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Overview of Evaluation of Prophylactic Antibiotics in Patients with Hernia Cases at a Private Hospital in South Tangerang, Indonesia, during the Period January 2019 – December 2020

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Surgical Site Infection (SSI) is one of the complications of surgery in a hospital. The SSI can increase the morbidity and mortality of patients. The primary prevention in the SSI case is to give the right prophylactic antibiotics following the applicable guidelines, which include the proper indication, the right type, the correct dose, the right time, and the right route for giving prophylactic antibiotics. One of the recommended surgical operations using prophylactic antibiotics is a hernia. The purpose of this study was to evaluate the accuracy of giving preventative antibiotics to patients with hernia cases at a private hospital in South Tangerang from January 2019 - December 2020.

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This study retrospectively used medical records, and the type of research used was non-experimental with a descriptive design. Based on the data obtained, the administration of prophylactic antibiotics to patients with hernia cases at a private hospital in South Tangerang showed 100% correct indication, 45% correct type, 100% correct dose, 68% timely, 100% correct route of administration of prophylactic antibioti cs.

Keywords: Surgical Site Infection (SSI); hernia; prophylactic antibiotics.

1. INTRODUCTION

Infection at the incision or surgery site is a surgical site infection (SSI). One of the complications that can cause SSI is surgery conducted in the hospital. The SSI can increase the morbidity and length of time for patient care and even patient mortality. It is close to the increasing hospital cost of treating patients [1]. According to World Health Organization (WHO), it is reported that the incidence of SSI in the world can reach around 5%-34%. Increased costs may occur due to long surgical infection treatment times [2]. A hernia is a protrusion that arises due to the expulsion of organs in the body through weakened surrounding tissues. In addition, a hernia is a protrusion of an internal organ through the abnormal or weak form of the muscles surrounding it. Hernias are divided based on the process of occurrence and location. Based on the process of hernias, hernias are divided into congenital hernias (congenital) and acquired hernias (acquired). Hernias are named according to where the hernia occurs, such as inguinal, umbilical, femonal, and many more hernias [3]. The treatment for hernias is surgery. There are several classifications of operations: clean, clean-contaminated, contaminated, and dirty operations. Clean-contaminated surgery opens organs such as opening the digestive tract, urinary tract, and respiratory tract to the oropharynx, such as surgery on the biliary tract, appendix, vagina or oropharynx, laparotomy, tracheotomy, and nephrostomy [4]. The hernia was included in the clean-contaminated operation because the organ would be opened in the hernia operation.

One of the preventions of surgical site infection can be done by giving prophylactic antibiotics. Prophylaxis has a meaning of prevention and can be divided into primary and secondary prophylaxis. Primary prophylaxis is usually used for prevention during the first infection. In comparison, secondary prophylaxis is used to prevent pre-existing infections. This action is carried out to eliminate organisms that can grow around the operating area so that infection does not occur. Thus, preoperative prophylactic antibiotics are used before surgery to reduce the risk of SSI [5]. It is generally known that the organisms that often cause SSI are organisms of the normal flora of the skin, namely: Staphylococcus aureus, coagulase-negative Staphylococcus (such as Staphylococcus epidermidis), Pseudomonas species (sp)., and Escherichia coli [6]. The diversity of the types of organisms that cause SSI will affect the type of prophylactic antibiotics the doctor gives at the time of surgery. Giving prophylactic antibiotics is highly recommended to doctors to be used before surgery because it can reduce and prevent the occurrence of SSI by 30-65% [7].

Giving prophylactic antibiotics to patients must be based on established written guidelines or guidelines. Regulation of the Minister of Health (Permenkes) RI No. 2406 of 2016 concerning General Guidelines for the Use of Antibiotics was used wisely in optimizing antibiotic use in surgery [8]. Guidelines for the benefit of prophylactic antibiotics have several criteria, namely whether prophylactic antibiotics are needed, the type of prophylaxis required, the number of doses, and the route of administration when to take antibiotics. The doctor will give antibiotic administration as well as the duration of antibiotic administration at the time before the operation begins [9]. The doctor's adherence to these guidelines or guidelines is essential so that the use of prophylactic antibiotics is optimal and there is no resistance to pathogenic organisms. Although the policies on the use of prophylactic antibiotics have been established, there are several studies conducted in hospitals that found inappropriate prophylactic antibiotic administration in several diseases, and the inaccuracy of prophylactic antibiotic administration could reach 40-62% [10].

