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Performance of SOFA Score in Patients with Sepsis and Related Syndromes Admitted to Medical ICU

Authors
Sri Sai Venkata Haritha Putrevu[1], Satish Sreenivas.P[2] , Tirumala Rao M.V.V[3], Vagdevi.K[4], Hanok Hruday Mohan.Y[5], Deepthi.M[6]

Abstract

Introduction: *Sepsis with multi organ dysfunction syndrome (MODS) is a common cause of Intensive Care Unit mortality and morbidity. Scoring systems helps to quantify the disease severity probability of mortality in hospital. But, this study focuses mainly on Sequential Organ Failure Assessment (SOFA) score.*

Patients and Methods: *50 patients admitted with a diagnosis of Sepsis were included in the study.*

Results: *Among 50 patients, 18 patients died and 32 patients survived.various parameters of SOFA score were assessed among survivors and Non- survivors.*

Conclusion: *Daily measurement of SOFA score during first week is useful tool in predicting the outcome. The trend of SOFA score was progressively declining in survivors while non-survivors had stable higher score during thefirst week.*

Introduction

Sepsis with multi organ dysfunction syndrome (MODS) is a common cause of Intensive Care Unit mortality and morbidity.[1] The primary cause; infectious or non infectious, triggers an uncontrollable inflammatory response. Sepsis can be reversed, but as sepsis progresses to severe sepsis and septic shock the mortality rate substantially increases.[2] Multi organ dysfunction syndrome is well established as the final stage of the continuum.[3] Due to the high mortality associated with sepsis and its complications it is necessary to rapidly diagnose and treat the underlying cause.

Various clinical, biochemical and haematological parameters in septic patients serve as the indicators of organ dysfunction and hence, can be used to define the prognosis in a patient with sepsis.

When a patient is admitted in ICU, the aetiology is usually not established. The intensivists have very little data to treat such patients in the first 24 to 48 hours which are crucial in reversing the process of sepsis and multi organ dysfunction. There are many scoring systems which are helpful in prognosticating the severity and outcome.

Scoring systems helps to quantify the disease severity and probability of mortality in hospital. It also guides the physician regarding the patient prognosis. There are many scores available at present. But, this study focuses mainly on Sequential Organ Failure Assessment (SOFA) score.

Patients and Methods

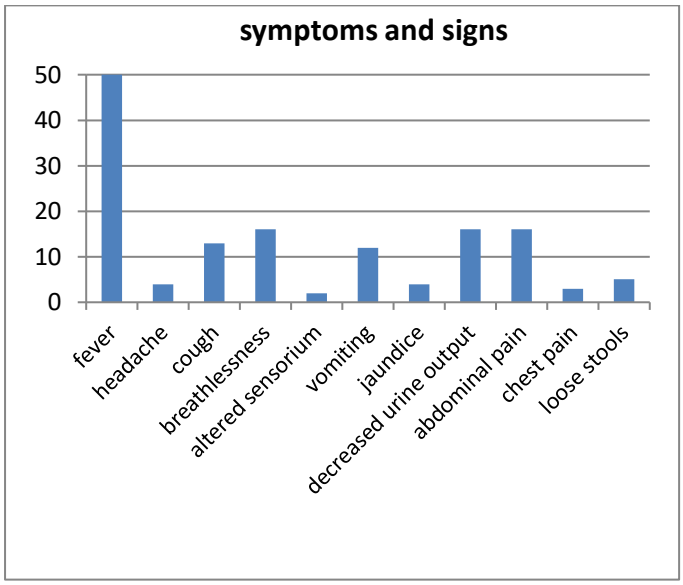
The study was carried from December 2017 to August 2019 and 50 patients were included in the study. The patients satisfying criteria according to American College of Chest Physicians/Society of Critical Care Medicine (ACCP/SCCM) Consensus Committee in 1992 were included in the study. The

predicted mortality rate was calculated by SOFA score on the day of admission, till last day for prognostication.

Analysis was done between survivor group and non-survivor group.

Results

Graph 1: various presenting complaints among the patients



In this study, fever is present in all 50 patients. Breathlessness was observed in 16 patients. Decreased urine output was seen in 16 patients. Pain abdomen was observed in 16 patients.

Respiratory system involvement is seen in 30 patients(i.e, 60%) and central nervous system involvement in 17 patients (i.e, 34%).

