Overview of Evaluation of Prophylactic Antibiotics in Surgical Patients with Hernia Cases at a Private Hospital in South Tangerang Period 2019–2020

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 surgical patients with hernia cases at a private hospital in South Tangerang from January 2019 - December 2020. 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 surgical 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 antibiotics.

Keywords: Surgical Site Infection (SSI), Hernia, Prophylactic Antibiotics

Introduction

Infection at the incision or surgery site is a surgical site infection (SSI). One of the complications that can cause SSI is surgery 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, fermonal, 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

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 research conducted at RSUD by Dr. Soetomo and RSUD Dr. Kariadi. 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 RSAL Mintohardjo in 2014, through approved guidelines on orthopedic surgery, prophylactic antibiotics will be 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 above, because there are inaccuracies in some hospitals in giving prophylactic antibiotics to surgical patients, therefore researchers are interested in examining the level of accuracy of surgeons in giving prophylactic antibiotics to surgical patients with hernia surgery cases in private hospitals in South Tangerang based on guidelines of the hospital.

Based on the description in the background above, as well as the hospital guidelines that will be used, the research can be formulated, namely: How is the description of prophylactic antibiotics given to surgical 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 surgical patients with hernia cases at one of the hospitals in South Tangerang for the period January 2019 - December 2020.

Literature Review

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].

The body's response when pathogenic microorganisms enter and colonize the body is called inflammation. The inflammatory reaction can be divided into two, namely, acute

inflammation and chronic inflammation. The difference between acute and chronic inflammation is the length of time it occurs. Acute inflammation can last from a few minutes to a few days, while chronic inflammation can occur from days to years. The process of inflammation begins when there is trauma to the skin, which causes microorganisms to enter the skin and colonize the wound site. The body's first line of defense comes from macrophages already in the area around the wound. Macrophages will phagocytize microorganisms; this defense occurs during the first few hours.

Resident macrophages will secrete chemotaxis and cytokines as an immune response. After the invasion of microorganisms, the blood vessels at the site of attack will experience dilation. Dilated blood vessels can be arteries and capillaries. The widening of the blood vessels is also known as vasodilation. It is caused by histamine released by mast cells in damaged tissue. The dilation of the capillaries can cause plasma proteins to leave the blood and enter the wound tissue, which can cause an increase in the colloid osmotic pressure of the interstitial fluid and capillary blood pressure. Changes in colloid osmotic pressure and capillary blood pressure can cause local fluid balance shifts or local edema. The local edema or swelling that usually accompanies inflammation is caused by histamine. Redness and warmth in the area of inflammation are typically caused by increased blood flow to the injured area. In addition, pain is caused by the area of the wound experiencing swelling. Then the characteristics of inflammation are swelling, redness, heat, and pain. After histamine causes an increase in blood vessel dilation, blood clotting factors are formed from the leaking proteins. These blood clotting factors will prevent or slow the spread of bacteria and other disease-causing factors.

Then when there are blood clotting factors, the wound area will be filled with leukocytes that have left the blood vessels. The leukocytes are neutrophils and monocytes. Chemotaxis attracts monocytes and neutrophils to migrate to the site of infection. Monocytes will experience enlargement to become macrophages, so macrophages and pathogens will destroy microorganisms. While phagocytic agents will destroy microorganisms, phagocytic agents will mark between normal cells and foreign cells. Because if you don't mark normal or foreign cells, it can cause cells to destroy all materials in the body and cause autoimmune. Substances from within the body that make bacteria more susceptible are opsonins. When destroying these foreign microorganisms, some chemicals mediate the inflammatory response. Leukocytes, namely cytokines, will secrete all chemical mediators other than antibodies. Macrophages, monocytes, neutrophils, T cells, especially helper T cells, and some non-immune cells are secreted by cytokines. There are other critical chemical compounds released by macrophages, such as interleukin 1 (IL-1), interleukin 6 (IL-6), and tumor necrosis factor (TNF), that are prepared to help the body fight infection or tissue damage. The end of the inflammatory process is to isolate and destroy the cause of tissue damage and repair the tissue [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 career 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.

