

Analysis Of Prophylactic Antibiotic Use In Appendicitis Surgery Patients At Muhammadiyah Hospital Ahmad Dahlan City Kediri

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ABSTRACT

Cases of acute appendicitis in Indonesia are 29.9 out of 10,000 per person with perforation appendicitis 20-30%, many factors cause SWI (Surgical Wound Infection) in appendectomy patients, SWI is one of three infections that occur in hospitals there are 14-16%, so it requires rational use of prophylactic antibiotics to prevent infection. Objective: to determine the frequency of SWI and to determine the pattern of use and identify the rationality of patients who use antibiotics for appendicitis surgical prophylaxis at Ahmad Dahlan Kediri Hospital. Methods: A quantitative descriptive research was conducted in 2023 with a total of 44 populations, utilising a cross-sectional design and a total sample approach. Results: 28 out of 44 patients were male, all procedures were performed laparoscopically with a duration of surgery of 1 hour and had a LOS (Length Of Stay) of 3 - 5 days, the majority were acute appendicitis with the most commonly used antibiotic ceftriaxone with a single dose of 17. There were 11 incidents of SWI types of superficial infections. Conclusion: the use of prophylactic antibiotics in appendicitis surgery patients is rational and proves that prophylactic antibiotics are effective in preventing the occurrence of SWI in appendicitis surgery patients at Admad Dahlan Kediri Hospital.

Keywords : Appendicitis, appendectomy, SWI, rational drug, prophylaxis

INTRODUCTION

Hospitals are important healthcare institutions that provide medical services to the community and significantly contribute to the improvement of public health conditions (Ivnike S, 2021). The term "appendicitis" is derived from the Latin words "appendix" and "it", which refer to the anatomical inflammation of the appendix, respectively. Symptoms of the disease usually manifest as an acute episode, often occurring within a 24-hour period, but can sometimes progress to a more persistent condition (Kryzak M, 2020).

The appendix is characterized as a slender, elongated segment, often measuring between 1 and 9 inches. The appendix is located at the back of the cecum, to the left of the ileum and mesentery, or at the bottom of the pelvis. The organ consists of three layers: mesentery, submucosa, and mucus (Kryzak M, 2020). The occurrence of obstruction in the lumen of the appendix is currently the most common pathophysiology of appendicitis. Bacterial spread increases as a result of this obstruction, leading to an inflammatory response (Petrianu M, 2016).

The first disease pathway of apensitis occurs due to hard physical labor, irregular eating and even occurs due to causes that are not clear until now. Fecal masses will become hard and then obstruct the lumen, causing the need for blood flow to decrease and causing the mucosa to erode. If it reaches this stage, the appendix will become inflamed which can lead to perforation of the abscess and peritonitis or complain adomen that presses on the gastric area and increases the production of HCL and experience nausea and vomiting, Both of these etiologies cause severe pain in the epigastric region or in the middle region, which eventually spreads to the right lower quadrant. It is necessary to either perform an appendectomy or a surgical incision, both of which can cause pain, risk of infection, and hollowing out of the fluid, leading to the risk of a lack of fluid volume in the body.



The classification of appendicitis can be divided into two types, namely acute appendicitis and chronic appendicitis (Sukmawati S, 2018). First, acute appendicitis is a sudden inflammation of the vermiform anatomical structure commonly known in the community as inflammation of the appendix, divided into 5 (simple acute, suppurative, gangrenous acute, infiltrate, abscess). Secondly, chronic appendicitis is a rare condition, which is often difficult to identify and can be misdiagnosed due to non-specific and or milder symptoms compared to acute appendicitis (Lee C, 2021).

Antibiotic therapy can be used to treat uncomplicated acute appendicitis. However, non-operative techniques require careful patient selection and should be avoided in cases of severe gangrenous appendicitis, abscesses and widespread peritonitis. In some cases of uncomplicated acute appendicitis, it may be considered safe and effective to use an antibiotic strategy first. Patients who wish to avoid surgery should know that they have a 39 percent risk of recurrence after five years (Di Saverio S, 2020). When the clinical diagnosis is clear, the most appropriate course of action and standard treatment is appendectomy. A short delay in hospital surgery for acute appendicitis, lasting up to 24 hours, is considered safe and does not pose a risk of complications or perforation in humans.