In 2008, there was a research conducted at Soetomo and Kariadi Hospital. This study showed that 53% of patients were prescribed antibiotic therapy, prophylactic antibiotics were given to 15% of patients, and 32% of prophylactic antibiotics were given with unknown

indications [11]. In another study conducted at Mintohardjo Hospital in 2014, through approved guidelines on orthopedic surgery, prophylactic antibiotics were given when implants or prosthetic materials are implanted. According to the guidelines, the antibiotic that can be provided in such cases is a first-generation cephalosporin. However, after being evaluated, the prophylactic antibiotics more widely used are third-generation prophylactic antibiotics, namely cephalosporins, which are not commonly recommended [12]. Based on some of the studies mentioned above, as there are inaccuracies in some hospitals in giving prophylactic antibiotics to patients, therefore researchers are interested in examining the level of accuracy of surgeons in giving prophylactic antibiotics to patients with hernia surgery cases in a private hospitals in South Tangerang based on guidelines of the hospital.

According to WHO, infection is one of the problems in the health sector that often occurs in developed and developing countries. According to WHO data, an infection can be the leading cause of death in children. In 2012, child mortality due to infectious diseases reached 20% [13]. Infection can be caused by the entry of microorganisms in the form of viruses, bacteria, fungi, or parasites into the host body and can cause disease [14]. When exposed to these microorganisms, the body releases the body's defense system, such as phagocytic neutrophils and macrophages [15,16]. Nosocomial infections (Hospital Acquired Infection/Nosocomial Infection) are infections suffered by patients who come from hospitals. Generally, new nosocomial infections will occur at least 3 x 24 hours since the patient was admitted, and the infection is not an ongoing infection from the health care that the patient received previously [17]. These infections can not only be affected by treated patients but nosocomial diseases can also be transmitted to health workers or visitors who have carrier status due to hospital conditions [18]. Nosocomial infections in hospitals in Indonesia receive significant attention in the health sector. It indicates that high nosocomial infections reflect the low quality of health services. In developing countries, the incidence of nosocomial infections can reach an average of 9.1% [19]. The number of nosocomial infections can continue to increase if prevention of nosocomial infections is not immediately carried out. Considering the hospital is a place that is prone to the spread, growth, and development of microorganisms according to ideal conditions for microorganisms to patients and visitors. The transmission of nosocomial infections can also be caused by personal hygiene factors such as washing hands, knowledge of personal hygiene, personal protective equipment (PPE), immunization, and previous disease history [20].

To reduce the spread of nosocomial infections, the WHO initiated "clean care is safe care." The slogan is a global patient safety program. In addition, the WHO also issued a strategy of 5 mandatory things to carry out hand hygiene, namely before and after contact with patients, before performing antiseptic actions, before exposure to patient fluids, and after contact with the patient's environment [21]. Nosocomial infections can be associated with surgery and the equipment used by patients during surgery. Several common nosocomial infections are associated with surgery and its equipment, namely urinary tract infections, surgical site infections, and primary bloodstream infections. Surgical site infection (SSI) is one of the hospital's most common nosocomial infections. Surgical Site Infections (SSI) are infections of the surgical incision involving the skin. SSI is a complication caused by surgery in a hospital [22]. It can seriously affect the tissues under the skin or related organs. Although SSI can be prevented by giving antibiotics, it can still cause patient morbidity and mortality [23]. H. Abdul Moeloek Bandarlampung City in 2011 showed that the most microorganisms causing SSI in surgical wards were Pseudomonas sp. 29.27%, Staphylococcus epidermidis 21.95%, and Klebsiella sp. 14.62% [24]. The most common bacteria on the skin are Staphylococcus aureus and Staphylococcus epidermidis. Both bacteria have the characteristics of being Gram-positive and spherical. In addition, another characteristic is that these bacteria contain polysaccharides and proteins that function as antigens on the bacterial cell wall. Clinically, this bacterium attacks people with low immunity, causes various heart, lung, bone, and bloodstream infections, and can cause antibiotic resistance [25].

