

## Original Research Article

## INITIAL SOFA SCORE AND MORTALITY OF SEPSIS PATIENTS IN THE INTENSIVE CARE UNIT OF HAJI ADAM MALIK HOSPITAL MEDAN: DOES IT CORRELATE?

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## ABSTRACT

**Introduction:** Sepsis is a life-threatening organ dysfunction or failure that is the primary cause of death in infectious disease. the Sepsis-3 Task Force recommends The Sequential (Sepsis-Related) Organ Failure Assessment (SOFA) Score as a means of Sepsis identification. **Objective:** To determine the correlation between sepsis patients' deaths in the intensive care unit (ICU) of Haji Adam Malik Hospital Medan and their initial SOFA score. **Materials and Methods:** This study uses a cross-sectional study design and an observational analytical investigation. The sample for this study was sepsis patients who were treated in the ICU of Haji Adam Malik Hospital Medan in 2021-2022, and they were selected using the purposive sampling method. After calculating the Slovin formula, 61 samples are required. The researchers obtained the data from patient medical records. The analyses used are univariate and bivariate, with the Independent-T test and Fisher's exact. **Results:** From 71 patients, there were 36 patients (50.7%) in the age group of 46-65 years old; 39 patients (54.9%) were male; 50 patients (70.4%) had comorbidities; and 50 patients (70.4%) had non-surgical disease. The average initial SOFA score was  $9.89 \pm 3.95$ , with mortality for sepsis patients in the ICU of 74.6%. The findings of the statistical analysis indicated a substantial difference ( $p < 0.001$ ) in the SOFA scores of those who survived and those who did not, as well as a significant correlation ( $p < 0.001$ ) between the initial SOFA score and mortality. **Conclusion:** There is a correlation between initial SOFA score and the mortality of sepsis patients in the ICU of Haji Adam Malik Hospital.

**Keywords:** Intensive Care Unit; Mortality; Organ Dysfunction; Sepsis; SOFA Score

## ABSTRAK

**Pendahuluan:** Sepsis merupakan disfungsi atau kegagalan organ yang mengancam jiwa dan merupakan penyebab utama kematian pada penyakit menular. *The Sequential (Sepsis-Related) Organ Failure Assessment* (SOFA) Score direkomendasikan oleh *The Sepsis-3 Task Force* dalam mengidentifikasi Sepsis. **Tujuan:** Mengetahui hubungan antara pasien sepsis yang meninggal di ruang rawat intensif RSUP Haji Adam Malik Medan dengan Skor SOFA pada awal masuk. **Bahan dan Metode:** Penelitian ini menggunakan design study *cross-sectional* dan merupakan penelitian analitik observasional. Sampel penelitian ini adalah pasien sepsis yang dirawat di ruang rawat intensif RSUP Haji Adam Malik Medan tahun 2021-2022 dan dipilih menggunakan metode *purposive sampling*. Setelah dihitung dengan rumus Slovin, jumlah sampel yang dibutuhkan sebanyak 61 sampel. Data yang digunakan berasal dari rekam medis pasien. Analisis yang digunakan adalah analisis univariat dan bivariat dengan uji T-Independen dan *Fisher's Exact*. **Hasil:** Dari 71 pasien, didapatkan 36 pasien (50,7%) berusia 46-65 tahun, 39 pasien (54,9%) laki-laki, 50 pasien (70,4%) dengan komorbid, dan 50 pasien (70,4%) mempunyai kasus penyakit non-bedah. Rerata skor SOFA awal pasien adalah  $9,89 \pm 3,95$ , dengan mortalitas pasien sepsis di ruang rawat intensif sebesar 74,6%. Hasil analisis statistik menunjukkan perbedaan yang signifikan antara skor SOFA pasien yang hidup dan yang meninggal ( $p < 0,001$ ), dan terdapat hubungan antara skor SOFA awal dengan mortalitas ( $p < 0,001$ ). **Kesimpulan:** Terdapat hubungan antara skor SOFA pada awal masuk rawat dengan mortalitas pasien sepsis di ruang rawat intensif RSUP Haji Adam Malik Medan.



**Kata kunci:** Unit Perawatan Intensif; Mortalitas; Disfungsi Organ; Sepsis; Skor SOFA

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## INTRODUCTION

A major global health concern, sepsis was responsible for 11 million deaths and 49 million cases globally in 2017, accounting for 20% of all deaths that year. A review from 2020 found that 189 adult cases of sepsis out of every 100,000 people had a mortality rate of 26.7%. The review also highlighted the large number of cases of sepsis in intensive care units, where 58 cases out of every 100,000 people had a mortality rate of 42% (1).

