

THE EPIDEMIOLOGICAL DETERMINATION OF NOSOCOMIAL INFECTION IN INPATIENTS AT ADAM MALIK GENERAL HOSPITAL, MEDAN

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ABSTRACT

Background: Nosocomial infection is a complication that most often occurs in hospitals and other health services. Infection is a most widely acquired hospital effect that can affect 5 to 10% of all hospitalized patients in developed countries and in low-background countries being a major burden.

Objectives: This study aims to determine the epidemiological determinants of nosocomial infections in inpatients at the General Hospital of the Haji Adam Malik Center, Medan in 2019.

Method: Determination of the sample size in the case and control using unpaired categorical analytical formula obtained a total sampel of 90 patients with ratio of 1:1. Data analysis using chi-square test analysis.

Result: The results showed that the dominant type of infection was urinary tract infection (35.6%), the most widely used type of invasive procedure was catheters (35.6%), the most common type of germs was conditional pathogens (84.4%), and the most common type of invasive procedure was catheter treatment ≥ 7 days (64.4%). The determinants of nosocomial infection in hospitalized patients were the type of invasive action (surgery, p value 0.013 and length of stay of patients (≥ 7 days, p value 0.035).

Conclusion: Performing surgery in accordance with standart operational procedure, applying surgical site infection bundles, discharging surgery patients on the fourth day, improving personal hygiene, reducing invasivtione procedures and providing antimicrobials to patients are necessary to reduce the incidence of nosocomial infections.

Keywords: *Determinants; Epidemiology; Nosocomial Infection*

INTRODUCTION

Nosocomial infection is the most common complication at hospital and other health services. Infection is the most common hospital-acquired effect that can affect 5 to 10% of all hospitalized patients in developed countries and in low-income countries it becomes a major burden^[1]. The impact of nosocomial infections is quite diverse, including the risk of exposure to infections that are not only experienced by the patient himself, but can also be experienced by health workers in health services, families, and visitors^[1]. Nosocomial infections can have an impact on patients and their families which result in loss of sources of income, danger, disability, death, additional treatment period, increased hospital expenses and can result in lowering the image of the hospital^[1].

According to the Advisory Council of the World Alliance for Patient Safety, 1.5 million deaths every day worldwide are caused by nosocomial infections^[2]. Based on a study in 55 hospitals in 14 different countries around the world conducted by WHO^[2], 8.7% of hospital patients suffered from nosocomial infections, while more than 40% of patients in hospitals developed infections during hospitalization in developing countries. Every year there are 2 million people in the United States who suffer from nosocomial infections and 9,000 of them end up dying^[2]. There are 100,000 nosocomial cases in the UK and 5,000 of them die each year^[2].

The results of a study in Indonesia at 11 hospitals in the DKI Jakarta area in 2004 showed that 9.8% of inpatients had new infections after being hospitalized^[3]. In 2004 as many as 2,772 patients from 300,858 at-risk inpatients in all hospitals in Indonesia were patients with nosocomial infections^[4]. Based on a survey conducted by Nursalam (2004) that of all people in the world, 1.4 million people suffer from infections caused by hospitalization. This

figure is 15.74%, far above developed countries with nosocomial incidence ranging from 4.8% to 15.5%^[5].

Infections that are often found in Indonesia as much as 7.1% are infections related to the use of invasive tools or procedures, namely: catheter-associated urinary tract infection (CAUTI), central line-associated blood stream infection (CLABSI), ventilator-associated infection (VAP), dan surgical site infection (SSI). In general, the most common nosocomial infections suffered by patients were pneumonia (22%), surgical site infections (22%), gastrointestinal infections (17%), urinary tract infections (13%) and bloodstream infections (10%)^[6].

Based on data from the Infection Prevention and Control Committee of the Haji Adam Malik General Hospital, in 2018 the incidence rate of VAP nosocomial infection reached 10.71%. The incidence rate of nosocomial SSI infection reached 3.81%. Meanwhile, the incidence of nosocomial infection rate for CLABSI is 2.72% and CAUTI is 2.39%. In 2019 the incidence rate of nosocomial VAP infection reached 8.03%, CAUTI 1.45%, CLABSI 1.09% and the lowest was SSI 0.91%.