Pseudomonas sp. and *Escherichia coli* are Gram-negative bacteria. Pseudomonas sp. is widespread in humid environments and thrives from 37°C to 42°C. These bacteria can cause infection in wounds and burns; there may be a purulent bluish-green color at the site of infection. In addition, it can cause meningitis if bacteria colonize the lumbar puncture and urinary tract infection if found in the catheter [26]. Escherichia

coli belongs to the family Enterobacteriaceae and is rod-shaped. These bacteria can grow with or without oxygen and cause a reduction in substrates, such as oxygen and nitrates [27]. These bacteria are outside the intestine or the number in the digestive tract increases, these bacteria can become pathogens. Escherichia coli is the main cause of UTI cases, and the incidence reaches 85%. It is because they colonize in places where equipment is installed, such as catheters, cannulae, or in the bladder [28].

In the past, many analyze the factors that cause SSI. In 1964, the National Research Council and the American College of Surgeon introduced and popularized four categories of degrees of contamination at the operating site, which have now become SSI contamination research standards. The classification is based on the degree of infection caused by bacteria, which consists of clean wounds, clean-contaminated Wounds, Contaminated Wounds, and Dirty or Infected Wounds [29]. Many studies look for the relationship between several factors that are thought to be the risk of SSI events. SSI risk factors are divided into two: factors originating from patients and procedural factors. Factors that come from patients that can cause risk events for SSI are age, local perfusion, obesity, immune status, comorbidities, and bleeding [30]. Age factors are related to changes in the function and structure of the skin tissue, so the older the skin, the more susceptible it is to infection. Changes in the function of the skin can lead to a longer rate of wound healing. There are several studies regarding the relationship between increasing age and the risk of SSI. In a study conducted at Berkah General Hospital Pandeglang, it was stated that there was no relationship between the age factor and the incidence of SSI. It is different from the research conducted at the Kanjuruhan Kepanjen Hospital, Malang Regency, which found a relationship between increasing age and the incidence of SSI [31,32]. Local perfusion has been shown to occur in patients with vascular disorders. Decreased perfusion will reduce the number of germs that cause infection [33]. In 2011, based on research conducted by Puspitasari said, the relationship between diabetes mellitus (DM) and wound healing. In patients with DM, there is an increase in fatty substances in the blood, which can stimulate the occurrence of atherosclerosis. Atherosclerosis is a buildup of fatty plaques in blood vessels that can clog the blood flow system [34].

SSI can be prevented by minimizing contact and transmission of microorganisms through the skin and clothing worn by patients, nurses, doctors on duty, operating theaters, and medical equipment. Prevention of surgical site infection is divided into three phases of surgery: before the operation begins, during the operation, and after the operation is completed [35]. Before the start of the operation, it will begin with preparations for the surgical patient and health personnel who will be involved. Patients must be prepared before surgery to clean the body, cut hair in the operating area, wear special clothes during surgery, and the doctor will give prophylactic antibiotics via the intravenous route before the operation. Cutting the surgical area hair may be necessary to reduce exposure and mark the area surgically removed. The surgical area was shaved using a clipper to minimize the risk of injury to the patient's body compared to a regular razor. Based on the recommendations of the IDSA (Infectious Diseases Society of America), prophylactic antibiotics are best given 60 minutes before surgery and adjusted to the half-life of the antibiotic [36].