Sepsis is a major contributor to preventable deaths, impacting infectious diseases, injuries, and non-communicable illnesses. Sustainable Development Goal 3's achievement depends on effective progress in sepsis prevention and treatment (2).

The definition of sepsis has evolved, emphasizing organ dysfunction. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) define sepsis as a potentially fatal organ failure or dysfunction brought on by an imbalanced host response to infection. Organ dysfunction is indicated by a  $\geq 2$ -point increase due to infection in the SOFA score. Early diagnosis of moderate organ dysfunction during infection is crucial, with the Sequential Organ Failure Assessment (SOFA) score serving as an objective tool to assess organ failure severity over time. A significant increase in the SOFA score indicates organ failure, correlating with a higher mortality risk (3).

Early detection is critical for sepsis patient prognosis, enabling prompt intervention to reduce mortality rates. Previous research has found a different link between SOFA scores at admission and patient outcomes (4-7). However, more research is needed, especially

at Haji Adam Malik Hospital Medan, to see how well initial SOFA scores are at predicting sepsis patient mortality rates in the intensive care unit.

## MATERIALS AND METHODS

This study uses a cross-sectional study design and an observational analytical investigation. The sepsis patients who were treated in the ICU of Haji Adam Malik Hospital Medan in 2021-2022 were selected using the purposive sampling method (8). After calculating the Slovin formula, 61 samples are required. The patient's medical records were used to collect the data.

Seventy-one patients (aged over eighteen) receiving ICU treatment and receiving a Sepsis-3 diagnosis of sepsis were included in the sample, out of the 158 medical records. Exclusion criteria include medical records that did not meet the SOFA scoring requirements.

The data collected include the patient's age, gender, comorbidities, disease case, initial SOFA score, and mortality status. The data were analyzed using Statistical Program for Social Sciences (SPSS) v27.0 software to conduct univariate and bivariate. Univariate analysis shows the frequency and percentage of the variables. The mean difference between the initial SOFA score of the patients who survived and the ones who died was determined using the independent T-test following the completion of the Kolmogorov-Smirnov/Shapiro-Wilk test to determine the data's normality.

A Fisher's Exact test was performed to determine the relationship between the initial SOFA score and mortality. The Commission of Ethics, Faculty of Medicine, Universitas



Sumatera Utara, granted ethical clearance for this study (656/KEPK/USU/2023).

## RESULT AND DISCUSSION

There were 71 sepsis patients in all who satisfied the inclusion requirements. The distribution of patient characteristics is shown in [Table 1](#). The results revealed that there were more male patients than female patients, with a total number of male patients of 39 (54.9%) and 32 female patients (45.1%). This study shows the same result as the cohort study conducted by Ko et al ([9](#)). The study revealed that sepsis incidence was higher in males (56.7%) than females (43.3%) ([9](#)). Another study conducted by Kabi et al. ([10](#)) also revealed that the incidence of septicaemia in males was higher than in females (62% vs. 38%).

**Table 1.** Patients' Characteristics Distribution

Variable	Description	
	Group	N (%)
Gender	Male	39 (54.9)
	Female	32 (45.1)
Age	≤25	12 (16.9)
	25-45	8 (11.3)
	46-65	36 (50.7)
	>65	15 (21.1)
Comorbidities	With Comorbidities	50 (70.4)
	Without Comorbidities	21 (29.6)
Disease Case	Surgical	21 (29.6)
	Non-surgical	50 (70.4)
Mortality	Died	53 (74.6)
	Survived	18 (25.4)

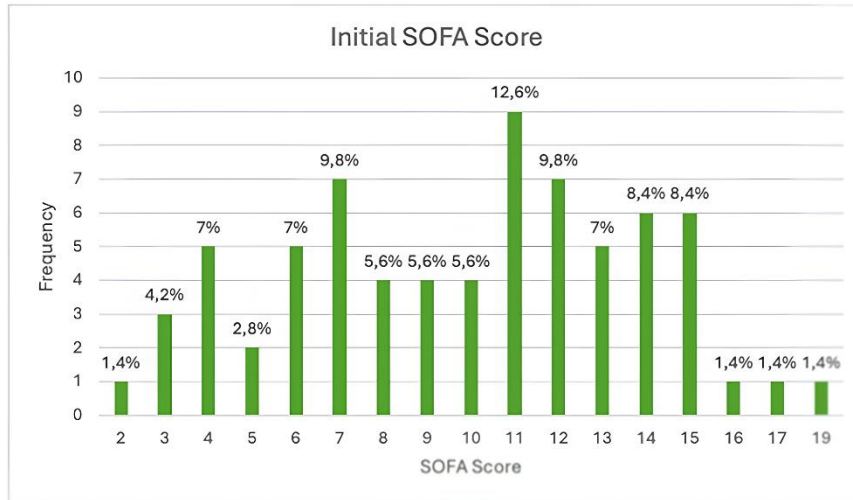
The underlying reasons for the higher incidence of sepsis in men remain unclear, but some studies suggest that hypotheses include physiological characteristics that contribute to differences in vulnerability to infection, a higher propensity for infections to escalate from mild to serious, and disparities in sepsis treatment between genders. Other factors, such