Nowadays, appendectomy has evolved into two different options: traditional appendectomy and laparoscopic appendectomy (Zani, 2019). Antibiotics should be administered before, during and within 24 hours after surgery in situations where there is no clinical indication of infection, to avoid the occurrence of surgical wound infection. Before surgery, it is expected that the antibiotics present in the target tissue have reached the ideal concentration, which is highly efficient in suppressing bacterial proliferation. The concept of prophylactic antibiotic use involves the choice of specific types and careful consideration of concentrations before and during the surgical procedure. (Permenkes, 2021).

Parameters Of Accuracy Of Appendectomy Prophylaxis Use

Table 1. Prophylactic antibiotic recommendations (SIGN, 2014)

Antibiotics	Rekomendasi Dosis		Adult Half-life with Normal Kidney (hours)	Recommended Re-dosing Interval (Since First Dosing Before Surgery) (hours ^c)
	Adults ^a	Kids ^b		
Ampicilin - sulbactam	3 g (ampicilin 2g/ sulbactam 1g)	50 mg/kg ampicilin	0,8-1,3	2
Aztreonam	2 g	50 mg/ kg	1-1,9	2
Cefazolin	2 g	30 mg/ kg	1,3-2,4	4
Cefuroxime	2 g, 3 g for patients who have BB ≥ 120 kg	50 mg/ kg	1,2-2,2	4
Cefotaxime	1,5 g ^d	50 mg/ kg	1-2	4
Cefoxitin	1 g ^d	40 mg/ kg	0,9-1,7	3
Cefotetan	2 g	40 mg/ kg	0,7-1,1	2
Ceftriaxone	2 g ^e	50-75 mg/ kg	2,8-4,6	6
Ciprofloxacin ^f	400 mg	10 mg/ kg	5,4-10,9	-
Clindamycin	900 mg	10 mg/ kg	3-7	-

Antibiotics	Rekomendasi Dosis		Adult Half-life with Normal Kidney (hours)	Recommended Re-dosing Interval (Since First Dosing Before Surgery) (hours ^c)
	Adult ^a	Kids ^b		
Gentamicin ^g	5 mg/ kg dosage based on BW	2,5 mg/ kg (dose depending on body weight)	30	-
Ertapenem	1 g	15 mg/ kg	2-4	6
Fluconazole	400 mg	6 mg/ kg	3-5	-
Levofloxacin ^f	500 mg	10 mg/ kg	2-3	-
Metronidazol	500 mg	15 mg/ kg (Neonates who have a BW < 1200 g should receive a single dose. 7,5 mg/ kg)	6-8	-
Moxifloxacin ^f	400 mg	10 mg/ kg	6-8	-
Piperacillin-tazobactam	3,375 g	Infants 2-9 months: 80mg/ kg piperacillin. Children >9 months and ≤40 kg :100 mg/ kg piperacillin	0,7-1,2	2
Antibiotics	Rekomendasi Dosis		Adult Half-life with Normal Kidney (hours)	Recommended Re-dosing Interval (Since First Dosing Before Surgery) (hours ^c)
	Adult ^a	Adult ^a		
Vancomycin	15 mg/ kg	15 mg/ kg	4-8	-
Antibiotics Oral prophylaxis for colorectal surgery (used for liaison with a mechanical bowel preparation)				
Erythromycin base	1 g	20 mg/ kg	0,8-3	-
Metronidazol	1 g	15 mg/ kg	6-10	-
Neomycin	1 g	15 mg/ kg	2-3 (3% under normal gastrointestinal conditions)	-

Table 2. Hospital Clinical Pathway

Activities	Activity Description	Day of Care						
		1	2	3	4	5	6	7
a. Infusion Fluid	Ringer Laktat							
	NS							
b. Injection Medicine	<ul style="list-style-type: none"> ▪ Ceftriaxone atau ▪ Cefoperazone ▪ Metronidazole infus ▪ Metamizol Na ▪ Ranitidin 							
Anesthetic Drugs	<ul style="list-style-type: none"> ▪ Ondancetron injeksi ▪ Metoclopramid injeksi ▪ Ketorolac injeksi ▪ Ranitidin injeksi ▪ Lidodex injeksi ▪ Miloz injeksi ▪ Pethidin injeksi 							
Oral Medication	<ul style="list-style-type: none"> ▪ - 							
Discharge Medication	<ul style="list-style-type: none"> ▪ Cefixime tablet 100 mg 							