Another essential thing to do is mentally or psychologically prepare the patient. Patients may experience anxiety when receiving prophylactic antibiotics. This anxiety can be detected by physical signs such as tachycardia, tachypnea, increased blood pressure, uncontrolled body movements, and many more. Preparing for health workers during surgery uses special operating clothes and hand hygiene by washing hands. Before the operation, the OK room (Operatie Kamer) or operating room must also be prepared. The postoperative stage consisted of changing the dressing using an aseptic technique, using sterile saline solution to clean the surgical wound up to 48 hours after surgery, applying antiseptic to the wound, and removing dead tissue. Wound care actions in postoperative patients must be carried out following Standard Operating Procedures (SOP), which refers to the standards of the Ministry of Health of the Republic of Indonesia. In the SOP, it is said that wound care must maintain sterile principles, namely using gloves when cleaning wounds, cleaning hands with antiseptic and taking gauze using sterile tweezers. Hernia is a bulge that appears due to an organ expulsion through the surrounding weak tissue through a defect in the womb. Hernias consist of rings, pouches, and hernia contents. External hernias are abdominal cavities on the body's surface in intra-abdominal organs wrapped in the outer parietal peritoneum.

An internal hernia protrusion of an intra-abdominal organ through a hole in the abdominal cavity. Hernias are classified based on the location of the hernia. In addition, if based on the symptoms of a hernia, hernias can be distinguished between responsible, iresponsible, incarcerated, and strangulation. Based on the occurrence, hernias are divided into femoral hernias, umbilical hernias, para umbilical hernias, epigastric hernias, ventral hernias, lumbar hernias, littre's hernias, obturator hernias, perineal hernias, and pantalon hernias [37]. Antibiotics are chemical substances produced by fungi and bacteria, which can reduce the growth of pathogenic microorganisms, but the toxicity of antibiotics to humans is relatively small. Antibiotics can be divided based on their work's nature into bactericidal and bacteriostatic antibiotics.

Prophylaxis means prevention. Prophylactic antibiotics can be divided into primary, secondary, or eradication prophylaxis. Primary infection prophylaxis is given to prevent early infection, while secondary prevention is provided to avoid relapse or reactivity. Eliminating group propagation organisms to prevent the development of infection in eradication prevention. Antibiotics given to patients who are still not infected but have a high probability of exposure to infection will be given prophylactic antibiotics. Prophylactic antibiotics administered by the intravenous route are recommended 15-60 minutes before the incision. If prophylactic antibiotics are not given as recommended, it can cause the effectiveness of antibiotics to be less than optimal. Administration of antibiotics to patients is recommended as a single dose, but there may be exceptions if certain conditions, such as a longer duration of surgery, a lot of blood is released, or other indications. Criteria for the use of antibiotics in surgery, namely: the right indication, the right type of antibiotic, the right dose, the right route of administration, the right time of administration, and the right duration of administration. In one of the studies on orthopedic surgery, prophylactic antibiotics were often given before surgery. The results of previous studies have shown that the rationality of the use of prophylactic antibiotics to obtain the results of the analysis of the accuracy of the use of antibiotics is the right indication for antibiotic administration (100%), the right patient receiving antibiotics (100%), the right type and class of drug (94.63%), the right dose was given (94.63%), duration of administration before surgery (100%) so that rationality was obtained (94.63%).

The rationale for using prophylactic antibiotics has a specific goal, namely, to reduce inaccuracies in the use of antibiotics. It is done to minimize the consequences of the misuse of prophylactic antibiotics. One of the risks of using prophylactic antibiotics is a penicillin allergy. Penicillins and cephalosporins are often the basic prophylactic antibiotics used. If this has been incorrectly associated with patients with penicillin allergy, the management will be less than optimal. The things that are important in looking at the allergic reaction are signs, symptoms, severity, previous reactions, time of occurrence of allergies, proximity to temporal and routes used in other drugs, other drugs consumed, and side effects. Patients with penicillin allergy are included in the type 1 hypersensitivity reaction, which is the type that causes allergies caused by antibiotic-specific IgE antibodies as mediators. Clinical symptoms resulting in type 1 hypersensitivity are anaphylaxis, urticaria, angioedema, bronchospasm, and hypotension. The allergic reaction may occur <72 hours after exposure [38].

