The Effect of One Hour Bundle Sepsis Management of Sepsis Patients On Lactic Acid and Sofa Scores

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***Abstract*- Background**: Sepsis is a life-threatening organ dysfunction resulting from regulatory disruption of the host response to infection. The Sequential Organ Failure Assessment (SOFA) aims to assess the severity of the disease based on the degree of organ dysfunction serially each time.

Objective: The purpose of this study was to determine the effect of the one hour bundle sepsis management in sepsis patients to lactate level and SOFA scores.

Method: This study is an observational study with prospective cohort data collection to determine the effect of the one hour bundle sepsis management in sepsis patients to lactate level and SOFA scores that carried out at General Hospital Haji Adam Malik Medan.

Results: The highest number of genders was female (14 (51.9%), the highest occupation was housewife with 12 (44.4%), and the most ethnic group was Batak 17 (63.0%). the average SOFA score at 0 o'clock (T0) was 11.66 with SD value. The mean SOFA score at the 3rd hour was 11.51 with an SD value of 2.53. The median SOFA score at the 24th hour (T1) is 11 with a min-max value of 1-14. The median SOFA score at the 71st hour (T2) is 10 with a min-max value of 5-13, There is no significant difference between the 0th hour - the 3rd hour with a value of P = 0.294. There is a significant difference between the 3rd hour - 24th hour with a value of P = 0.001 and at 24th hour - 72th hour with a value of P = 0.001. There was no significant difference between the 0th hour - 3rd hour with a value of P = 0.161. There is a significant difference between the 3rd hour - 24th hour with a value of P = 0.001. There is a significant difference between the 24th hour - 72th hour with a value of P = 0.001.

Conclusions: There was a significant decrease in SOFA scores and lactate levels after giving one hour bundle at 24 and 72 h.

***Index Terms*-** Sepsis, One hour bundle, Lactate, SOFA score.

I. Introduction

Sepsis is a life-threatening organ dysfunction resulting from regulatory disruption of the host's response to infection[1]. The global incidence between 1995 - 2015 was 437 per 100,000 people per year for sepsis and severe sepsis. Sepsis contributes to one in two to three mortality rates in cohort studies in hospitals[2]. Data from the Center for Disease Control (CDC) shows that the incidence of sepsis increases ± 8.7% every year, from 164,000 cases (83 per 100,000 population) in 1979 to 660,000 cases (240 cases per 100,000 population) in 2000. In America also a developed country, death from sepsis each year reaches 70,000 people. Approximately 500,000 new cases of sepsis have reached 35% of deaths. This death rate tends to rise and now ranks 10th cause of death in the United States[3].

Sepsis-related Organ Failure Assessment, which became known as Sequential Organ Failure Assessment (SOFA) was introduced in 1994. The aim is to assess the severity of the disease based on the degree of organ dysfunction serially at all times. The SOFA score consists of an assessment of 6 organ systems namely; respiration, coagulation, liver, kidney, cardiovascular and central nervous system. Each stranger has a value between 0 - 4 based on the degree of dysfunction[4].

According to SSC 2018, the handling of sepsis patients is carried out within the first hour, ie measuring levels of lactic acid, blood culture before giving antibiotics (specific), giving broad-spectrum antibiotics, giving crystalloid 30 ml / kgbb immediately if there is hypotension or lactate ≥ 4 mmol / L , give vasopressors if hypotension is encountered during or after fluid resuscitation to maintain MAP ≥ 65 mmHg.

Lactate is considered as a byproduct of the process of glycolysis in the condition of lipidia. In basal lactate, 0.8 - 1.0 mmol / kg BW / hour is produced continuously by skeletal muscle, skin, brain, red blood cells, gastrointestinal tract, and kidney medulla. Lactate is the most widely used by the liver, kidneys, and heart muscle. The lactate clearance rate can reach a concentration of 320 mmol / L / hr. If production exceeds the rate of clearance will arise hyperlactatemia, but in normal circumstances there is a balance between production and metabolism of lactate[5]. Hyperlactatemia in sepsis results from tissue hypoperfusion, and lactate represents a sign of tissue hypoxia. This occurs because of microcirculation dysfunction that has occurred since the beginning of sepsis and is an early critical stage of tissue hypoxia and organ failure.