Surgical wound infections or surgical site infections are infections that arise at the site of surgery, according to the Centers for Disease Control and Prevention (CDC). Surgical site infections can be superficial infections that affect only the skin, but more serious infections can affect tissues under the skin, organs, or implanted materials (Giesen LJX, 2017). Many factors hinder the occurrence of SWI, one of which is the rational use of drugs. In order to promote rational drug use, health institutions and health workers should implement policies and instructional procedures. When using rational medication, several criteria must be followed, including accurate diagnosis, accurate information, appropriate dose, appropriate drug selection, appropriate time of administration, appropriate route of administration, and appropriate follow-up. (Ministry of Health, 2017).

METHODS

This study offers quantitative descriptive data using cross-sectional methodology. Every two months, data was collected in the RM room of Ahmad Dahlan Hospital, Kediri City. We retrospectively collected patient data from the medical records of appendicitis patients who underwent appendectomy therapy at Ahmad Dahlan Muhammadiyah Hospital in Kediri City from January to December 2022-2023. Our inclusion criteria were met by these patients. It is known that the population is 76 patients but those included in the inclusion criteria (patients who undergo appendectomy and get prophylaxis, all ages and genders, hospitalization at least 1x24 hours, clear RM data) and exclusion (patients who have congenital complications) researchers are 44 patients. The instruments used for data collection are the patient's RM, data collection sheets that refer to SIGN 2014 and Hospital Clinical Pathway.

RESULTS

PATIENT CHARACTER

Table 3. Patient Characteristics

No	Parameters	Total	Presentation
1.	Jenis kelamin		
	a. Female	16	36,4 %
	b. Male	28	63,6 %
2.	Age		
	a. 5 – 11		5
	b. 12 – 25		12
	c. 26 – 45		11
	d. 46 – 65		11
	66 >		5

Based on data taken from medical records of appendicitis patients at Ahmad Dahlan Hospital, Kediri City in 2023, it can be seen that the proportion of male patients is higher, namely 28 people (63.3%) and 16 women (36.4%). After being classified, it turns out that the age range of 12-25 years is 12 patients (27.2%).

VARIABLE CHARACTERISTICS

Table 4. Appendectomy Measures

No	Parameters	Total	Presentation
1.	Types of Appendectomy		
	a. Laparotomi	44	100 %
	b. Laparoscopi	0	0 %
2.	Duration of Operation		
	a. < 1 hours	0	0 %
	b. 1 hours	39	88,6 %
	c. > 1 hours	5	11,4 %
No	Parameter	Total	Presentation
3.	LOS		
	a. < 3 day	0	0 %
	b. 3 – 5 day	30	68,2 %
	c. > 5 day	14	31,2 %
4.	Types of Appendicitis		
	a. Akut	34	77,3 %
	b. Abses/ perforasi	8	18,2 %
	c. Kronis	2	4,5 %

The appendectomy action performed for appendicitis patients at Ahmad Dahlan Hospital, Kediri City only uses one appendectomy method, namely laparotomy 44 treatments (100%), Although there is only one appendectomy treatment but the duration in handling is different, the most duration obtained is 1 hour 39 (88.6%), The classification of patient LOS is divided into 3 groups because it refers to the hospital's clinical pathway and 3 to 5 days 30 patients (68.2%) are the most LOS. diagnosis is acute appendicitis as many as 34 (77.3%).