The risk of other prophylactic antibiotics is that they can cause antibiotic resistance. Increased use of antibiotics leads to more resistance, as shown by various large and small-scale studies. Three uncontrolled observational studies have shown that when prophylactic antibiotics are given for surgical operations, there is an increased risk of patients developing antibiotic resistance after treatment. In addition, other trials using the antibiotics ciprofloxacin or vancomycin showed an absolute increase in the number of patients with resistant organisms after treatment compared to before treatment. All surgical procedures pose a risk of infection to the patient. However, the benefits of prescribing prophylaxis must be balanced against the potential risks associated with antimicrobial use, including allergic reactions and resistance to antibiotics. Some surgical procedures, such as clean procedures not associated with prosthetics, are not indicated for prophylactic antibiotics. In general, prophylactic antibiotics are indicated for scenarios where the incidence of infection at the time of surgery is high and the consequences of the disease are significant.

Based on the above background, as well as the hospital guidelines that were used, the research

was formulated, namely: How is the description of prophylactic antibiotics given to patients with hernia surgery cases which include class and type, indication, time and duration, and route of antibiotic administration in a hospital in South Tangerang for the period January 2019 – December 2020. The purpose of the study was to determine surgeons' characteristics, usage patterns, and level of compliance in administering prophylactic antibiotics to patients with hernia cases at one of the hospitals in South Tangerang for the period January 2019 - December 2020.

2. METHODOLOGY

This research design is non-experimental because no treatment is given to the research subjects. In this study, we looked at the situation at a certain period by evaluating the doctor's compliance in giving prophylactic antibiotics (type, dose, time of administration, and duration of prophylactic antibiotics) to hernia surgery patients against the regulations in force at a private hospital in South Tangerang. This research was retrospective sttudy. The research was conducted in the medical records section at a private hospital in South Tangerang from January 2019 to December 2020. The population of this study were all patients with hernia cases who were given prophylactic antibiotics recorded in the medical records. The samples in this study were all medical records of patients undergoing surgery with hernia cases at a private hospital in South Tangerang during that period who received prophylactic antibiotics. The data used in this study is primary data, namely direct data collection by examining medical record documents for hernia surgery patients. In this study, the data collection method used was the observation method. Collecting data by observing the object to be studied, namely taking samples of medical record documents of patients to observe doctor compliance in giving antibiotics (right patient, right indication, right type, right route, right dose, right time of administration) based on hospital guidelines. The research instruments are a) Medical records of patients with hernia surgery cases; b) Guidelines for Prophylactic Antibiotics at a private hospital in South Tangerang. In this study, the data taken were based on data collection techniques which were analyzed using a computer program. The data processing of the results of this study was formed by using the steps of editing, coding, entry, and cleaning. The data analysis used is a descriptive analysis method regarding the results of evaluating physician compliance and comparing it with the guidelines for the use of antibiotics at the hospital. The analysis was carried out by looking at the accuracy of the doctor giving antibiotics by looking at (the type of antibiotic, dose, time of administration, proper indication, right patient, right drug selection, and proper method of administering medicine) safely treated at a private hospital in South Tangerang, as well as analysis which produce quantitative data (percentage) and qualitative data (description) later.

3. RESULTS AND DISCUSSION

The study was conducted at a private hospital in South Tangerang in December 2021. Data were taken from the hospital's medical record section regarding the administration of prophylactic antibiotics to patients with hernia cases from January 2019 to December 2020, obtaining 91 cases of hernia (Table 1). Among them, there were 64 patients included in the inclusion criteria and 27 patients included in the exclusion criteria.

In this study, the data was collected in the form of gender, age, and category of surgery, as well as a list of prophylactic antibiotics (type of prophylactic antibiotics, route of administration of antibiotics, time of administration, duration of prophylactic antibiotics). Furthermore, the data collected is analyzed based on the hospital's guidelines for giving prophylactic antibiotics.

Based on the study's results, patients with hernia cases were 57 male patients (89%) and seven female patients (11%) (Table 2). This result is also following that obtained by Damar Magni, who was conducted at the Tangerang City General Hospital, where there were more male patients (88.1%) than female patients (11.9%). Likewise, research conducted at RSU by dr. Soetomo Surabaya said there were more male patients (83.3%) than female patients (16.7%). The main reason that more men suffer from hernias than women is due to several factors, such as anatomical structures, for example, in the case of inguinal hernias, where the inguinal canal in men is larger than in women. In addition, in men, there are differences in the process of developing reproductive organs with women during the fetus (Table 3). This area can be a potential weak point for hernias [39]. So, it can be concluded that hernia cases are more common in male patients than female patients.

