

Correlation Between Gender and Random Plasma Glucose on The Outcome of Sepsis Patients with Type 2 Diabetes Mellitus in The Internal Medicine Room of Dr. Soetomo General Hospital

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ABSTRACT

Background: Indonesia has a tropical climate, so it cannot be separated from sepsis. Sepsis is a severe health problem with very high mortality worldwide. Type 2 diabetes mellitus comorbidities that Indonesian people often suffer from can affect patient outcomes. The effect of gender on patient outcomes is still controversial. It is estimated that gender differences can affect hormonal responses, which cause differences in immune responses. In addition, random plasma glucose levels can also be associated with the outcome of septic patients with type 2 diabetes mellitus due to impaired immune response that occurs in patients. **Method:** This research is a retrospective study using the Cross-Sectional method by taking the medical record data of sepsis patients treated in the internal medicine room of Dr. General Hospital. Soetomo Surabaya for January 1, 2020 - December 31, 2020. **Result:** Of the 215 study subjects divided into two groups, 123 patients died, while 92 patients were discharged. There were no significant results that gender in type 2 diabetes mellitus sepsis patients was associated with patient outcomes from hospital care ($p = 0.055$). In addition, there was also no significant relationship between random plasma glucose levels of patients and patient outcomes during hospitalization ($p = 0.790$). **Conclusion:** Gender and random plasma glucose levels in septic patients with type 2 diabetes mellitus are not associated with hospital outcomes.

Keywords: sepsis; type 2 diabetes mellitus; gender; random plasma glucose.

INTRODUCTION

Sepsis is a severe health problem with a very high mortality rate worldwide classified as a global health problem. In 2017 WHO stated that there were 48.9 million sepsis patients worldwide, with 11 million of them dying, with 85% of sepsis death cases occurring in low and middle-income countries [1]. Type 2 diabetes mellitus is also a disease that many people suffer from lifestyle changes. Besides causing macro and microvascular complications, patients with diabetes mellitus are more prone to suffer from sepsis due to abnormal immune responses [2,3].

The sex-related relationship to mortality in sepsis patients with type 2 diabetes mellitus is controversial. In women, the immune system activation is greater than that of men so that women can survive better during sepsis [4]. The global incidence of sepsis states that women are more likely to suffer from sepsis than men, but men have a higher mortality rate than women [5].

Uncontrolled blood glucose levels are associated with mortality in critically ill patients with type 2 diabetes mellitus comorbidities. Hyperglycemia and hypoglycemia conditions can affect the outcome of sepsis patients [6,7]. Patients with stress hyperglycemia can increase the risk of mortality more than five times [6].

Acutely fluctuating blood sugar levels can induce endothelial cell damage and apoptosis in vitro studies [8]. Knowing the relationship of type 2 diabetes mellitus comorbidities to the outcome of sepsis patients will likely assist clinicians in appropriately determining the patient's prognosis. In addition, knowing this prognosis can be the next step in considering more effective treatment that should be given to patients. Therefore, we conducted this study to determine the relationship between gender and random plasma glucose levels of sepsis patients with type 2 diabetes mellitus on the outcome of hospitalization.

METHOD

This study used a cross-sectional method by looking for the relationship between gender, organ failure, and random plasma glucose on the death of sepsis patients with type 2 diabetes mellitus comorbidities while undergoing treatment in the internal medicine room of Dr. Soetomo Surabaya, the period January 1, 2020 - December 31, 2020. The study was conducted retrospectively by taking secondary data from patient medical records. The data obtained will be analyzed using the chi-square test, which is processed using the IBM SPSS program.

RESULTS

Two hundred fifteen patients were selected as the study sample who met the inclusion and exclusion criteria. The characteristics of the research sample are provided in Table 1.

TABLE 1: Characteristics of type 2 diabetes mellitus Sepsis Patients in the Internal Medicine Room of Dr. Soetomo General Hospital Surabaya Period January 1, 2020 – December, 31 2020.

	Died n = 123	Discharged n = 92
Age		
18-54 years	53 (43 %)	43 (46.7%)
55-64 years	36 (29.2%)	33 (35.8%)
65-74 years	24 (19.5%)	12 (13%)
≥ 75 years	10 (8.3%)	4 (4.5%)
Gender		
Male	48 (39%)	48 (52.1%)
Female	75 (61%)	44 (47.9%)
Random plasma glucose level		
< 200 mg/dL	49 (39.8%)	35 (38%)
≥ 200 mg/dL	74 (60.2%)	57 (62%)
Organ failure		
Yes	86 (70%)	24 (26%)
Not	37 (30%)	68 (74%)
Other comorbidities		
Malignancy	5 (4%)	0 (0%)
Kidney disease	71 (57.7%)	41 (44.5%)
Congestive heart failure	2 (1.6%)	1 (1%)
Cerebrovascular disease	4 (3.2%)	9 (9.7%)
Pulmonary disease	88 (71.5%)	44 (47.8%)
Liver disease	18 (14.6%)	15 (16.3%)
Gastrointestinal Diseases	21 (17%)	8 (8.6%)
Connective tissue disease	1(0.8%)	4 (4.3%)
Cardiovascular disease	28 (22.7%)	28 (30.4%)
Covid-19	33 (26.8%)	9 (9.7%)
Encephalopathy	42 (34.1%)	23 (25%)
Autoimmune disease	0 (0%)	1 (1%)
CCI score		
Low	2 (1.6%)	7 (7.6%)
Medium	18 (14.6%)	20 (21.7%)
High	103 (83.8%)	65 (70.7%)