The standard indicator that has been set for nosocomial infections in inpatients in hospitals or other health facilities is 1.5%^[7]. This indicates that the incidence rate of nosocomial infection at the Haji Adam Malik General Hospital Medan is still above the established standard. Although the science of microbiology has improved quite rapidly in the last 3 decades and can slowly prevent the risk of infection, the number of patients continues to increase with various diseases, such as immunocompromised, antibiotic-resistant bacteria, superinfections and fungi, as well as invasive procedures, causing nosocomial infections. which results in 88,000 deaths every year.

Many hospitals have carried out procedures and actions to assist in the diagnosis or monitoring of the course of the

disease as well as therapy that is able to make patients included in the group that is susceptible to nosocomial infections. Patients who have advanced age, long lying periods or medical procedures such as infusions, catheters for a long time, patients with congenital diseases that require therapy, or other congenital diseases that can increase the patient's susceptibility to nosocomial infections. This makes researchers interested in conducting research to determine the epidemiological determinants of nosocomial infections in inpatients at Haji Adam Malik General Hospital Medan.

METHOD

This research is an analytic observational with a case control research design. Committee on Infection Prevention and Control (PPI) Haji Adam Malik Central General Hospital. The population in this study were all hospitalized patients from 2019. The inclusion criteria in this study included, patients hospitalized 2 x 24 hours, receiving invasive procedures, positive culture results for the case group and negative culture results for the control group. Determination of the sample size in the case and control groups using unpaired categorical analytical formulas obtained a total sample of 90 patients with a ratio of 1:1^[8].

$$n_1 = n_2 = \left[\frac{(Z_{\alpha} \sqrt{2PQ} + Z_{\beta} \sqrt{P_1Q_1 + P_2Q_2})^2}{(P_1 - P_2)} \right]^2$$

Secondary data collection was carried out by observing the monthly nosocomial infection surveillance report documents of the Infection Prevention and Control Committee (PPI) of the Haji Adam Malik General Hospital in 2019 and the medical record documents of inpatients at the Haji Adam Malik Central General Hospital. The research instrument was the nosocomial infection surveillance form of the Infection Prevention and Control Committee (PPI) at Haji Adam Malik General Hospital. The dependent variable in this study was

nosocomial infection and the independent variables were age, gender, congenital disease, invasive procedures, patient ward, length of stay and type of microorganism.

Data processing was carried out through IBM SPSS statistics 23 for analysis. Univariate analysis was used to describe the epidemiology of nosocomial infections in inpatients at the Haji Adam Malik General Hospital Medan in 2019. Furthermore, bivariate analysis used the chi-square test. This test was conducted with the aim of knowing the relationship between the independent variables (age, gender, congenital disease, invasive procedures, patient care, length of stay and types of microorganisms) and the dependent variable (incidence of nosocomial infections).

RESULT

Univariate Analysis

The results of univariate analysis on nosocomial infection variables in the form of nosocomial infection types and distribution of patient characteristics are shown in Table 1 and Table 2 below:

Table 1. Distribution of Nosocomial Infection Cases by Type of Nosocomial Infection

Types of Nosocomial Infections	n	%	95% CI
Central Line-Associated blood Stream Infection (CLABSI)	1	2,2	0,0 – 6,7
Ventilator Associated Pneumonia (VAP)	15	33,3	20,0 – 48,9
Catheter-Associated urinary Tract Infection (CAUTI)	16	35,6	22,2 – 51,5
Surgical Site Infection (SSI)	13	28,9	17,8 – 44,4
Total	45	100	

From table 1, it is known that there are 45 hospitalized patients suffering from

nosocomial infections. The most common type of nosocomial infection suffered by hospitalized patients was catheter-associated urinary tract infection (CAUTI) as many as 35.6% of cases. While the lowest percentage of 2.2% is a central line-associated blood stream infection (CLABSI).

Tabel 2. Distribution of Nosocomial Infection Cases Based on Patient Characteristics

People Variabel	n	%	95% CI
Age			
Toddler	11	24,4	11,1 – 38,7
Children	2	4,4	0,0 – 14,7
Teenager	3	6,7	0,0 – 13,3
Mature	9	20,0	12,0 – 32,5
Old	20	44,4	31,1 – 57,8
Sex			
Male	24	53,3	40,0 – 66,7
Female	21	46,7	33,3 – 60,0
Comorbid			
Yes	30	66,7	51,1 – 80,0
No	15	33,3	20,0 – 48,9
Type of Invasive Procedure			
CVC	1	2,2	0,0 – 6,7
ETT	15	33,3	20,0 – 46,7
Catheter	16	35,6	22,2 – 51,1
Surgical	13	28,9	15,6 – 42,2
Type of Germs			
<i>Conventional Patogens</i>	5	11,1	2,2 – 22,2
<i>Conditional Patogens</i>	38	84,4	7 – 93,3
<i>Oppurtunistic Patogens</i>	2	4,4	0,0 – 11,1
Type of Treatment Room			
Ward	21	46,7	33,3 – 62,2
Special Ward	24	53,3	37,8 – 66,7
Length of Stay			
≥ 7 days	29	64,4	48,9 - 77,8
< 7 days	16	35,6	22,2 – 51,1