Table 1. Data on patients with hernia cases

Criteria	Number of patients	Percentage
Patients with in complete data	6	7%
Patients not receiving prophylactic antibiotics	21	23%
Patients receiving prophylactic antibiotics	64	70%
Total	91	100%

The most common age group is the elderly, namely >60 years were 29 patients (45%). While in the adult group, namely 20-59 years, there was a total of 35 patients consisting of the age category 20-39 with 13 patients (20%) and age 40-59 with 22 patients (35%). Based on the results of research conducted by Damar Mugni, the highest percentage of patients aged 56 – 65 was 23.73%. Other studies also align with Damar Mugni's research that patients with a lot of inguinal hernias are patients of productive age or 19-64 years, and the next most presentation is in elderly patients. This study is in line with these research results indicationg the highest presentation in patients of productive age. The incidence of hernias increases with age. Patients of productive age can get hernias because of the intensity of the work they do. Increased use of muscles and the presence of tension or strain in the abdomen so that the abdominal organs can come out through the damaged or defective abdominal wall, resulting in hernia cases. In elderly patients, hernias are generally caused by reduced muscle function or strength due to aging. In patients with young age or children, hernias can usually occur due to congenital abnormalities.

Based on research data on the type of hernia surgery, from 64 patients, the most types of surgery were repair of femoral hernia as many as 40 patients (63%) (Table 4). In addition, there was also a hernia repair in 13 patients (20%), and repair of an inguinal hernia in 9 patients (14%), repair of an umbilical hernia in 2 patients (3%). Based on the guidelines for the use of antibiotics in hospitals and the previous discussion, surgical procedures are divided into four groups, namely clean operations, clean-contaminated operations, contaminated operations, and infected operations. Clean surgery is an operation that does not open hollow organs such as the respiratory tract, urinary tract, gastrointestinal tract.

Table 2. Distribution of sex in patients with hernia cases

Gender	Total (n)	Percentage (%)
Male	57	89%
Female	7	11%
Total	64	100%

Based on the data, 64 patients received prophylactic antibiotics, of which 33 were in the clean-contaminated surgery category and 31 were in the clean surgery category (Table 5). Prophylactic antibiotics are given to patients with indications for surgery categories that have a high risk of infection. It is because the purpose of giving antibiotics is to reduce the incidence of infection during the surgical process. Indications and selection of antibiotic therapy were determined based on the operating category, the most common pathogenic microbes in the operating room, the safety and efficacy profile of the antimicrobial agent, and the antibiotic's price. Inappropriate use of antibiotics can cause antibiotic resistance, prolong the time the patient is hospitalized, and increase the cost to the patient. In hernia surgery, including clean surgery or polluted clean surgery, which generally only has a very minimal risk of infection, this operation can be at risk for infection when accompanied by mesh installation, so special considerations are needed in giving the antibiotic.

Infection in clean-contaminated surgical wounds can reach 2.1-9.5% of the incidence of SSI with antibiotics. It can happen because other risk factors can cause surgical site infections, such as the patient's nutritional status, type of surgery, duration of surgery, and so on. Based on guidelines from the hospital, giving antibiotics to patients is also highly recommended to reduce the incidence of infection in several other hospitals, such as the hospital where the research was conducted. Based on the Regulation of the Minister of Health of the Republic of Indonesia no. 2406 of 2011, it is not recommended that prophylactic antibiotics be given for hernia surgery. However, this can also be considered because the type of surgery recommended for prophylactic antibiotics is clean, and a clean operation may become polluted. So in hernia surgery, prophylactic antibiotics are given as prevention to reduce the incidence of surgical site infection.

Based on the data obtained, there are several classes of antibiotics given to patients with hernia

cases. Generation 1 cephalosporins were the most widely administered antibiotics, amounting to 33 cases (51%). After that, there was a third-generation cephalosporins administration to 26 (41%) patients, carbapenems in 1 case (2%), and there were other groups in 4 (6%) cases (Table 6). The class of drugs included in the first-generation cephalosporins is cefazolin. The 3rd generation cephalosporins included in this group are ceftriaxone, cefoperazone, and cefotaxime. Meropenem is an antibiotic belonging to the carbapenem group. In this study, another class of antibiotics was a mixture of cefoperazone and sulbactam, where cefoperazone was included in the third-generation cephalosporin, and sulbactam was included in the beta-lactamase inhibitor class of antibiotics.