as smoking and alcohol consumption, may also affect the chance of coming into contact with infectious diseases in the environment ([11](#)).

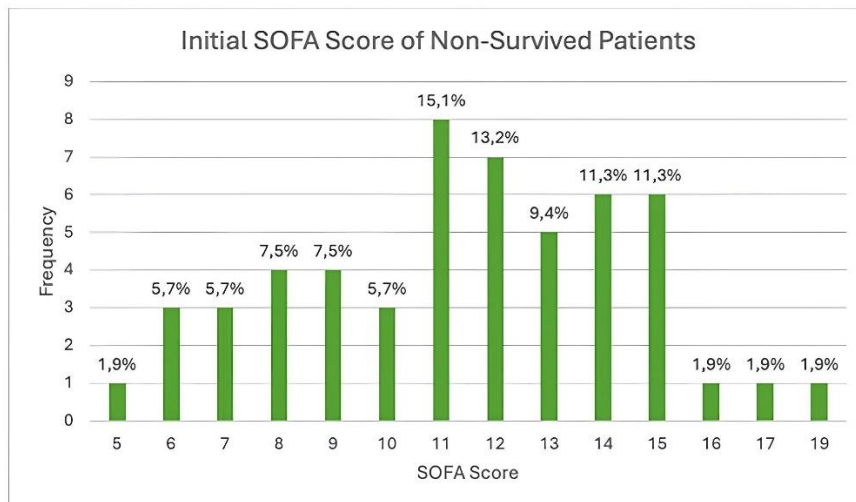
There were 36 patients (50.7%) in the age group of 46-65 years old in this study. These findings are consistent with a study carried out by Kartika et al. ([12](#)), which states that most sepsis patients (40%) are in the age range of 45-65 years.

In this study, sepsis patients with comorbidities (70.4%) were found to be more than patients without comorbidities (29.6%). These findings are consistent with the study carried out by Sinapidis et al. ([13](#)) which stated that comorbidities increase the risk of progression of infection to sepsis. Based on the disease case, we found that the proportion on non-surgical sepsis cases (70.4%) was higher than that of surgical sepsis cases (29.6%). The results obtained are different from the research conducted by Mewes et al ([14](#)) which found more surgical sepsis patients than non-surgical sepsis. Variations in sample size and sampling site may account for discrepancies in the study's findings. In this study, the number of sepsis patients who died in the intensive care unit was 53 patients (74.6%), and 18 patients survived (25.4%).

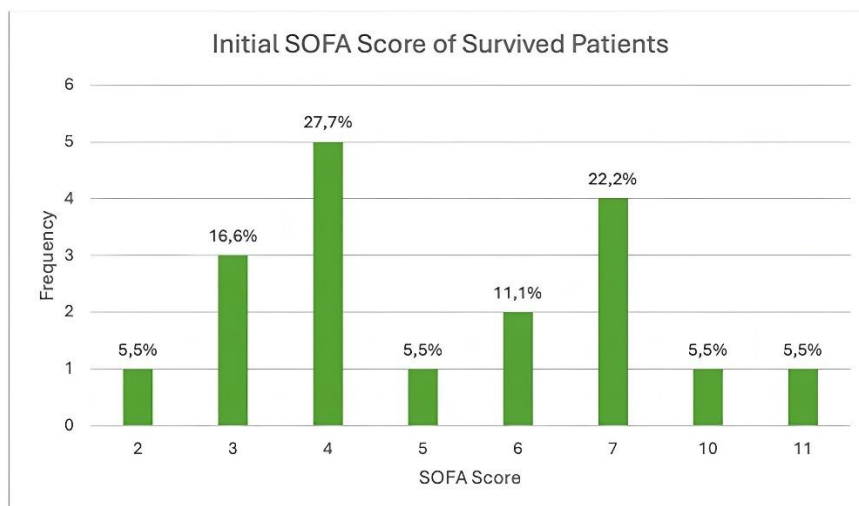
[Figure 1](#) displays the distribution of patients' initial SOFA score, [Figure 2](#) displays the initial SOFA score of patients who did not survive, and [Figure 3](#) displays the initial SOFA score of patients who survived. In this study, 9 patients, or 12.6% of the total, had the highest initial SOFA score of 11, with a mean score of 9.89 to 3.95. The initial SOFA score of patients who died was highest with a score of 11, namely 8 patients (15.1%), while the initial SOFA score of patients who survived was highest with a score of 4, namely 5 patients (27.7%).