II. METHODS

This study is observasional with kohort prospektif design. The subjects of this study were taken by using consecutive sampling technique which means sample obtained until the sample

size is met. After obtaining approval from the Ethics Committee, Faculty of Medicine, Universitas Sumatera Utara, based on inclusion criteria (Adult patients (18-60 years) with sepsis with a SOFA Q score> 2) and exclusion criteria (Patients / families of patients not willing, sepsis / suspected sepsis with lactate levels <2 mmol / L, history of kidney disease, cardiac dysfunction, immune system disorders, cancer, immunosuppressant drug therapy and patients with impaired liver function.). Drop out criteria are Patients in the observation period stated withdrawing from the study / withdrawal of informed consent and the patient moved to an outside hospital. 27 samples were collected. All subjects were recorded for their identity after obtaining informed consent and being approved by the medical research ethics commission of the Faculty of Medicine, University of North Sumatra, then anamnesis, physical examination and support are performed on the patient to rule out the inclusion and exclusion criteria. After the sample is found, lactate and SOFA are examined at 0, 3 , 24 and 72 hours Then observed whether there are changes in the lactate value and SOFA score. Data analysis was performed using computerization. Statistical tests with T-Paired samples test, Wilcoxon test, ANOVA, and Friedman test. All statistical tests with p <0.05 were considered significant.

III. RESULTS

This study was attended by 27 subjects who met the inclusion criteria. The characteristics of this study were displayed based on age, sex, occupation, ethnic and haemodinamik :

Table 1 Demographic Characteristics

Characteristics	N (%)	Mean ± SD/ Median, min-max
Age (years)		56,8 ± 13,5
Sex		
Male	13 (48.1)	
Female	14 (51.9)	
Occupation		
Lecturer	1 (3.7%)	
Teacher	1 (3.7%)	
Honorer	1 (3.7%)	
Housewife	12 (44.4%)	
Private sector worker	10 (37.0%)	
Entrepreneur	2 (7.4%)	
Ethnic		
Batak	17 (63.0%)	
Jawa	8 (29.6%)	
Melayu/Minang	2 (7.4%)	
Hemodinamik		
Systolic blood pressure		90 (70-190)
Dyastolic blood pressure		60 (40-110)
Heart Rate		126 (62-154)
Respiratory Rate		26 (16-31)
Total	27	

Data is presented as mean ± SD if normally distributed and presented as median (min-max) if data is not normally distributed.

Based on table 1 above, a total of 27 subjects were found, with an average age of 56.8 years with an SD score of 13.5 years. The male sex are 13 people (48.1%) while the female gender are 14 (51.9%). The most work is IRT (Housewife) 12 people (44.4%). The most ethnic group is the Batak people of 17 people (63.0%). The median value of systolic blood pressure is 90 with a min-max of 70-190, the median value of diastolic blood pressure is 60 with a min-max of 40-110, the median value of heart rate pressure is 126 with a min-max of 62-154 and the median value of respiratory rate is 26 with min-max 16-31.

Tabel 2 Disease Characteristics

Disease	Frequency	Persentase
Pneumonia	8	9,9
Stroke	5	6,2
Lung TB	4	4,9
Sepsis	27	33,3
ARDS	4	4,9
peritonitis	2	2,5
Tetanus	1	1,2
PPOK	2	2,5
CKD	5	6,2
PSMBA	1	1,2
Dm type 2	7	8,6
MDS	1	1,2
Uremic Encepalopaty	2	2,5
Flame Burn	1	1,2
Penetrating Neck Injury	1	1,2
Ruptur Artery Radialis	1	1,2
SGB	2	2,5
Asidosis Metabolik	5	6,2
KAD	2	2,5
Total	81	100,0

Based on table 2 above, it is found that the total number of diseases obtained is 81 diseases, where in one sample there are more than one disease. Most diseases were Sepsis with 27 (33.3%) and the least diseases were Tetanus, PSMBA, MDS, Flame Burn, Penetrating Neck Injury and Radial Artery Rupture with 1 each (1.2%).

