Mortality Prediction Using the SOFA Score and APACHE II Score in Sepsis Patients Treated in ICU H. ADAM MALIK Hospital

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Abstract

Introduction: Sepsis is life-threatening organ dysfunction with a high mortality rate. Scoring systems have been widely used in predicting mortality in sepsis patients, which is influenced by many factors. Aimed of this study to determine the role of the SOFA score and APACHE II score in predicting the mortality of sepsis patients in the ICU of RSUP H. Adam Malik.

Methods : Diagnostic study with cross-sectional approach. Subjects of this study were sepsis patients who were treated in the ICU with consecutive sampling techniques. Scoring in predicting mortality using the SOFA score and APACHE II. Data analysis was performed univariately and bivariately using IBM SPSS version 22 for windows. The cut off value is based on the median value and the sensitivity and specificity is determined based on the formula from Table 2 x 2.

Research results : Of 123 sepsis patients were analyzed in this study with a mortality rate of 57.7%. The most common source of infection that causes sepsis was pneumonia (61.8%) and the most comorbid diabetes mellitus (26%). Cut off of the study was determined using the median value where the SOFA cut off score was 10 and APACHE II was 13. The sensitivity and specificity of the SOFA score were superior in predicting mortality (Sens : 76.1%; specs 82.7%) compared to the APACHE II score (sens = 70 .4%; specs = 59.6%).

Conclusion : The SOFA score has better diagnostic value and is superior in predicting mortality in sepsis patients.

Keywords:*Sepsis, Mortality, Couch Score, APACHE II Score.*

INTRODUCTION

Sepsis is a case that is often found in the Intensive Care Unit (ICU) which is usually associated as a cause of death and organ failure. Based on the 2016 Survival Sepsis Campaign (SSC) definition, sepsis is defined as the result of organ dysfunction due to dysregulation of an irregular host response to the infection process.[1]

In 2017 there were approximately 11 million total sepsis-related deaths worldwide in 2017, representing 19.7% of deaths that year.[2] In the United States about 750,000 people get sepsis in critically ill patients with about 210,000 dying from sepsis each year with 15% developing septic shock and accounting for about 10% being admitted to the ICU with a mortality rate of more than 50%.

The SOFA assessment consists of an assessment of 6 organ functions, namely lung function, coagulation, liver, heart, central nervous system, and kidney where each has a lowest value of 0 (normal function) to a highest of 4 (very abnormal) which totals the value range from 0 to 24. With a higher SOFA score associated with increased mortality in sepsis patients.[1,3]

the APACHE II score can predict the severity of sepsis patients with a mean score of 18.74 ± 7.26 (Arif S et al, 2021). Based on a study conducted by Lan Gao et al in China on 432 sepsis patients who were followed up in which APACHE II was found to have a sensitivity of 79.4% and a specificity of 60.8% in predicting mortality for patients with sepsis.[4]

METHOD

This study is a retrospective diagnostic test in which this study aims to compare SOFA and APACHE II scores as the gold standard in predicting mortality for sepsis patients.

This research was conducted on inpatients at the ICU of H. Adam Malik General Hospital Medan from January to December 2021. Where data collection was carried out at the Medical Record Installation of H. Adam Malik General Hospital Medan. This research takes place from July 2022 until the sample is fulfilled

the research sample uses the Non Probability Sampling technique, namely by using a Consecutive Sample where the sample is taken if it meets the inclusion and exclusion criteria until the sample size is fulfilled

Data analysis in the form of univariate and bivariate. Univariate analysis determined descriptive characteristics of sepsis patients treated in ICU H. Adam Malik General Hospital Medan. Bivariate analysis in this study was to determine the sensitivity, specificity, negative prediction value and positive prediction value based on the Chi Square test using a 2 x 2 table and expected count >5

RESULTS

Table 1

Characteristics	Die N = 71 (57.7%)	Life N = 52 (42.3%)	Total N = 123
Age, n(%)			
18 – 25 years	8 (11,3)	2(3,8)	10 (8,1)
26 – 35 years	18 (25.4)	12 (23.1)	30 (24.4)
36 – 45 years	13 (18.3)	15 (28.8)	28 (22.8)
46 – 55 years	14 (19,7)	11 (21.2)	25 (20.3)
56 – 65 years	10 (14,1)	7(13,5)	17 (13,8)
> 65 years	8 (11,3)	5(9,6)	13 (10,6)
Gender, n(%)			
Man	33 (46.5)	17(32,7)	50(40.7)
Woman	38(53.5)	35 (67.3)	73(59.3)
Length of stay, mean±SD	13±6,9	13±7,4	13±7,1
Source of Infection			
Pneumonia	40 (56.3)	36 (69.2)	76 (61.8)
Urinary tract infection	24 (33.8)	14 (26.9)	38 (30.9)
Intra-abdominal infection	7 (9,9)	2(3,8)	9 (7,3)
Comorbid			

Diabetes mellitus	20 (28.1)	12 (23)	32 (26)
Hypertension	16 (22.5)	8(15,4)	24(19.5)
Malignancy	8 (11,3)	2(3,8)	10 (8,1)
Ischemic Stroke	7(9,8)	2(3,8)	9 (7,3)
There is no	7 (9,8)	13 (25)	20 (16.3)
Chronic Kidney Disease	5 (7)	8(15,3)	9 (7,3)
Congestive heart failure	4 (5,6)	3 (5,7)	7(5,6)
Deep Vein Thrombosis	2(2,8)	1(1,9)	3(2,4)
myocardial infarction	2(2,8)	3(5,7)	3 (2,4)

Based on the analysis in this study around 57.7% of sepsis patients died and 42.3% lived. Based on the characteristics of the age group, the most inpatients with sepsis were aged 26-35 years, around 25.4% in the group with sepsis who died and 23.1% in the group with sepsis who lived.