Organisms that cause SSI are mostly caused by normal skin flora, namely Staphylococcus aureus, coagulase-negative Staphylococcus (such as Staphylococcus epidermidis), Pseudomonas sp., and Escherichia coli [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]. However, Escherichia coli is a good bacterium that lives in the human intestine and has many essential roles. But when 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 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 skin, 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. Surgical 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 (Infection Disease 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.

During the operation, the doctor will use incise drapes which can attach the skin at the incision site, and apply antiseptic to the operating area. The patient's condition to remain normal during the operation must also be maintained by maintaining the patient's blood pressure, heart rate, respiration, blood sugar, and body temperature. Cold operating room temperatures can trigger hypothermia, so to prevent this situation, several methods are used to warm the patient's body. These methods are forced-air warming systems, water bed systems, and passive warming like blankets. Irrigating the wound and rinsing the patient's hollow organs, such as the stomach and intestines, with antiseptic, cleaning the incision wound with a topical antiseptic before closing the wound, choosing the right wound closure, and using a surgical wound dressing.

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 SOP (Standard Operating Procedures), 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, ireponibel, inkaserata, 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.

The etiology of each hernia can be different or the same depending on its location and nature. Inguinal hernias can occur because of the time in the womb or acquired. Inguinal hernias are more common in men than women. It can be caused by the shape of the hernia entrance, namely the internal annulus, which is wide enough in men to make the hernia sac and contents come out. There are other causes, such as the contraction of m. transversus abdominis. The stretching of the crura of the internal ring, iliopubic tract, and transversalis fascia thickens when the muscle contracts causing the ring to close like a sphincter (Shutter Mechanism). When this happens, m. obliques-external stretches to form the anterior wall of the inguinal canal and compress the internal ring on the weakened posterior wall. In addition, inguinal hernias, such as ventral hernias, can occur due to acquired or congenital abnormalities. In acquired abnormalities, the tissue in the abdominal wall will experience microscopic tears due to increased intra-abdominal pressure. Conditions that can cause increased intra-abdominal pressure include constipation, labor, excessive coughing, or repeated vomiting. While the congenital ventral hernia, hernia defects occur from birth, and with increasing age, the defect can enlarge.

There are several clinical manifestations of hernia [37]: a) Hernia is a lump in and out or hard, and a lump can be seen in the groin; b) There is a pain in the protrusion area if the contents occur accompanied by a feeling of nausea; c) Nausea and vomiting or distension become one of the symptoms if there are complications; d) If the patient has a strangulated inguinal hernia, there will be increased pain and signs of inflammation in the skin; e) In a small femoral hernia there will be a bladder wall that can cause pain when urinating (dysuria) accompanied by hematuria next to a lump on the inside of the thigh; f) Diaphragmatic hernia will cause pain in the abdominal area accompanied by shortness of breath; g) Coughing can make the hernia lump get bigger.

Conservative action is to reposition to maintain the contents of the hernia and use a buffer or support. However, with the use of conservative therapy, relapse can occur. Conservative measures consist of repositioning, injections, hernia belts, and surgery. There are three types of hernia surgery: herniotomy, herniorrhaphy, and hernioplasty.

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.

Research Method

This research design is non-experimental because no treatment is given to the research subjects. In this study, we will look 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 is retrospective. It took data from medical records from January 2019 to December 2020. The research will be conducted in the medical records section at a private hospital in South Tangerang from January 2019 to December 2020. The population seen in this study are all surgical patients with hernia cases who were given prophylactic antibiotics recorded in the medical records at a private hospital in South Tangerang from January 2019 to December 2020. 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 at a private hospital in South Tangerang from January 2019 to December 2020. 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 surgical 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 surgical patients with hernia surgery cases in January 2019 - December 2020; 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 in a private hospital in South Tangerang. Data were collected retrospectively on the patient population who underwent hernia surgery by tracing data from the patient's medical records. 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. It will produce quantitative data (percentage) and qualitative data (description or description) later.

Result 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 surgical patients with hernia cases from January 2019 to December 2020, obtaining 91 points for hernia patients. In the 91 cases of hernia, there were 64 patients included in the inclusion criteria and 27 patients included in the exclusion criteria.

Table 1. Data on Surgical Patients with Hernia Cases at a Hospital in South Tangerang for the Period January 2019 – December 2020

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

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.