In several studies, the average operation in hernia cases is carried out by giving prophylactic antibiotics in the form of cephalosporins, but the types of cephalosporins differ depending on the pattern of germs in the hospital. Patients with hernia cases were given prophylactic antibiotics, namely a generation 1 cephalosporin, cefazolin, which was in line with the hospital guidelines that the researchers got. The type of antibiotic given is cefotaxime, which is a third-generation cephalosporin. In other studies, it was also found that many use third-generation cephalosporin antibiotics, while in their use in hospitals, it is better to consider first-generation antibiotics rather than direct third-generation antibiotics. It means that the use of the type is also different, where the third class of cephalosporin antibiotics, namely ceftriaxone, has less

Table 3. Age distribution of patients with hernia cases

Age	Gender		Total (n)	Percentage (%)
	Male	Female		
1–19	0	0	0	0%
20–39	12	1	13	20%
40–59	19	3	22	35%
> 60	26	3	29	45%
Total	57	7	64	100%

Table 4. Types of operations on patients with hernia cases

Types of hernia surgery	Total	Percentage
Repair of Hernia	13	20%
Repair of Femoral Hernia	40	63%
Repair of Umbilical Hernia	2	3%
Repair of Inguinal Hernia	9	14%
Total	64	100%

Table 5. Description of operation category with antibiotics for patients with hernia cases

Operation category	Total	Percentage
Clean – Contaminated	33	52%
Clean	31	48%
Total	64	100%

Table 6. Types of prophylactic antibiotics based on antibiotic groups given to patients with hernia cases

Group	Types of antibiotics	Total	Percentage
1st Generation Cephalosporins	Cefazolin	33	51%
3rd Generation Cephalosporins	Ceftriaxone	25	39%
3rd Generation Cephalosporins	Cefotaxime	1	2%
Carbapenem	Meropenem	1	2%
Other groups	Cefoperazone + Sulbactam	4	6%
Total		64	100%

effectiveness against Gram-positive bacteria but is very good on Gram-negative bacteria compared to the previous generation. The administration of third-generation antibiotics in surgery can occur if there is resistance to bacteria antibiotics.

Regulation of the Minister of Health of the Republic of Indonesia no. 2406 of 2011 recommends using first and second-generation cephalosporins for surgical prophylaxis. Meanwhile, third and fourth-generation cephalosporins, carbapenems, and quinolones are not recommended [40]. Similar things are also recommended based on the guidelines for the use of antibiotics in force at the hospital, where the recommended antibiotics are prophylactic antibiotics of the first generation of cephalosporins, namely cefazolin, and second generation of cephalosporins, namely cefuroxime. It can be considered because the administration of first or second-generation cephalosporins is sufficient based on the germ pattern in the hospital. Third-generation cephalosporins, in hospital guidelines, are recommended for craniotomy or surgical operations on the skull. In addition, if there are patients who have penicillin allergies, the patient cannot receive penicillin or cephalosporins. Selection of antibiotics based on the pattern of germs in the hospital. It can be concluded that there is non-adherence to the administration of antibiotics occurred in 31 patients consisting of 26 cases receiving prophylactic antibiotics of the third-generation cephalosporin group, 4 cases received antibiotics with a group that was a combination of third-generation antibiotics and beta-lactamase inhibitors, and 1 case used carbapenems.

