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Determinant Factors of Surgical Site Infection after Laparotomy at Refferal Hospital in Central Java Indonesia

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Abstract: *Surgical Site Infection (SSI) is a major clinical matter and cause of increasing cause of nosocomial infection in matter after laparotomy. Data on SSI in Indonesia is still limited. The aim of this study is to ensure the determinant factors of SSI after laparotomy at Refferal Hospital in Central Java Indonesia. A cross-sectional study was conducted on medical record data of patients with a history of laparotomy from 1 October 2021 to 30 June 2022. Bivariate Chi-square analysis was acquire to identify risk factors with a relevant p-value <0.05. A total of 213 patients received laparotomy during the study period. SSI occurred in 9.38% (20) of patients. The mean age is 37.61 (±20.6) years. ASA score <3 (p=0.006, PR=5.11, 95% CI=1.416-18.453) and contaminated and dirty surgical wound (p=0.023, PR=2.860, 95% CI=1.124-7.276) were the determinants of post-laparotomy SSI. The incidence of SSI after laparotomy at Refferal Hospital in Central Java Indonesia is quite high. The ASA score and the type of surgical wound are risk factors associated with an increased incidence of SSI. Attention to these factors must be increased in efforts to control and prevent infection so that the incidence of post-laparotomy SSI can be reduced.*

Keywords - *Determinant factors, SSI, laparotomy*

I. INTRODUCTION

Surgical site infections (SSI) are a major clinical matter and *cause of increasing* cause of nosocomial infections, especially in sufferer after laparotomy. According to the 2020 CDC report, the prevalence of SSI in sufferer undergoing surgery was 110,800 according to a 2015 survey. Various infection prevention and control measures have been taken, including improving the quality of operating room ventilation, disinfection methods, barriers, and surgical techniques, but despite the existence of antibiotic prophylaxy, morbidity and length of hospital stay continue to increase. Time prolongation, and the cause of death is still a major problem. [(1)] Reports indicate that SSI account for 20% of nosocomial transmission and are bond with a 2- to 11-fold grow in mortality. The cost of SSI treatment is the largest burden of nosocomial infections, at approximately $3.3 billion per year. SSIs increase hospital stays by 9.7 days and medical costs increase by $20,000 per day.[(2-4)]

In Indonesia, data on the incidence of SSI and its determinants are still limited, even though the prevalence seems high. The incidence of SSI in Indonesia is around 2-15%. The percentage of SSI incidents in several educational center hospitals in Indonesia without differentiating the type of surgery is as follows: RSUP dr. Pringadi Medan in 2006 (12%), RSUP dr. Sardjito in 2007 (5.9%), Adam Malik Hospital in (5.6%), Arifin Achmad Pekan Baru Hospital in 2014 (4.5%)[(5)]

Several risk factors associated with SSI have been widely reported worldwide. Risk factors can come from patients, operations, or microorganisms that cause SSI. Age, secondary ischemia due to vascular disease, comorbid diseases, diabetes mellitus, radiation exposure, smoking, obesity, and Staphylococcus aureus colonization are important factors for patients to cause SSI. Drain, surgical technique (handling tissues gently, leaving no hematoma, avoiding dead space), type of surgical wound, type of anesthesia, and ASA score affect the incidence of postoperative SSI. Microorganisms that cause SSI can come from endogenous or exogenous microorganisms. [6,7]

Currently, although clinical practice has advanced and various infection prevention and control methods have been implemented, including in Indonesia, the burden of SSIs, including incidence, complications, patient morbidity, healthcare costs, and mortality, remains a significant public health issue. Therefore, the aim of this study is to related and evaluate the extent of implications participation to SSI in a referral hospital in Central Java, Indonesia.

II. METHOD

2.1 Subjects and Research Design

The study used a cross-sectional observational design with research subjects taken from medical records of patients who underwent laparotomy at Tugurejo Hospital Semarang in the period 1 October 2021 -30 June 2022. Incomplete medical record data were besides from the study. The study was recognized by the Medical and Health Research Ethics Committee of Semarang Tugrejo Hospital.

2.2 Sample size

Calculate the minimum sample size using the binomial proportional equation for a cross-sectional study, assuming a 95% CI, a 15% SSI event rate, and a 5% margin of error. The minimum sample size for this survey is 204.