Table 5. Antibiotic Usage

No.	Parameters	Total	Presentation
1.	Antibiotics used Cefoperazone		
	a. Cefoperazone	2	4,5 %
	b. Ceftriaxone	17	38,6 %
	c. Cefuroxime	1	2,3 %
	d. Cefuroxime + Ceftriaxone	1	2,3 %
	e. Cefoperazone + Metronidazole	10	22,8 %

f.	Ceftriaxone + Metronidazole	2	4,5 %
g.	Cefuroxime, Ceftriaxone	2	4,5 %
h.	Cefuroxime, Cefoperazone	2	4,5 %
i.	Cefoperazone, Metronidazole	3	6,8 %
j.	Cefuroxime + Metronidazole, Ceftriaxone	1	2,3 %
k.	Ceftriaxone + Metronidazole, Metronidazole	1	2,3 %
l.	Metronidazole, Metronidazole + Ceftriaxone	1	2,3 %
m.	Cefoperazone + Metronidazole, Ceftriaxone + Metronidazole	1	2,3 %

The use of prophylactic antibiotics in appendectomy patients at Ahmad Dahlan Hospital, Kediri City, there are 4 antibiotics used, namely cefoperazone, ceftriazone, cefuroxime, metroniazole but with various uses, dominated by Ceftriaxone 17 patients (38.6%) and a combination of Cefoperazone + Metronidazole 10 patients (22.8%) both after and before surgery.

Table 6: Appropriateness of prophylaxis use

No	Parameter	Acuan			
		Clinical Pathway (Total)	Clinical Pathway (Presentation)	SIGN (Total)	SIGN (Presentation)
1.	Right route of administration				
	a. Oral	0	0 %	0	0 %
	b. Intravena	44	100 %	44	100 %
2.	Right Condition				
	a. Allergies	0	0 %	0	0 %
	b. Kidney Damage	0	0 %	0	0 %
	c. No Allergy and no kidney damage	44	100 %	44	100 %
3.	Right Duration				
	a. Exactly	0	0 %	44	100 %
	b. Inappropriate	0	0 %	0	0 %
4.	Right Dosage				
	a. Exactly	0	0 %	44	100 %
	b. Inappropriate	0	0 %	0	0 %
5.	Right Medicine				
	a. Exactly	41	93,2 %	41	93,2 %
	b. Inappropriate	2	4,5 %	1	2,3 %

In this study the pattern of prophylactic antibiotic use of appendicitis was analyzed on 5 parameters. And the four parameters of the right route, right condition, right duration, right dose stated that all 44 patients got the right results all 100%. While in the last parameter, namely the right drug, there were two patients who were in accordance with the Hospital Clinical pathway 4.5% and one patient who was only in accordance with SIGN 2014 2.3%, while the remaining 41 patients 93.2% were in accordance with the Hospital Clinical pathway and SIGN 2014.

Table 7. SWI occurrence intensity

NO	Parameters	Total	Presentation
1.	SWI		
	a. SWI occurred	11	25 %
	b. No SWI occurs	33	75 %
2.	Type of Infection		
	a. Superfisial	11	100 %
	b. Daep (fascial/muscular)	0	0 %
	c. Organ/ cavity	0	0%

Based on the table above, there are 32 patients who do not experience SWI (75%), while there are 12 cases of SWI (25%) with the same type of infection (100%), namely superficial.

DISCUSSION

A large number of males at Ahmad Dahlan Hospital, up to 63.6%, had negative results. This may be due to the high concentration of lymphoid tissue in the appendix wall which is more prevalent in males than females. (Mawaludin. 2020). the majority of appendicitis patients are under 35 years old with a high prevalence in adolescence. A large number of appendicitis cases occur in young individuals due to the higher concentration of lymphoids in the appendix tissue. Acute appendicitis may result from lymphoid hyperplasia triggered by injury to the lumen of the appendix. (Jones. 1985).

In appendectomy there are 2 kinds of actions that can be used with certain objectives and advantages, namely laparotomy and laparoscopy, while at Ahmad Dahlan Kediri Hospital only uses laparotomy as a surgical procedure for appendicitis patients. Even so, laparotomy remains an important option in the treatment of appendicitis and when appendicitis has complications such as perforation or abscess that require greater access for better handling, laparotomy is often recommended (Mega Haryanti. 2023). generally, the time required to do so ranges from 1 to 3 hours (Sorensen. 2017).