From the available sample characteristics data, it was found that female patients who died compared to patients who were discharged (61% vs. 47.9%), patients died with randomized plasma glucose levels ≥ 200 mg/dL compared with discharged patients (60.2% vs. 62%), and patients who died with organ. failure compared with discharged patients (70% vs. 26%).

The differences between the two groups were analyzed in table 2 regarding gender, and table 3 regarding random plasma glucose levels of patients using the chi-square test.

Correlation between Gender and Patient Outcome

In table 2, 48 male and 44 female patients were discharged, while 48 male and 75 female patients died. The data analysis showed no significant relationship between gender in sepsis patients and patient outcomes (p = 0,055).

TABLE 2: Analysis of the correlation between gender and patient outcomes.

	Patient Outcome		p-value
	Discharged	Died	
Gender			
Male	48	48	0,055
Female	44	75	
Total	92	123	

Correlation between Random Plasma Glucose and patient outcome

Table 3 shows that 35 patients with random plasma glucose levels < 200 mg/dL and 57 patients with random plasma glucose levels > 200 mg/dL were discharged.

In comparison, 49 patients with random plasma glucose levels < 200 mg/dL and 74 patients with random levels of plasma glucose > 200 mg/dL died. The data analysis showed no significant association between random plasma glucose in septic patients and patient outcomes (p = 0,790).

TABLE 3: Analysis of the correlation between random plasma glucose and patient outcomes.

	Patient Outcome		p-value
	Discharged	Died	
Random plasma glucose			
< 200 mg/dL	35	49	0,790
≥ 200 mg/dL	57	74	
Total	92	123	

DISCUSSIONS

Gender differences are thought to cause differences in immune responses in a person. Women have a more favorable immunological response during infection than men [9]. Epidemiological studies reported that men had a higher incidence of sepsis than women [10]. However, female patients were independent predictors of increased mortality in patients with infection in the ICU [11].

On the other hand, men tend to have more severe progression if they suffer from pathogenic infections, whether viral, bacterial, or parasitic [12]. The risk of death from sepsis was statistically significantly increased in male patients (OR 1.3) [2]. IL-6 levels in male sepsis patients were two times higher than in females (60.72 ± 13.41 pg/ml vs. 28.06 ± 7.16 pg/ml) ($p = 0.025$). It was also found that there was a significant difference in IL-6 levels in those patients who died had higher IL-6 levels than patients who were discharged from the hospital and recovered ($p < 0.01$) [13].

Alpha-1-acid glycoprotein (AGP) is one of the crucial factors for modulating neutrophil migration [14]. AGP plays a role in the formation of the glycocalyx in the form of a complex polysaccharide glycoprotein that surrounds the extracellular membrane. Glycocalyx destruction in septic patients is associated with increased interaction of extracellular adhesion molecule (ICAM-1) with neutrophils (CD11b) which increases adhesion and increases the recruitment of neutrophils to the site of infection [15]. In a state of hyperglycemia, there is an increase in AGP levels which results in the thickening of the glycocalyx layer so that the recruitment activity of neutrophils to the site of infection decreases [16]. Therefore, the patient's hyperglycemia can reduce immunity, affecting patient outcomes.

The results obtained in this study regarding the relationship of random plasma glucose levels to the outcome of sepsis patients did not show significant results. It was estimated that several factors could affect random patients' blood sugar levels, such as taking blood sugar-lowering drugs before testing. In addition, other factors that can affect changes in patient blood sugar levels such as malnutrition, gastrointestinal disorders, decreased food intake, polypharmacy, blood sugar monitoring, and inadequate patient education [17–20]. Cohort study-type research is needed to obtain more accurate data and results related to the relationship between these two variables.

CONCLUSION

In this study, there was no relationship between gender and random blood sugar levels in sepsis patients with type 2 diabetes mellitus comorbidities on patient outcomes treated at Dr. General Hospital. Soetomo Surabaya. This research is limited to only looking at phenomena from patient medical records collected only at one time. The researchers suggest further research using primary data and other methods, such as a cohort study, are needed.

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