Table 2. Distribution of Sex in Surgical Patients with Hernia Cases at One Hospital in South Tangerang Period January 2019 – December 2020

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

Based on the study's results, surgical patients with hernia cases were 57 male patients (89%) and seven female patients (11%). 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. 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 3. Age Distribution of Surgical Patients with Hernia Cases at One Hospital in South Tangerang Period January 2019 – December 2020

Age	Gender		Total (n)	Percentage (%)
	Male	Female		
1–19	0	0	0	0%
20–39	12	1	13	20%
40–59	19	3	23	36%
> 60	26	3	36	56%
Total	57	7	64	100%

The most common age group is the elderly, namely >60 years were 36 patients (56%). While in the adult group, namely 20-59 years, there was a total of 36 patients consisting of the age category 20-39 with 13 patients (20%) and age 40-59 with 23 patients (36%). 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 the research results that the researchers got, namely 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 a young age or children, hernias can usually occur due to congenital abnormalities.

Table 4. Types of Operations on Surgical Patients with Hernia Cases at One Hospital in South Tangerang Period January 2019 – December 2020.

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%

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%). 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, and system.

Table 5. Description of Operation Category with Antibiotics for Surgical Patients with Hernia Cases at a Hospital in South Tangerang Period January 2019 – December 2020

Operation Category	Total	Percentage
Clean – Contaminated	33	52%
Clean	31	48%
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. 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. In one study by Jeyamohan, it was found that surgical wounds in the clean operating class could reach 5.6% of the incidence of SSI with antibiotics.

Meanwhile, according to research by Avenia, 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 is polluted. So in hernia surgery, prophylactic antibiotics are given as prevention to increase the incidence of surgical site infection.

Table 6. Types of Prophylactic Antibiotics Based on Antibiotic Groups Given to Surgical Patients with Hernia Cases at a Hospital in South Tangerang Period January 2019 – December 2020

Group	Types of Antibiotics	Total	Persentase
1st Generation Cephalosporins	Cefazolin	33	52%
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%

Based on the data obtained, there are several classes of antibiotics given to surgical patients with hernia cases. Generation 1 cephalosporins were the most widely administered antibiotics, amounting to 33 cases (52%). 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.

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 that researchers have read, 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. In a study by Selly Septi et al. at the Surabaya City 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. But in one of the studies by Nyayu Siti Aminah at Dr. Hospital. H. Marzoeki, in the case of hernia, 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 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 if only the first generation is used.

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]. And 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. So this is done 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.

Table 7. Dosage of Prophylactic Antibiotics for Surgical Patients with Hernia Cases at a Hospital in South Tangerang Period January 2019 – December 2020

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%

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. 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 data that the researchers got, 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].

Table 8. Timing of Prophylactic Antibiotics for Surgical Patients with Hernia Cases at a Hospital in South Tangerang Period January 2019 – December 2020.

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%

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. 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. According to research conducted by Anggita et al., 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.

Table 9. Routes of Administration of Prophylactic Antibiotics to Surgical Patients with Hernia Cases at a Hospital in South Tangerang Period January 2019 – December 2020.

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

Based on the data on 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. One of the studies conducted by Sani Nurlela et al. at the SMC Hospital, Tasikmalaya district, evaluated postoperative patients, including those with lateral inguinal hernias. In surgical patients, as many as 65 (83.2%) received prophylactic antibiotics by intravenous route. 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.

Conclusion

Based on the results of the previous study, it was found that of the 85 patients, 64 (75%) received prophylactic antibiotics, and 21 (25%) did not receive prophylactic antibiotics. Based on the results of research conducted at a private hospital in South Tangerang, of the 64 cases receiving 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 (52%); 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%).

References

[1] Haque M, Sartelli M, McKimm J, Bakar MA. Health care-associated infections–an overview. Infection and drug resistance. 2018;11:2321.

[2] Wahyuningsih IP. Analisis Pelaksanaan Bundles Care Ido terhadap Kejadian Infeksi Daerah Operasi dan Dampaknya terhadap Lama Rawat Pasien. Jurnal Health Sains. 2020 Dec 24;1(6):366-76.

[3] Kappikeri VS, Thalasta P. Clinical study of hernia in females. International Surgery Journal. 2017 Apr 22;4(5):1632-6.

