THE DIFFERENCE INCIDENT RATE OF SEPSIS BETWEEN HEMODIALYSIS CHRONIC KIDNEY DISEASE PATIENTS WITH HEART FAILURE AND NON-HEART FAILURE

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ABSTRACT

Introduction: Sepsis is one of the deadliest diseases in the world because it can cause 2-8 million deaths yearly. Chronic kidney disease (CKD) is one of the predisposing factors for sepsis. The more deteriorating the condition of a kidney, it can lead to cardio-renal syndrome interactions, resulting in heart diseases, including heart failure. Chronic kidney disease and heart failure theoretically have several mechanisms that could underlie the occurrence of sepsis. This study aimed to determine the difference in the incidence of sepsis in patients with heart failure and non-heart failure with hemodialysis CKD.
Methods: This research is an analytic observational with a cross-sectional approach. The number of samples used reached 90 data. Sampling was carried out at Dr Hospital. Moewardi in the 2019-2021 period. The researcher used purposive sampling with inclusion and exclusion criteria in this study. The research sample was obtained from the patient's medical record data. Data analysis used SPSS 26 software and the Chi-square test for bivariate analysis.
Results: There was no significant difference in the incidence of sepsis between patients with heart failure and non-heart failure with CKD hemodialysis, with a p-value of 0.581 (P>0.05).
Conclusion: There was no significant difference in the incidence of sepsis between patients with heart failure and non-heart failure with CKD hemodialysis.

Keywords: CKD; Heart failure; Sepsis.

INTRODUCTION

Sepsis is a condition that must be watched out for because sepsis is among the world's top 10 causes of death, causing 2-8 million deaths each year [1]. Based on data taken at Moewardi Hospital Surakarta in 2009, hospitalized patients during 2009 were 28,385 people, of which there were 597 cases of sepsis [2]. Chronic kidney disease (CKD) is a condition where damage or dysfunction occurs in the kidneys, which leads to reduced levels of *estimated Glomerular Filtrate Rate* (eGFR) <60 ml/minute/1.73 for three months or more [3].

Chronic kidney disease has a prevalence of 11-13% of the total world population [4]. Meanwhile, in Indonesia, based on data obtained from Riskesdas (2013) shows that the prevalence of CKD in Indonesia is around 0.2%. This disease increases directly proportional to the number of ages [5]. Patients aged ≥ 75 years have the most considerable prevalence of 0.6 per cent, followed by patients with an age range of 55-74 years by 0.5 per cent [6].

Heart failure is a condition of disruption in the process of ventricular filling and the process of pumping blood throughout the body [7]. Data from WHO (2015) shows that cardiovascular disease results in 17.7 million deaths, about 45% of deaths caused by non-communicable diseases. Data from Riskesdas (2018) shows the prevalence of heart disease in Indonesia is 1.5%, with the third highest prevalence rank being in the provinces of North Kalimantan (2.2%), DIY (2%), Gorontalo (2%) [8].

Sepsis is when life-threatening organ failure occurs due to dysregulation of the immune response to infection [9]. Sepsis is more susceptible to contracting in people with higher stages of CKD. If the person has heart failure simultaneously, then this can increase the chances of sepsis in that person [1].

Proinflammatory cytokines such as IL-1, IL-6, TNFα and HMGB 1 are elevated in CKD patients, making the body more susceptible to sepsis [10]. The more severe the patient, the more risk of developing *cardiorenal syndrome*, where severe kidney conditions can significantly impact heart performance [11].

Organ dysfunction, tissue hypoperfusion, and cell apoptosis can occur in patients with heart failure. This is due to systemic circulation disorders caused by decreased heart performance. These conditions also make it easier for a person to develop an infection that can progress to sepsis, especially if the person has CKD at the same time [12]. So, theoretically, patients who have CKD conditions along with heart failure will be more susceptible to sepsis than CKD patients without heart failure. Therefore, from the various theories obtained, researchers want to determine the difference in the incidence of sepsis in hemodialysis CKD patients with heart failure and non-heart failure.

METHOD

This study used analytical observational methods. This research design uses *a cross-sectional research design*. This research will be conducted at the Department of Internal Medicine at Dr Moewardi Hospital Surakarta.

The population of this study was patients diagnosed with CKD at Dr Moewardi Surakarta Hospital, with the following sample criteria:

a) Inclusion Criteria
   1) Patients on hemodialysis

b) Exclusion Criteria
   1) Immunodeficiency diseases such as HIV
   2) Immunosuppressive treatment, such as the use of corticosteroids

3) Pneumonia
4) Diabetes Mellitus

This study used a purposive sampling method. The sample size uses the hypothesis test formula two proportions. From the results of the sample calculation, a minimum sample size of 45.2 was rounded to 45. Because this study compares two groups, namely heart failure and non-heart failure, the sample size obtained is multiplied by 2. Thus, the total number of samples to be taken is 90 people.