Based on the data obtained, it can be concluded that the average dose given to hernia surgery patients is about 1-2 grams for each type of antibiotic, both generation 1 cephalosporins, third-generation cephalosporins, carbapenems, or other antibiotic groups. In the right dose category, based on the data obtained, almost every patient who received prophylactic antibiotics received the appropriate dose between 1-2 grams, with most patients receiving an average dose of 2 grams in adult patients (Table 7). Another study by Selly Septi et al. found that the antibiotic given to the hernia patient was cefazolin at 2 grams. If the dose is given more or less, it can cause effects on these patients, such as resistance to antibiotics or surgical site infections. Based on the present data set, it can be concluded that the dosing at the hospital was very appropriate, following applicable guidelines. Repeated doses can be given if there is bleeding due to surgery of more than 1500 ml or the operation lasts more than 3 hours, according to the Minister of Health of the Republic of Indonesia Regulation No. 2406 in 2011 [40].

The appropriate time for antibiotic administration is 20-60 minutes before surgery begins. In these data, it was found that 58 patients received prophylactic antibiotics at the right time, which was between 20-60 minutes before surgery. The other six patients received a period of antibiotic administration outside the guidelines, namely, 0-19 minutes before surgery, >60 minutes before surgery, and after surgery (Table 8). Based on research conducted by Nyayu Siti at Dr. Hospital. H Marzoeki Bogor, based on the applicable guidelines, antibiotics are administered 30-90 minutes before surgery. It has a longer duration of time than giving antibiotics at other hospitals. It is ideal that prophylactic antibiotics can be given less than 60 minutes before surgery. It is estimated that at the start of surgery, the antibiotic has obtained optimal levels to reduce the growth of bacteria that can cause infection.

Based on the data concerning the route of administration of antibiotics given to these 64 patients, it was found that the route used was intravenous. Meanwhile, there were no patients who received prophylactic antibiotics orally. Evaluated postoperative patients, including those with lateral inguinal hernias. In patients, as many as 65 (83.2%) received prophylactic antibiotics by intravenous route (Table 9). Administered antibiotics by the intravenous route are carried out because the prophylactic drug can reach peak serum concentrations quickly because it does not go through the absorption process, and so on. In this study, all patients who received prophylactic antibiotics received intravenous administration, so It can be concluded that the administration of antibiotics is the right route.

Table 7. Dosage of prophylactic antibiotics for patients with hernia cases

Group	Type antibiotics	Dose		Total	%
		1 gram	2 grams		
1st Generation Cephalosporins	Cefazolin	3	30	33	52%
3rd Generation Cephalosporins	Ceftriaxone	1	24	25	39%
3rd Generation Cephalosporins	Cefotaxime	0	1	1	2%
Carbapenem	Meropenem	1	0	1	2%
Other groups	Cefoperazone + Sulbactam	1	3	4	6%
Total				64	100%

Table 8. Timing of prophylactic antibiotics for patients with hernia cases

Timing of prophylactic antibiotics		
Time	**Total**	**Percentage**
0 - 19 minutes before surgery	5	8%
20 - 39 minutes before surgery	4	6%
40 - 59 minutes before surgery	54	84%
>60 minutes before surgery	1	2%
0 - 19 minutes after surgery	0	0%
20 - 39 minutes after surgery	0	0%
40 - 59 minutes after surgery	0	0%
Total	64	100%

Table 9. Routes of administration of prophylactic antibiotics to patients with hernia cases

Route of antibiotics	Total	Percentage
Intravenous	64	100%
Per-oral	0	0%
Total	**64**	**100%**

4. CONCLUSION

Based on the results of the present study, it was found that out of the 85 patient with complete data set, 64 (75%) received prophylactic antibiotics, and 21 (25%) did not receive prophylactic antibiotics. Of the 64 cases receiving Antibiotics (AB) Prophylaxis, it can be concluded: a) The accuracy of the indication for giving AB Prophylaxis reached 64 cases (100%) which means that all cases had the correct indication; b) The accuracy of the type of AB drugs, and the recommended prophylaxis is 1st generation cephalosporin; there are 33 cases (51%); c) Accuracy of AB Prophylaxis dose reached 64 cases (100%), indicating the correct dose was given, namely 1-2 grams; d) Timeliness of giving appropriate prophylactic AB right at 20-60 minutes before surgery there were 58 cases (91%); and e) The accuracy of the route used in the administration of AB Prophylaxis was the intravenous route with accuracy in all cases, namely 64 cases (100%).

CONSENT

As per international standard or university standard, patient(s) written consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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