[4] Goyal R, Sandhu HP, Kumar A, Kosey S, Mehra N. Surveillance method for surgical site infection. Indian Journal of Pharmacy Practice. 2015;8(2).

[5] Jones DJ, Bunn F, Bell-Syer SV. Prophylactic antibiotics to prevent surgical site infection after breast cancer surgery. Cochrane Database of Systematic Reviews. 2014(3).

[6] Sganga G, Tascini C, Sozio E, Carlini M, Chirletti P, Cortese F, Gattuso R, Granone P, Pempinello C, Sartelli M, Colizza S. Focus on the prophylaxis, epidemiology and therapy of methicillin-resistant Staphylococcus aureus surgical site infections and a position paper on associated risk factors: the perspective of an Italian group of surgeons. World Journal of Emergency Surgery. 2016 Dec;11(1):1-3.

[7] Nuriana M, Dwiningshih SR, Indiastuti DN, Setiabudi RJ. The Effect of Pre-Operating Antibiotic Prophylaxis on Post C-Section Infection In RSUD DR. Soetomo Period January 2021–June 2021. International Journal of Social Service and Research. 2022 Jan 15;2(1):40-7.

[8] Anggraini AB, Syachroni S. Penggunaan antibiotik profilaksis pada bedah bersih di Rumah Sakit di Jakarta. Jurnal Penelitian dan Pengembangan Pelayanan Kesehatan. 2020 May 7:7-12.

[9] Habib AM, Wong AD, Schreiner GC, Satti KF, Riblet NB, Johnson HA, Ossoff JP. Postoperative prophylactic antibiotics for facial fractures: A systematic review and meta-analysis. The Laryngoscope. 2019 Jan;129(1):82-95.
[10] Doron S, Davidson LE. Antimicrobial stewardship. InMayo Clinic Proceedings 2011 Nov 1 (Vol. 86, No. 11, pp. 1113-1123). Elsevier.
[11] Fadhilah H, Chasanah N, Ruswendi R. Evaluasi Penggunaan Antibiotik Profilaksis Cefazolin Pada Pasien Operasi di Rumah Sakit Premier Bintaro. Edu Masda Journal. 2019 Sep 7;3(2):141-7.
[12] Alaniz C, Regal RE. Spontaneous bacterial peritonitis: a review of treatment options. Pharmacy and Therapeutics. 2009 Apr;34(4):204.
[13] Cunningham RM, Walton MA, Carter PM. The major causes of death in children and adolescents in the United States. New England Journal of Medicine. 2018 Dec 20;379(25):2468-75.
[14] Greenwood D, Slack RC, Barer MR, Irving WL. Medical Microbiology E-Book: A Guide to Microbial Infections: Pathogenesis, Immunity, Laboratory Diagnosis and Control. With STUDENT CONSULT Online Access. Elsevier Health Sciences; 2012 Jul 17.
[15] Alberts B, Johnson A, Lewis J, Raff M, Roberts K, Walter P. Innate immunity. InMolecular Biology of the Cell. 4th edition 2002. Garland Science.
[16] Freire MO, Van Dyke TE. Natural resolution of inflammation. Periodontology 2000. 2013 Oct;63(1):149-64.
[17] Burke JP. Infection control-a problem for patient safety. New England Journal of Medicine. 2003 Feb 13;348(7):651-6.
[18] Jin YH, Huang Q, Wang YY, Zeng XT, Luo LS, Pan ZY, Yuan YF, Chen ZM, Cheng ZS, Huang X, Wang N. Perceived infection transmission routes, infection control practices, psychosocial changes, and management of COVID-19 infected healthcare workers in a tertiary acute care hospital in Wuhan: a cross-sectional survey. Military Medical Research. 2020 Dec;7(1):1-3.
[19] Irdan I. Faktor-Faktor Yang Berhubungan Dengan Infeksi Nosokomial (Inos) Oleh Perawat Di Irna Bedah Rsud Kayuagung Kabupaten Oki Tahun 2017. InProsiding Seminar Nasional dan Penelitian Kesehatan 2018 2018 Aug 30 (Vol. 1, No. 1).
[20] Soman Pillai V, Krishna G, Valiya Veettil M. Nipah virus: past outbreaks and future containment. Viruses. 2020 Apr 20;12(4):465.
[21] Arifianto A, Aini DN, Kustriyani M. Gambaran Perawat Dalam Pencegahan Infeksi Nosokomial Di Rsud Dr H Soewondo Kendal. InProsiding Seminar Nasional Widya Husada 2019 Oct 28.
[22] Alfouzan W, Al Fadhli M, Abdo N, Alali W, Dhar R. Surgical site infection following cesarean section in a general hospital in Kuwait: trends and risk factors. Epidemiology & Infection. 2019;147.
[23] Langat CK. Antimicrobial susceptibility and management of bacterial skin and soft tissue infections at Moi Teaching and Referral Hospital, Eldoret, Kenya (Doctoral dissertation, Moi University).
[24] Hardiyanti R. Penggunaan Antibiotik Profilaksis Pada Pasien Sectio Caesarea. Journal of Health Science and Physiotherapy. 2020 Jan 7;2(1):96-105.
[25] Yoshikawa TT, Bradley SF. Staphylococcus aureus infections and antibiotic resistance in older adults. Clinical infectious diseases. 2002 Jan 15;34(2):211-6.
[26] Bodey GP, Bolivar R, Fainstein V, Jadeja L. Infections caused by Pseudomonas aeruginosa. Reviews of infectious diseases. 1983 Mar 1;5(2):279-313.
[27] Effendi II. Identifikasi Bakteri: Metode Identifikasi dan Klasifikasi Bakteri. Oceanum; 2020 Apr 1.