2.3 Operational definition

SSI is interpreted as a joint operation transmission that develop at or near the site of a surgical incision with 30 days after surgery. The Centers for Disease Control and Prevention (CDC) and the National Hospital Infectious Diseases System (NNIS) It means that SSI utilizes clinical variety, namely: 1. Purulent exudate oozing from the site of abrasion. 2. Positive culture were obtained from the initially closed surgical site. 3. The surgeon diagnoses the infection. 4. One or more of the following signs or symptoms require reopening of the surgical site: pain, swelling, redness or heat. [1]

Wounds are as follows: 1. Clean wounds, i.e. non-infected wounds without inflammatory processes 2. Clean and contaminated wounds with respiratory, digestive or urinary tract control functions are always present. A wound that occurs in a bacterially contaminated environment, such as an acute wound, a non-purulent inflammation, a type of wound that occurs in a bacterially contaminated environment, and is not suitable for the following non-sterile site surgeries: B. Emergency surgery at the wound site. [1]

The American Society of Anesthesiologists (ASA) classifies pre-anesthesia physical standing into 5 (five) classes, namely: 1) ASA 1: surgical disease patients without systemic disease. 2) ASA 2: surgical disease patients accompanied by mild systemic disease. Examples are coughs and colds in children or controlled hypertension and DM in adults. 3) ASA 3: surgical disease patient accompanied by severe systemic disease due to various causes but not life-threatening. Examples are uncontrolled DM and hypertension, active hepatitis, and obesity (BMI > 40). 4) ASA 4: surgical disease patient accompanied by severe systemic disease due to various causes but not life-threatening. Examples are ongoing cardiac ischemia or severe heart valve dysfunction. 5) ASA 5: surgical patients who are accompanied by severe systemic diseases that can no longer be helped, operated on, or not within 24 hours the patient will die. Examples are multiorgan failure and sepsis with hemodynamic instability. [1]

2.4 Statistic analysis

The chi-square test was used to assure the relevant association between risk factors and SSI incidence. Odds ratios were calculated using Fisher's exact test to test the capacity of the association midst risk implications. A P value of <0.05 was examine statistically relevant.

III. RESULTS

A total of 213 matter received laparotomy when you study period. SSI occurred in 9.38% (20) of patients. The mean age is 37.61 years (±20.6). The average weight is 53.55 kg (± 19.45) and the average height is 156.89 cm (± 19.47). There were no relevant differences in the mean age (p=0.957), body weight (p=0.108), and height (p=0.818) between groups of study subjects with and without SSI.

The most indication for laparotomy surgery in research subjects was appendicitis at 34.1% (73). The other indications for laparotomy were caused by perforation, tumor, and malignancy at 21.1% (45), 11.7% (25), and 6.1%, respectively (13). In more detail, indications for laparotomy in study subjects are shown in Fig.1.

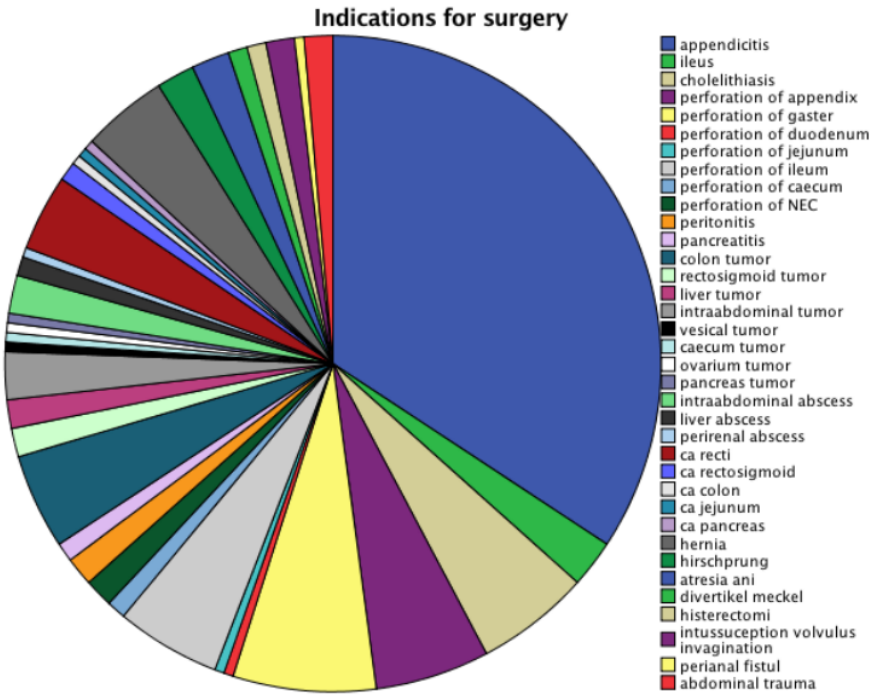

Figure 1. Indications of laparotomy in study subjects

The results of the bivariate analysis of the implications that were considered to influence the happening of SSI are shown in Table 1. The results of the analysis conveyed that the ASA number along with the type of surgical wound was a determinant of the occurrence of SSI after laparotomy in the study subjects. ASA score ≥ 3 increased the risk of SSI by 5 times. The type of contaminated and dirty surgical wound upward the risk of SSI by 2.9 times.