RESULT

This research was carried out from August 2 -11, 2021, at the Medical Records Section of Dr Moewardi Hospital Surakarta. Researchers took samples using stage 5 CKD medical records with hemodialysis treated at Dr Moewardi Hospital in 2020-2021. The sample size of this study reached 90 people, with 45 suffering from heart failure and 45 not with heart failure. In this study, researchers did not include confounding factors in the sample studied.

Univariate Analysis

Based on the distribution of sepsis, the number of sepsis patients was 16 people (17.7%), and no sepsis 74 (82.3%) people.

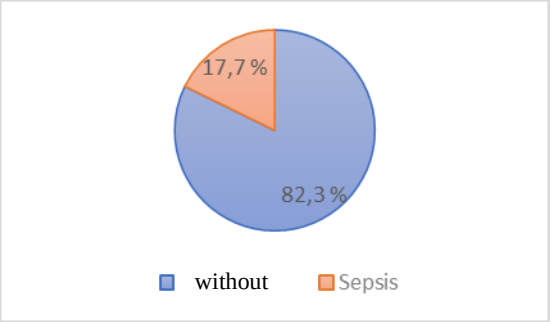

Figure 1. Distribution of samples by sepsis.

Bivariate Analysis

This study used the Chi-square bivariate analysis test on SPSS software to determine whether there is a difference in the incidence of sepsis in hemodialysis CKD in diseases with heart failure and non-heart failure.

The incidence of sepsis in patients with heart failure is 16% of the total group of patients with heart failure. Meanwhile, the incidence of sepsis in non-heart failure patients is 20% of the total group of non-heart failure patients.

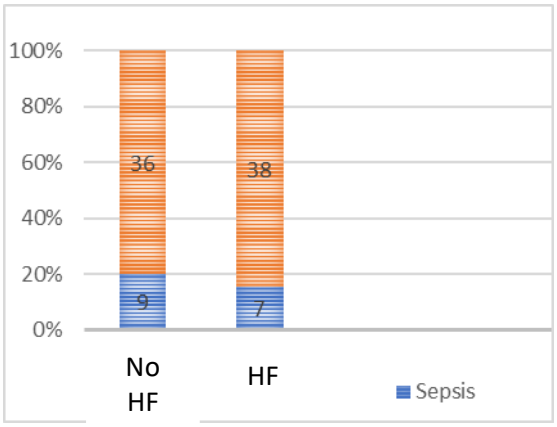

Figure 2. Diagram of differences in sepsis incidence rates in heart failure and non-heart failure patients with chronic kidney disease hemodialysis

Based on the Chi-square test results, a p-value of 0.581 (p>0.05) was obtained, which showed no significant difference between the incidence of sepsis in heart failure patients and non-heart failure patients with chronic kidney disease hemodialysis.

Table 1. Calculating the P-Value using the *chi-square formula*

Sepsis					*P value*
Heart Failure		No	Yes	Total	
	No	36	9	45	
	Yes	38	7	45	.581
Total		74	16	90	

DISCUSSION

Analysis of Research Results

Chronic kidney disease is one of the predisposing factors to the appearance of sepsis. This is because CKD can increase proinflammatory cytokines such as TNFα, IL-1, IL-6, and HMGB1, which can cause several mechanisms that can cause sepsis. Hemodialysis is also one of the predisposing factors of sepsis because in patients undergoing hemodialysis, it is possible to become a pathway of infection through vascular access [13].

Along with the decline in kidney performance, especially if it has reached the final stage and needs more treatment, the heart condition can also worsen and can even become heart failure due to the interaction of *cardiorenal syndrome*. Although heart failure is theoretically not one of the predisposing factors to the emergence of sepsis, patients with heart failure also experience elevated levels of various kinds of proinflammatory cytokines such as TNFα, IL-1, IL-6 so that it can also be the basis of the mechanism of sepsis [14].

This study aimed to determine whether there is a difference between the incidence of sepsis in heart failure patients and non-heart failure with chronic kidney disease with hemodialysis. Therefore, from the data obtained, researchers use the *Chi-square* test to find out if there is a significant difference between the two. This study showed that the p-value calculation *was 0.581 (p > 0.05), which indicates that heart failure does not significantly affect the incidence of sepsis in patients with CKD who are undergoing hemodialysis.*

The results in this study align with research conducted by Mayr *et al*. (2014) showed that sepsis is most triggered by infections in the respiratory system, followed by bacteremia, then infections in the urinary system and infections that attack the abdominal region. Meanwhile, triggers originating from the heart are only ranked 8 in sepsis-triggering diseases. The study showed that the incidence of sepsis originating from heart failure only ranged from 0.5-0.9%, indicating that heart failure is not a significant trigger for sepsis [15].

Research Limitations

Researchers have tried their best to work on this research. However, there are some limitations to this study:

1. Researchers take data during a pandemic so that it directly or indirectly affects the incidence of samples.
2. Researchers did not include confounding variables in this study.

CONCLUSION

Based on the results of the study, it was concluded that there was no significant difference in the incidence of sepsis in heart failure patients and non-heart failure with CKD undergoing hemodialysis.

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CONFLICT OF INTEREST

None

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