[28] S azkiah ER. Epidemiological Determinants of Nosocomial Infections in Inpatients at Haji Adam Malik General Hospital Medan (Doctoral dissertation, State Islamic University of North Sumatra).
[29] Hughes JM. Study on the efficacy of nosocomial infection control (SENIC Project): results and implications for the future. Chemotherapy. 1988;34(6):553-61.
[30] Klemencsics I, Lazary A, Szoverfi Z, Bozsodi A, Eltes P, Varga PP. Risk factors for surgical site infection in elective routine degenerative lumbar surgeries. The Spine Journal. 2016 Nov 1;16(11):1377-83.
[31] Kartikasari R, Apriningrum N. Determinants of the Occurrence of Surgical Wound Infection (ILO) Post Sectio Caesarea. Faculty of Health Journal. 2020 Dec 4;7(03):162-9.
[32] Sandy TP, Yuliwan R, Utami WN. Surgical Wound Infection (ILO) in Post Laparotomy Surgery Patients. Journal of applied nursing. 2015;1(1):14-24.
[33] Alsen MA, Sihombing R. Surgical wound infections. Sriwijaya Medical Magazine. 2014 Jul 1:46(3):229-35.
[34] Rudijanto A. The role of vascular smooth muscle cells on the pathogenesis of atherosclerosis. Acta Med Indonesia. 2007 Apr 1:39(2):86-93.
[35] Niken Y. Analysis of the Implementation of Prevention and Control of Nosocomial Infections in the ICU Room of RSUD dr. Rasidin Padang Year 2020 (Doctoral dissertation, Andalas University).
[36] Enzler MJ, Berbari E, Osmon DR. Antimicrobial prophylaxis in adults. InMayo Clinic Proceedings 2011 Jul 1 (Vol. 86, No. 7, pp. 686-701). Elsevier.
[37] LeBLANC KE, LeBLANC LL, LeBLANC KA. Inguinal hernias: diagnosis and management. American family physician. 2013 Jun 15;87(12):844-8.
[38] DePestel DD, Benninger MS, Danziger L, LaPlante KL, May C, Luskin A, Michael P, Hadley JA. Cephalosporin use in treatment of patients with penicillin allergies. Journal of the American Pharmacists Association. 2008 Jul 1;48(4):530-40.
[39] Adhyatma A. Characteristics of Inguinal Hernia Patients Based on Age and Gender at Haji Hospital Medan 2015.
[40] Tampa'i R, Ngala N, Wua D. Evaluation of the Use of Prophylactic Antibiotics in Cesarean Surgery Patients at the Central Surgical Installation of Xy Hospital Manado. Farmasindo Journal. 2020 Jun 30;4(1):8-12.