlah (N=139) | Persentase (%) |
|---------------------------|----------------|----------------|
| <b>Jenis Kelamin</b>      |                |                |
| 1. Pria                   | 75             | 54,95          |
| 2. Wanita                 | 64             | 46,04          |
| <b>Usia</b>               |                |                |
| 1. 0-18 tahun             | 18             | 12,94          |
| 2. 19 – 30 tahun          | 34             | 24,46          |
| 3. 31 – 45 tahun          | 27             | 19,42          |
| 4. 46 – 60 tahun          | 30             | 21,58          |
| 5. 60>                    | 30             | 21,58          |
| <b>Rencana Operasi</b>    |                |                |
| 1. Elektif                | 124            | 89,20          |
| 2. Emergensi              | 15             | 10,79          |
| <b>Penyakit Penyerta</b>  |                |                |
| 1. Ada                    | 43             | 30,93          |
| 2. Tidak ada              | 96             | 69,06          |
| <b>Prosedur Operasi</b>   |                |                |
| 1. Appendectomy           | 12             | 8,63           |
| 2. Kepala dan Leher       | 13             | 9,35           |
| 3. Obsetri dan Gynekologi | 10             | 7,19           |
| 4. Orthopedi              |                |                |
| 5. Kolorektal             | 23             | 16,54          |
| 6. Thorax                 | 3              | 2,15           |
| 7. Urologi                | 1              | 0,71           |
| 8. Hernia repair          | 38             | 27,33          |
| 9. Onkologi               | 5              | 3,59           |
|                           | 34             | 24,46          |

Tabel 3. The results of the analysis of the inappropriate use of prophylactic antibiotics using the Gyssens flow chart method.

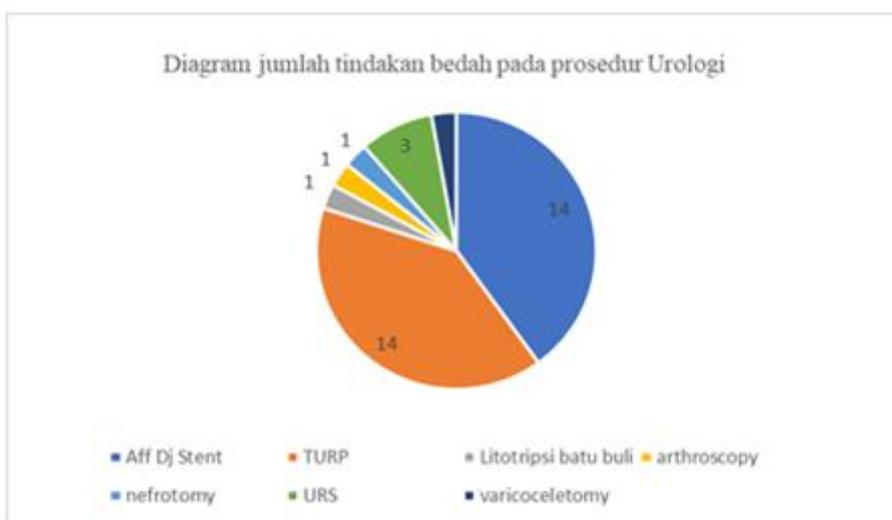
| Kategori Gyssenss   | Frekuensi N=139 | Persentase (%) |
|---|-----------------|----------------|
| VI (Data Lengkap)<br>1. Ya<br>2. Tidak                    | 138<br>1        | 98,57<br>1,42  |
| V (tepat indikasi a.b profilaksis)<br>1. Ya<br>2. Tidak   | 55<br>83        | 31,88<br>68,11 |
| IVa (ada antibiotik lebih efektif)<br>1. Ya<br>2. Tidak   | 52<br>3         | 94,54<br>5,45  |
| IVb (ada antibiotik kurang toksik)<br>1. Ya<br>2. Tidak   | 0<br>3          | 0<br>100       |
| IVc (ada antibiotik lebih murah)<br>1. Ya<br>2. Tidak     | 0<br>3          | 0<br>100       |
| IVd (ada antibiotik spektrum sempit)<br>1. Ya<br>2. Tidak | 0<br>3          | 0<br>100       |
| IIIa (durasi terlalu lama)<br>1. Ya<br>2. Tidak           | 0<br>3          | 0<br>100       |
| IIIb (durasi terlalu singkat)<br>1. Ya<br>2. Tidak        | 0<br>3          | 0<br>100       |
| IIa (tidak tepat dosis)<br>1. Ya<br>2. Tidak              | 0<br>3          | 0<br>100       |
| IIb (tidak tepat interval)<br>1. Ya<br>2. Tidak           | 0<br>3          | 0<br>100       |
| IIc (tidak tepat rute pemberian)<br>1. Ya<br>2. Tidak     | 0<br>3          | 0<br>100       |
| I (tidak tepat waktu pemberian)<br>1. Ya<br>2. Tidak      | 3<br>0          | 100<br>0       |
| 0 (tidak termasuk kategori I-VI)<br>1. Ya<br>2. Tidak     | 0<br>0          | 0<br>0         |



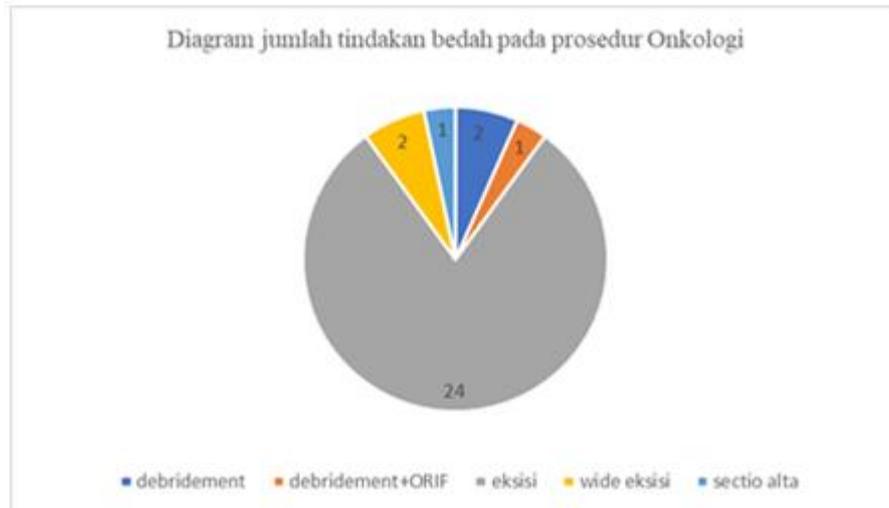
Figure 1. Research flow



**Figure 2.** Flowchart of assessment of the quality of antibiotic administration Gyssens Method (taken from Permenkes No. 8 of 2015)



**Figure 3.** Comparison diagram of surgical procedures in urological surgical procedures at the Depok City Hospital for the January-March 2020 period



**Figure 4.** Comparison diagram of surgical procedures on oncology surgical procedures at the Depok City Hospital for the January-March 2020 period