Factors that influence the Length Of Stay of or can be called the length of stay of patients have many contributing factors, namely the relationship between other diseases, drugs, nutrition, wound care, nutrition, mobility (Suci. 2019). LOS for appendicitis patients undergoing surgery varies, but the average duration of hospitalization is 2 to 4 days (Shifa khamila. 2023). Acute appendicitis is more common because it is a common surgical emergency. One of the most frequently performed emergency surgical procedures is acute appendicitis, surpassing perforated and chronic appendicitis. (Amer Fayraq. 2023).

The use of intravenous (IV) antibiotics as the route of administration for patients undergoing surgery, such as appendectomy, is common practice in the management of acute appendicitis. Clinical trials have shown that intravenous administration of prophylactic antibiotics successfully prevents surgical wound infection (SIGN. 2014). This study is considered appropriate if the patient's health does not meet the requirements that must be considered, especially individuals with allergies, renal impairment, and obesity, as they have a very high risk of surgical wound infection. (Bratzler. 2013).

The use of prophylactic antibiotics before surgery is usually recommended not to exceed 24 hours however, the use of antibiotics for more than 24 hours has been shown that it may not improve the prevention of postoperative infections and could potentially result in the proliferation of antibiotic-resistant bacteria. (Kiki Amelia. 2019). Another study also showed that the use of antibiotics with a duration of less than 24 hours was the most commonly used duration, this duration did not affect the occurrence of SSI (Surgical Area Infection) and stated that the duration was declared appropriate (Dhannia Fitriara. 2021).

SIGN (Scottish Intercollegiate Guidelines Network) is one of the trusted clinical guidelines by developing evidence-based clinical guidelines for the NHS (National Health Service) in Scotland issued by HIS (Healthcare Improvement Scotland), looking at the reference it is said that it is determined that the daily dose of cefoperazone 2g, ceftriaxone 2 g, cefuroxime 2 - 3 g and metronidazole 500 mg. Prophylactic antibiotics refer to antibiotics used before, during and after surgical operations with the aim of preventing surgical site infections (SSIs).

β -lactam antibiotics (including cephalosporins, penicillins, and meropenem) show additive or synergistic effects when co-administered with metronidazole by inhibiting the final stage of peptidoglycan formation through alkylating transpeptidase or penicillin-binding protein (BP). Thus, bacteria undergo lysis as a consequence of the action of cell wall autolysis enzymes, leading to the destruction of the cell wall structure (Zulfan Zazuli, 2015). Metronidazole is a dual-action antibacterial and antiparasitic agent that exerts its effects by interacting with DNA during the diffusion process within the organism, resulting in the loss of the helical shape of DNA and the breaking of DNA strands. Inhibition of protein synthesis and subsequent cell death of the target organism is the result. (Zulfan Zazuli. 2015). Two other researchers said one of the most commonly used third-generation cephalosporin antibiotics as a preventive treatment for appendicitis is ceftriaxone, used in more than 70% of appendectomy patients (Nurul F. 2017 and Imam F. 2016).

In addition, other studies also agree that Cefoperazone, a third-generation cephalosporin antibiotic often used in conjunction with Metronidazole, primarily targets infections produced by anaerobic bacteria,

such as *Bacteroides fragilis*, which commonly manifests in appendicitis. Research suggests that dual use of these two antibiotics may provide a better defense against postoperative infections compared to single antibiotic use. (Arega. 2018 and Gusti R. 2021). Surgical wound infection (SWI) is a common and avoidable complication of any surgery. Intraoperative bleeding (SWI) is an important factor contributing to postoperative illness and death. According to the definition provided by the Centers for Disease Control and Prevention (CDC). Superficial type infections are prevalent among people who have undergone appendectomy. (Sri Fajriani .2016).

CONCLUSION

The most widely used antibiotic use pattern was a single antibiotic Ceftriaxone (38.6%) with the most common type of acute appendicitis (77.3%) and known SWI intensity (25%) of all appendectomy patients with the same type of infection, namely superficial infection (100%). The use of antibiotics at Ahmad Dahlan Hospital, Kediri City has been said to be rational when viewed from the right dose, the right route of administration, the right condition, the right drug administration and the right duration when viewed from SIGN 2014 and Hospital Clinical Pathway. It is recommended that the hospital medical team review the clinical pathway when it is more detailed to make it easier for pharmaceutical personnel to take action.

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