From table 2, it can be seen that of the 45 inpatients suffering from nosocomial infections, 44.4% of the patients were in the older age group. The age group of children is the age group with the least number of nosocomial infections, namely 4.4% of patients. In the gender variable, patients with male gender suffer more from nosocomial infections than patients with female sex, namely 53.3% of patients. There are 66.7% of patients with nosocomial infection who have a history of previous congenital disease. The most common type of invasive procedure applied to patients suffering from nosocomial infections was catheter as much as 35.6% of patients. While the type of invasive procedure that is least applied to patients is CVC 2,2% patient. On the variable jenis type of germ is known that there are three types of bacteria that cause nosocomial infections based on culture results. The type of conditional pathogenic bacteria is the most common type of germ that infects hospitalized patients, namely 84.4% of patients. The types of germs that infect the patients the least are opportunistic pathogens as many as 4.4% of patients.

There are two types of treatment rooms provided by the hospital. More inpatients with nosocomial infections came from special care units, as many as 53.3% of patients. And the rest came from the treatment room as many as 46.7% of patients. There were 64.4% of nosocomial infection patients who had been hospitalized for 7 days. While 47.8% of patients with nosocomial infections who had undergone <7 days of hospitalization at hospital

Bivariate Analysis

Tabel 3. Differences in the Risk of Urinary Tract Nosocomial Infections

People Variabel	Nosocomial Infection				P Value	OR (95% CI)
	Infected		Not Infected			
	N	%	N	%		
Age						
Todler	11	24,4	14	31,1	0,638	0,716 (0,283-1,811)
Children	2	4,4	1	2,2	1,000	2,047 (0,179-23,409)
Teenager	3	6,7	6	13,3	0,485	0,464 (0,109-1,985)
Mature	9	20,0	5	11,1		<i>Reference</i>
Old	20	44,4	19	42,2	1,000	1,095 (0,475-2,521)
Sex						
Male	24	53,3	26	57,8		
Female	21	46,7	19	42,2	0,832	0,835 (0,363-1,920)
Comorbid						
Yes	30	66,7	36	80,0		
No	15	33,3	9	20,0	0,233	0,500 (0,192-1,303)
Type of Invasive Procedure						
CVC	1	2,2	13	28,9		<i>Reference</i>
ETT	15	33,3	15	33,3	1,000	1,000 (0,416-2,403)
Catheter	16	35,6	15	33,3	1,000	1,103 (0,462-2,634)
Surgical	13	28,9	2	4,4	*0,013	5,688 (1,494-21,655)
Type of Germs						
<i>Conventional Patogens</i>	5	11,1	0	0,0	0,056	2,125 (1,696-2,662)
<i>Conditional Patogens</i>	38	84,4	0	0,0	**<0,000	7,429 (3,729-14,798)
<i>Oppurtunistic Patogens</i>	2	4,4	0	0,0	0,494	2,047 (1,653-2,534)
Nothing	0	0,0	45	100		<i>Reference</i>
Type of Treatment Room						
Ward	21	46,7	19	42,2	0,832	1,197 (0,521-2,753)
Special Ward	24	53,3	26	57,8		
Length of Stay						
≥ 7 days	29	64,4	18	40,0	0,035	2,719 (1,158-6,382)
< 7 days	16	35,6	27	60,0		
Total	45	100	45	100		

From table 3 it is known that the old age group is the most infected age group, namely 44.4% of patients. The same thing also happened in the uninfected group, the old age group being the largest age group, namely 42.2% of patients. The results of the statistical test (chi-square) with a p value of 0.638 in the toddler category, 1,000 in the children and old categories, and 0.485 in the youth category. This value shows that there is no relationship between

the age of the patient and the incidence of nosocomial infections.

In the gender variable, there were more infected males than infected females, namely 53.3% of patients. Likewise with the uninfected group, there were fewer women than men, amounting to 57.8% of patients. Based on the results of statistical tests (chi-square) it was found that there was no significant relationship between gender and the incidence of nosocomial infections with a p value of 0.832.