Based on gender, the majority in this study were women in the dead (53.5%) and living (67.3%) groups. The average length of stay in the ICU for sepsis patients is around 13±7,1. In terms of the source of infection, the most common cause of sepsis in this study was Pneumonia, which was around 61.8%. Based on the presence or absence of comorbid sepsis patients in this study, around 16.3% of sepsis patients without comorbidities and the most comorbid suffered from sepsis patients in this study were diabetes mellitus (26%), hypertension (19.5%) and malignancy (8.1%). %).

Table 2

Variable	**Die**	**Life**	**Total**
SOFA score			
Means±SD	11,3±1.81	7,9±1.91	9,9±2,5
Median	12	8	10
APACHE 2			
Means±SD	14.0±3.0	10,9±3,2	12,7±3,4
Median	14	12	13

Determination of cut off or cut off points for SOFA and APACHE II scores in predicting mortality in this study used the median value which can be seen in table 4.2. Overall, the mean SOFA score of sepsis patients was 9.9±2.5 (SD) with a median value of 10. In the death group the mean SOFA score was around 11.3±1.81 and a median of about 12 which was higher in the dead group than the living group (mean = 7.9±1.91; median = 8).

Based on the mean and median APACHE II score of around 12.7±3.4 and a median of 13. In sepsis patients who died the mean value was around 14.0±3.0 and the median is 14. Meanwhile in the living group the mean value is 10.9±3,2 and median 12. Based on this analysis it appears that the mean and median APACHE II scores were higher in the dead group than in the living group

Table 3

*cut off*SOFA score	Die	Life	Total
≤10	54	9	63
> 10	17	43	60
Total	71	52	123

The point of intersection of the SOFA scores in this study was 10, which was obtained from the median value. Determination of specificity sensitivity, Positive Prediction Value (PPV) and Negative prediction Value (NPV) in a 2 x 2 table uses the following formula:

- Sensitivity : a/(a+c) = 54/(54+17) = 0.76 x 100% = 76%
- Specificity : d/(b+d) = 43/(9+43) = 0.82 x 100% = 82%
- *Positive Predictive Value*(PPV) : b/(a+b) = 9/(54+9) = 0.143 x 100% = 14.3%
- *Negative Prediction Value*(NPV) : c/(c+d) = 17/(17+43) x 100% = 0.283 x 100% = 28.3%

Table 4

cut off APACHE II score	Die	Life	Total
≤13	50	21	71
> 13	21	31	52
Total	71	52	123

The APACHE II score cut point in this study was 13 which was obtained from the median value. Determination of specificity sensitivity, Positive Prediction Value (PPV) and Negative prediction Value (NPV) in a 2 x 2 table uses the following formula:

- Sensitivity : a/(a+c) = 50/(50+21) = 0.704 x 100% = 70.4%
- Specificity : d/(b+d) = 31/(21+31) = 0.596 x 100% = 59.6 %
- *Positive Predictive Value*(PPV) : b/(a+b) = 21/(50+21) = 0.296 x 100% = 29.6 %
- *Negative Prediction Value*(NPV) : c/(c+d) = 21/(21+31) x 100% = 0.404 x 100% = 40.4%

Table 5

Variable	*cut off*	Dead	Life	Sens	Spes	PPV	NPV
SOFA score	>10	54	9	76,1	82.7	14,3	28,3
	<10	17	43				
APACHE II	>13	50	21	70,4	59,6	29,6	40,4
	<13	21	31				

In this study the SOFA score had a sensitivity and specificity of 76.1% and 82.7% in predicting mortality in sepsis patients in the ICU while APACHE II had a sensitivity of 70.4% and a specificity of 59.6%. The results of this study indicate that the SOFA score has a higher sensitivity and specificity in predicting mortality than the APACHE II score.

Conclusion

From the results of the research conducted, it was concluded:

Mortality prediction using the SOFA score is superior to the APACHE II score which can be seen from the sensitivity and specificity values of the SOFA score which are higher than the APACHE II score. Characteristically, the most age who died from sepsis was in the 25-35 years group, the most sex was female and had a mean length of stay (LOS) of 13 days. The mortality of sepsis patients in the ICU is around 57.7% with the most common cause of sepsis being pneumonia 61.8% and the most comorbid being diabetes mellitus (26%). Determination of the cut-off value in diagnostic enforcement was determined by using the median value where the SOFA score median was 10 while APACHE II was 13. The sensitivity and specificity of the SOFA score in predicting mortality in sepsis patients in this study were around 76.1% and 82, respectively.

Suggestion

It is hoped that future research can conduct studies with a larger sample size and consider prospective cohort studies to address the causes of mortality in sepsis patients in the ICU. The sofa score has advantages and the ability to detect organ failure for both septic and non-septic patients. In addition, in this study the sofa score also has advantages in predicting mortality with high sensitivity and specificity, so it is very important to use the sofa score in the ICU to be able to predict mortality for sufferers. sepsis. Meanwhile, the sofa score has high sensitivity and specificity in predicting mortality in sepsis patients, so it is recommended to monitor the daily SOFA score in the ICU.

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