Table 1. Analysis of determinants factor of SSI

	Without SSI	SSI	p value	PR	CI 95%
Sex					
Male	109	15			
Female	84	5	0.110	0.433	0.151-1.238
BMI					
Overweight	87	13	0.222	0.515	0.175-1.516
Normal	65	5			
ASA Score					
<3	184	16			
3	9	4	0.006*	5.111	1.416-18.453
Diabetes mellitus					
DM	9	0			
without DM	184	20	0.324	0.902	0.862-0.944
Type of wound surgery					
Clean and Clean- contaminated	143	10	0.023*	2.860	1.124-7.276
Contaminated and Dirty	50	10			
Technic of surgery					
Median incision	129	14	0.775	0.864	0.317-2.353
Non-median incision	64	6			
Length of surgery					
< 120 minutes	164	12	0.085	2.424	0.861-6.820
≥ 120 minutes	29	6			

*p< 0.05, p= Chi square, SSI= Surgical Site Infection, BMI= Body Mass Index, ASA = The American Society of Anesthesiologists, DM= Diabetes Mellitus

IV. DISSCUSSION

The happening rate of post-laparotomy SSI was high (9.38%) at Tugurejo Hospital Semarang. This number is within the range of SSI happening rates in Indonesia that have been reported by several previous studies of 2-15%.[5] Recent studies in Ethiopia, Bangladesh, and Nepal showed higher SSI incidence rates of 11.1%,12 .9%, and 38%. [7-9] The prevalence and happening of SSI after digestive surgery in Europe tend to be lower by 4.4 and 5.4%. [10] In the United States, SSI activity in surgical patients is 2-5%. [2] These studies revealed that the happening of SSI in developing countries is high, but the available data regarding the incidence and prevalence of SSI is still limited. Surveillance and studies on the determinants of the incidence of SSI, especially post-laparotomy, need to be intensified.

The results of this study showed that in matter with a history of laparotomy, the risk of SSI was five times higher with an ASA score of more than 3. These results are conformable joint those of a systematic monitoring of SSI risk factors that found that more severe ASA levels were connected joint a 12-fold grow in the risk of SSI in surgical matter. [11]

Conformable joint the results of a meta-analysis of observational studies on the determinants of SSI in surgical patients, the type of surgical wound was a risk factor for SSI in this study. The results of the seven studies included in the meta-analysis showed that the risk of SSI increased joint the type of contaminated or unclean surgical wound (RR = 2.65, 95% CI: 1.52-4.61, I = 86%).[12] In this study, patients with this type of surgical wound were contaminated and gross have the risk of experiencing an SSI of 2.8 times. This type of dirty surgical wound causes more microorganisms to grow that causing infection.

This study will be useful for tomorrow research on SSI. Although this study aims to supply data to strengthen the information about several risk implications, it still has some weaknesses. One of the important factors in forestall SSIs is the surgeon's prowess and skill, which are variable factors that are hard to measure. The surgeon's undergo could not be measured in this study. The cross-sectional observational method and the use of medical record data as a source of information have the potential to cause data bias. Randomized Controlled Trial research is needed for further research. Heterogeneous types of laparotomy surgery in this

study led to limitations in comparing the results with other studies so the conclusions drawn cannot be immediately generalized. This is also related to differences in clinical factors and parameters used. Future research can take one type of operation to increase sample homogeneity. There is no information about the bacteria that cause SSI and the pattern of sensitivity of bacteria to antibiotics in the study location hospital so it cannot provide suggestions for empirical management of post-laparotomy SSI in that hospital.

V. CONCLUSION

The ASA score > 3 and the type of infected and dirty surgical wound are the determinants of the incidence of post-laparotomy SSI at Refferal Hospital in Central Java Indonesia. Better data and understanding of SSI and its risk factors can guide clinicians and policymakers in making more appropriate interventions to prevent and control SSI events.

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