In the congenital disease variable, it is known that there are more patients infected with nosocomial diseases with a total of 66.7% of patients. In the category of congenital disease but not infected, more than those without congenital disease and 80.0% of patients were not infected. The results of the statistical test (chi-square) that have been carried out have a *p* value of 0.233. This value shows that there is no relationship between congenital disease and the incidence of nosocomial infection.

Based on the type of invasive procedure, the use of a catheter was the most common type of invasive procedure used in the infected group compared to other types of invasive procedures, namely 35.6% of patients. Meanwhile, in the uninfected group, there were two types of invasive procedures with the highest number, namely ETT and catheter with 33.3% of patients each. From the statistical test (chi-square) obtained a *p* value of 1,000 in the catheter and ETT categories, while 0.013 in the surgery category. This value indicates that there is a relationship between the type of invasive procedure and the incidence of nosocomial infection. So it is considered to be the category of least risk of nosocomial infection. Of the three categories, surgery is the category that has a relationship with the incidence of nosocomial infection (*p* value 0.013) with an OR (95% CI) 5.688 (1.494-21.655). This value means that the type of invasive procedure in the form of surgery has a 5.7 times risk of nosocomial infection compared to invasive procedures such as the use of CVC.

Of the 90 patients who were sampled, 45 of them were the control group or those who were not infected with nosocomial infection. So this group does not contain any types of germs. While 45 people in the case group or who were infected with nosocomial, the most common types of germs that infected were conditional pathogens as many as 84.4% of patients. After statistical test (chi-square) it was found that the *p* value was 0.056 in the

categories of conventional pathogens, conditional pathogens <0.000, and opportunistic pathogens. Based on the *p* value of the conditional pathogens category, it shows that there is a relationship between the types of germs and the incidence of nosocomial infections. The OR value (CI 95%) was 7,429 (3.729-14,798), which means that patients exposed to conditional pathogens have a 7.4 times risk of developing nosocomial infections than patients who are not exposed to germs.

In the variable type of treatment room, it is known that patients treated in special care units are more infected than patients treated in treatment rooms, which are 53.3% of patients. In the uninfected group, fewer patients were treated in the treatment room than patients treated in the special care unit, namely 57.8% of patients. Based on statistical test (chi-square) obtained *p* value of 0.832. This value indicates that there is no relationship between the type of ward and the incidence of nosocomial infection.

In the variable length of stay, it is known that patients who were treated for 7 days were more infected than patients who were treated for < 7 days, namely 61.7% of patients. On the other hand, patients who underwent treatment < 7 days were more uninfected compared to patients who underwent treatment 7 days, namely 62.8% of patients. Based on the statistical test (chi-square) showed a *p* value of 0.035 with an OR (95% CI) of 2.719 (1.158-6.382). This value means that there is a relationship between length of stay and the incidence of nosocomial infection and patients with length of stay 7 days have a 2.7 times risk of nosocomial infection compared to patients with length of stay < 7 days.

DISCUSSION

In the invasive procedure variable, the results of this study are in accordance with the study of risk factors for nosocomial infection in Ethiopia which has

a p value < 0.000 in the operating variable with the incidence of nosocomial infection. This figure means that there is a relationship between surgery which is an invasive procedure and the incidence of nosocomial infection^[19].

In a clinical study found that nosocomial infections are caused by infections from urinary catheter insertion, infection using intravenous needles, respiratory tract infections, skin infections, infections from surgical wounds and septicemia. The use of non-sterile equipment is also a cause of nosocomial infections^[20]. A series of medical examination procedures and patient therapy such as biopsy, endoscopy, catheterization, intubation and surgery also increase the risk of infection^[13]. Surgical action triggers bacterial contamination which can lead to infection of the operating area through the incision wound in the operating area. The virulence of bacteria is related to the ability of bacteria to produce toxins or other things that trigger tissue damage from the patient's body^[21].

A patient who has just undergone surgery is allowed to go home on the fourth or fifth day which is best as long as the patient does not develop complications. This is because the length of the patient's treatment period will affect the occurrence of transmission from patient to patient^[22].