Tabel 3 Characteristics of Lactic Acid (n=27)

Characteristics	Mean	SD
Lactic Acid at T0	4,55	1,16
Lactic Acid at T1	4,54	1,15
Lactic Acid at T2	4,12	1,17
Lactic Acid at T3	3,67	1,09

T0 = Hour to-0; T1 = Hour to-3; T2 = Hour to -24; T3 = Hour to -72

Tabel 4 Characteristics of SOFA Score (n=27)

Characteristics	Mean	SD	Median	Min.	Max.
SOFA score at 0 hours (T0)	11,66	2,64	-	-	-

SOFA score at 3 hours (T1)	11,51	2,53	-	-	-
SOFA score at 24 hours (T2)	-	-	11	5	14
SOFA score at 72 hours (T3)	-	-	10	5	13

Note : T0 = Hour to-0; T1 = Hour t -3; T2 = Hour to -24; T3 = Hour to -72

Data is presented as mean ± SD if normally distributed and presented as median (min-max) if data is not normally distributed.

Tabel 5 Difference in Lactic Acid Levels at 0th hour (T0), 3rd hour (T1), 24th hour (T2) and 72nd hour (T3)

Biomarker	p-value a)	p-value b)
Lactic Acid Levels at 0th (T0) – 3rd hours (T1)	0,294	
Lactic Acid Levels at 3d (T1) – 24th hours (T2)	0,001*	0,001 *
Lactic Acid Levels at 24th (T2) – 72th hours (T3)	0,001*	

a) *T-Paired samples test*, b) *ANOVA Repeated*

Based on table 5 shows the statistical test results of the difference in 3 time groups in the assessment of lactic acid levels. There was no significant difference between the 0th hour - 3rd hour with a value of P = 0.294. There is a significant difference between the 3rd hour - 24th hour with a value of P = 0.001 and at 24th hour - 72th hour with a value of P = 0.001. The statistical test results of the decrease in average lactic acid is P = 0.001, which means there is a significant difference in the average decrease in lactic acid over time

Tabel 6 Difference between SOFA Scores at 0th hour (T0), 3rd hour (T1), 24th hour (T2) and 72nd hour (T3)

Biomarker	p-value a)	p-value b)
SOFA score Levels at 0th (T0) – 3rd hour (T1)	0,161	
SOFA score Levels at 3rd (T1) – 24th hour (T2)	0,001*	0,001 *
SOFA score Levels at 24rd (T2) – 72th hour (T3)	0,001*	

a) *Wilcoxon*, b) *Friedman*

Based on table 6 shows the statistical test results of differences in the 3 groups of time assessment SOFA score. No significant difference was found between the 0th hour - the 3rd hour with a value of P = 0.161. There is a significant difference between the 3rd hour - 24th hour with a value of P = 0.001. There is a significant difference between the 24th hour - 72th hour with a value of P = 0.001. The statistical test results of an average decrease in SOFA score is P = 0.001, which means there is a significant difference in the average decrease in SOFA score over time.

IV. CONCLUSIONS

From the results of this study conducted to see the effect of one hour bundle sepsis management of sepsis patients on lactic acid and sofa scores at Haji Adam Malik General Hospital, it can be concluded that:

1. There was a statistically significant decrease in SOFA scores after administering one hour bundle sepsis at 24 and 72 hours (p = 0.001).
2. There was a statistically significant reduction in lactate levels after administration of one hour bundle sepsis at 24 and 72 hours (p = 0.001).

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