**Figure 1.** Initial SOFA Score



**Figure 2.** Initial SOFA Score of Non-Survived Patients



**Figure 3.** Initial SOFA Score of Survived Patients

An independent-T test was conducted to determine the mean difference between the initial SOFA scores of patients who lived and those who died, as shown in [Table 2](#).

**Table 2.** Initial SOFA Score Comparison

Initial SOFA Score	N (%)	Mean	SD	p-value
Died	53 (74.6)	11.42	3.12	< 0.001*
Survived	18 (25.4)	5.39	2.45	
Total	71 (100)	9.89	3.95	

\* Independent-T Test (unpaired, normal distribution)

The result showed that the mean initial SOFA score of the patient who died ( $11.42 \pm 3.12$ ) was higher than those who survived ( $5.39 \pm 2.45$ ). The results showed a significant difference between the two groups ( $p < 0.001$ ). These results are similar to the research conducted by Kartika et al. (12) in the intensive care unit at Dr. Saiful Anwar Hospital Malang, which stated that the mean SOFA score of patients who died ( $8.63 \pm 3.55$ ) was significantly higher than patients who lived ( $5.47 \pm 3.11$ ).

**Table 3.** Correlation Between Initial SOFA Score and Mortality

Initial SOFA Score	Mortality		p-Value
	Died N (%)	Survived N (%)	
< 7	4 (5.6)	12 (16.9)	< 0.001*
$\geq 7$	49 (69)	6 (8.5)	
Total	53 (74.6)	18 (25.8)	

\* Fisher's Exact test

The correlation between the initial SOFA score and mortality is shown in [Table 3](#). Considering the study's results, it is known that patients with an initial SOFA score  $\geq 7$  have a mortality rate of 69%, which is higher than patients with an initial SOFA score  $< 7$ , which is 5.6%. An analysis of the correlation between

sepsis patients' deaths in the intensive care unit (ICU) and their initial SOFA score was measured using the Fisher's Exact test, and  $p < 0.001$  was obtained. The outcomes show the significance of the relationship between the two variables.

The results of this study are in line with the research conducted by Kartika et al. (12) in the intensive care unit of Dr. Saiful Anwar Hospital Malang. They found a link between the patient's SOFA score when they were admitted and their death in the intensive care unit ( $p < 0.05$ ). Patients with SOFA scores  $\geq 7$  had a higher death rate than patients with SOFA scores  $< 7$ , which was 35.8%. These results are also in line with the research conducted by Iskandar and Siska (5), which stated that patients with SOFA scores  $\geq 7$  have a 3.8-fold greater chance of dying compared to patients who have SOFA scores  $< 7$ .

Sepsis is a result of the host's response to infection aimed at eliminating the pathogen. An unbalanced inflammatory response is the primary cause of sepsis pathogenesis, and it manifests itself throughout the sepsis course (15). Oxygenation disorders caused by vasodilation, microvascular thrombosis, and mitochondrial damage will lead to reduced oxygen delivery in sepsis, which will then cause septic shock and multiple organ dysfunction syndrome (16). Higher SOFA scores in patients who experience mortality indicate a higher level of organ dysfunction in patients and are related to a higher chance of mortality (3).

Thakur et al. (6) mentioned that the SOFA score system is a useful technique for predicting mortality and morbidity in patients suffering from sepsis, and the correlation of early SOFA with mortality showed significant results. The study also stated that the SOFA score on day 2 (SOFA score at 48 hours) was a better predictor of 30-day mortality. However,

this study did not analyze the correlation between mortality and serial SOFA score, which is a limitation of this study.

In future studies, a serial SOFA score and cut-off measurement will be needed to provide a more detailed picture of the correlation between SOFA scores and mortality in sepsis patients in the ICU of Haji Adam Malik Hospital Medan.

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## CONCLUSION

The results showed a significant difference between the SOFA scores of patients who lived and those who died, and there was a correlation between the initial SOFA score and mortality in the ICU of Haji Adam Malik Hospital Medan.

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## Conflict of Interest

The authors declare no conflict of interest.

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## Author's Contributions

All authors have contributed to all processes in this research.

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