Surgery is one of the determinants of nosocomial infection, so the thing that really needs to be considered to prevent nosocomial infections due to surgery is to conduct an examination of surgical patients before the patient enters or is hospitalized by improving the patient's condition, such as improving the nutrition of the patient. Prior to surgery, the patient's surgery must be carried out correctly in accordance with applicable procedures, such as fasting, disinfection of the operating area, sterilization of operating equipment and other related matters. When undergoing surgery, all officers are required to comply with operating room regulations, namely to work according to the applicable SOP

(standard operating procedure), namely paying attention to the time/length of the operation. In addition, pay attention to additional equipment installed after surgery, such as catheters, infusion sets, and others must be cared for so as not to become a place for bacteria to colonize and infect the patient^[23].

In addition to carrying out SOPs, prevention of nosocomial infections such as infections of the operating area can also be done by applying SSI bundles, such as not shaving hair unless it interferes with the operation, giving prophylactic antibiotics one hour before surgery, and the patient's body temperature and sugar levels must be in normal condition^[24].

Types of germs also affect the occurrence of nosocomial infections, as stated by Assar et al in their study (2012) that *Enterobacter* is the most common cause of nosocomial infections and then *E. coli* which is most commonly found in patients with nosocomial infections of the CAUTI type^[25]. Both germs are bacteria that are classified as conditional pathogens.

According to a report obtained at the Central General Hospital (RSUP) Dr. Kariadi Semarang in 2012, it was found that *Enterobacter sp* and *Pseudomonas sp* are the bacteria group that most often causes SSI. Both types of bacteria are classified as conditional pathogens. *Enterobacter sp* is a bacterium that causes nosocomial infections that live in commensals in water, meat, hospital environment and skin^[26]. A study in Taiwan found that out of 60 patients, 66.7% had nosocomial infections due to *Enterobacter cloacae*^[27].

Pseudomonas aeruginosa is a pathogen that causes infection in hospitalized patients, people who have a weak immune system (immunocompromised) and patients with cystic fibrosis^[28]. In American hospitals the overall prevalence of nosocomial infections due to *Pseudomonas aeruginosa* is estimated at 0.4% or 4/1000 patients. *Pseudomonas aeruginosa* is the fourth

most common bacteria causing nosocomial infections, accounting for 10.1% of all nosocomial infections. Skin and feces are the places where *Pseudomonas aeruginosa* is found with the percentage of 5% and 3%, respectively, in patients^[29].

Klasiella sp is a gram-negative rod bacteria that is included in the type of conditional pathogens. *Klasiella sp* often causes various types of nosocomial infections, such as VAP, CAUTI and SSI. The spread of *Klasiella sp* in hospitals occurs through hand-to-hand contact between medical staff and patients or from one patient to another. Can be found in the surrounding environment as well as on the surface of living things such as humans and animals. In humans, *Klasiella sp* is found in the nasopharynx and gastrointestinal tract, whereas if it is found on the skin, it is a transient pathogen^[30].

Bacterial colony is one of several risk factors for SSI. The skin becomes a place that is always inhabited by pathogens, both resident flora and transient flora. Resident flora are microorganisms that tend to stay and transient flora are microorganisms that are on the skin for a while and originate from the surrounding environment. In general, flora on the skin does not cause health problems in healthy people and provides benefits for preventing bacterial colonies that are pathogenic^[31]. Normal flora can turn into disease pathogens when there is a change of place or when the body's defenses are weak^[32].

Starting from the occurrence of bacterial contamination in the surgical wound, an inflammatory response arises to fight bacteria. Infection occurs when the number of bacteria and virulence exceeds the body's ability to defend against bacteria. Usually it takes >10 microorganisms per gram of tissue to cause nosocomial infection^[21].

Skin hygiene, especially the hands, is known to be one way to reduce the risk of bacterial transmission due to contact or the fecal-oral route^[33]. Research conducted by Gilmore et al (1981) found that bathing can

reduce the number of *Pseudomonas aeruginosa* and *Kalbsiella* on the skin surface and is able to eliminate these bacteria in several places. ^[34].

In the variable of hospital room type, the results of this study are inversely compared with the study of Fildzah and Masyitah (2017) who reported that there is a relationship between treatment room with invasive events (p value 0.027)^[15]. In this study, it was found that many patients were treated in special care units, such as ICU, NICU, PICU, and post-surgical units. Patients undergoing treatment in special care units receive invasive procedures during treatment. This allows bacteria to infect the patient and increase the length of stay of the patient.

It was stated that patients undergoing treatment in the ICU are more likely to become infected with nosocomial infections because as long as the patient is in the ICU, the patient will receive invasive procedures that can damage the tissues of the patient's body. In this way, the patient will also undergo a longer treatment in the hospital^[35]. Patients undergoing intensive care in special care units are patients diagnosed with chronic disease, this condition makes the patient's body tolerant to infecting germs. The use of drugs with immunosuppressive properties also plays a role in decreasing the body's immunity to the occurrence of^[13].

On the variable length of stay, the results of this study are in line with the study of Wigati (2015) with a large p value of 0.036 so that it is stated that there is a relationship between length of stay and the incidence of nosocomial infections^[36]. This is related to the longer the patient undergoes treatment in the hospital, the longer the patient gets invasive procedures. In addition, the patient is also more likely to have bacteria enter the body, so the patient is more likely to be exposed to nosocomial infections. The period of patient care in the hospital can be influenced by several factors, including the severity of the disease, the general

condition of the patient, the possibility of other diseases that the patient has, the risks of the therapy the patient undergoes during treatment and medical intervention^[15]. The longer the patient is treated, the greater the risk of the patient getting nosocomial infections^[17].

The adult age group is designated as a reference, this is related to the fact that adults have a better overall health status than other age groups who are more susceptible to infection^[9]. Based on the analysis results, the p value in all age groups is greater than the alpha value, which means that there is no relationship between age and the incidence of nosocomial infections.

In line with the study of prevalence and risk factors for nosocomial infections in Shiraz, Iran, it was found that age had no relationship with the incidence of nosocomial infections (p value 0.231)^[10]. The same thing was also found in the study of Kritsotakis et al (2017) that there was no relationship between age and the incidence of nosocomial infections (p value 0.999)^[11].

According to Hesti (2003), the very young and the very old have a high risk of nosocomial infections. This is caused by a low immune system at too young or too old. This is different from the productive age group, such as the adult or adolescent age group, who have a stable immune system to fight infection^[12].

Age is one of the most influential factors on the level of tolerance and response of the patient's body. Too young and too old are associated with a decrease in the body's resistance to infection. This age will have tolerance for germs that infect the patient's body so that the incidence of infection cannot be avoided [13]. Toddler age has a weak body defense against infection, this is because at birth the baby has antibodies from the mother and the immune system is still immature. In contrast to adults who already have an immune system that is able to defend against bacteria that infect the body.

Whereas in the elderly, there is a decrease in organ function so that the immune system also decreases^[14].

The gender variable is in line with the research by Fildzah and Masyitah (2017) regarding the determinants of nosocomial infections in hospitals that obtained results from sex statistical tests with the incidence of nosocomial infections with a p value of 0.994^[15]. These results are in accordance with the research of Ali et al (2018) which got a p value of 1.44, it is known that there is no relationship between gender and the incidence of nosocomial infections^[9].

According to Hally (1993) in Yelda (2004) that men have a greater chance of getting nosocomial infections than women. This is because the level of personal hygiene of men is lower than that of women. Low personal hygiene makes it easier for bacteria that cause nosocomial infections to develop and infect patients^[16].

Meanwhile, in the study of nosocomial infections, it was stated that a woman is a group that is more susceptible to the incidence of nosocomial infection than the male group. The condition of women's body resistance, which is weaker than men's, is an influencing factor. Women's biological systems such as menopause which makes the body's immune process decrease. Hormonal activity when menopause occurs will decrease, the quality of blood vessels decreases so that they are susceptible to infection^[17].

On the congenital disease variable, the results of the study are in line with the research of Rashella (2012) which got a p value for the same variable of 0.701 which shows there is no relationship with the incidence of nosocomial infections^[18]. The same thing was also obtained by Fildzah and Masyitah (2017) who got a p value of 0.343. This is related to congenital diseases that can increase the severity of the patient's disease so that it has the potential to prolong the hospital stay^[15].

The status of patients who have previous congenital diseases makes the

immune system weaker, making it easier for bacteria to infect patients. The entry of microorganisms into the patient's body that cannot be resisted by the patient's weakened immune system so that it affects the patient's body physiology. Physiological changes in the patient's body that result in a new infection which is then called a nosocomial infection^[17].

CONCLUSION

From this study, it was concluded that the epidemiological determinants of nosocomial infections in inpatients at the Haji Adam Malik General Hospital Medan in 2019 included the type of invasive procedure, which was 5.7 times more risky for patients with surgery compared to patients using CVC. with conditional pathogens 7.4 times more risk of nosocomial infection than patients who were not exposed to germs and patients with length of stay 7 days had 2.7 times risk of nosocomial infection compared to patients with length of stay < 7 days.

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