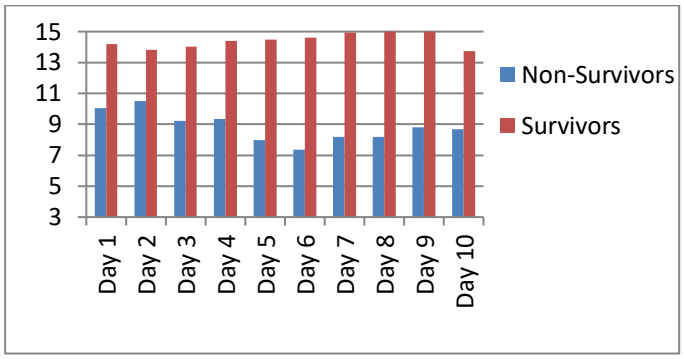
Among 50 patients, 8 patients were positive for malaria, 9 patients were positive for dengue ,2 patients were positive for leptospirosis was. 4 patients had UTI, of which 3 were caused by Eschieria coli, and in 1 case it is due to klebsiella species. Among 50 patients , 17 patients had lower lobe pneumonia but Sputum culture revealed Streptococcus pneumonia species in only 1 patient. 1 patient was identified to have H1N1.

Table 1: division of sample into survivors and non-survivors

Mortality	Number of patients	%
Non- survived	18	36.0
Survived	32	64.0
Total	50	100.0

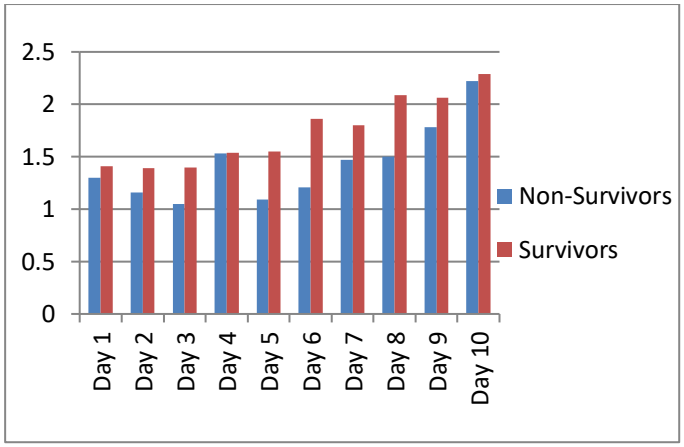
Evaluation of various parameters of SOFA score among survivors and non-survivors

Graph 2: GCS among Non-survivors and survivors

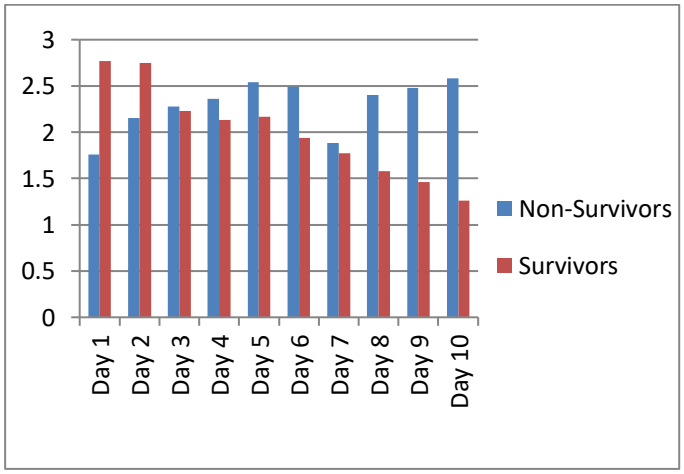


GCS was statistically high in case of survivors as compared to non-survivors on all days.

Graph 3: Platelet count among Non-survivors and survivors

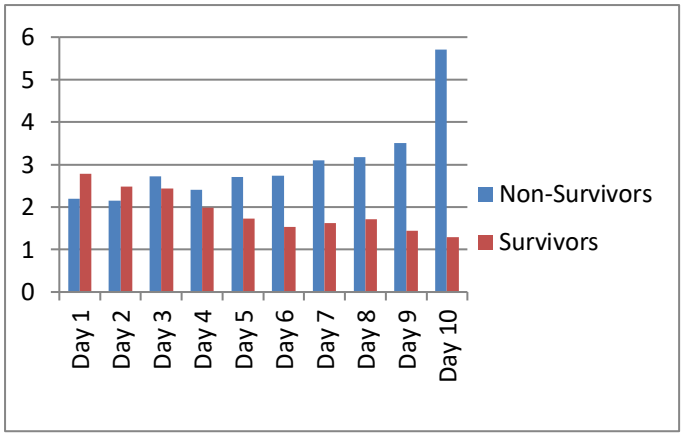


Graph 4: Serum creatine amon Non-survivors and Survivors



Out of 50 patients studied, there was no statistical difference between survivors and non survivors on serum creatinine value.

Graph 5: Serum bilirubin among non-survivors and survivors



Out of 50 patients studied, there was no statistical difference between survivors and non survivors with respect to serum bilirubin value.

Table 2: Evaluation of ventilator support, dialysis and ionotropic support and duration of ICU stay

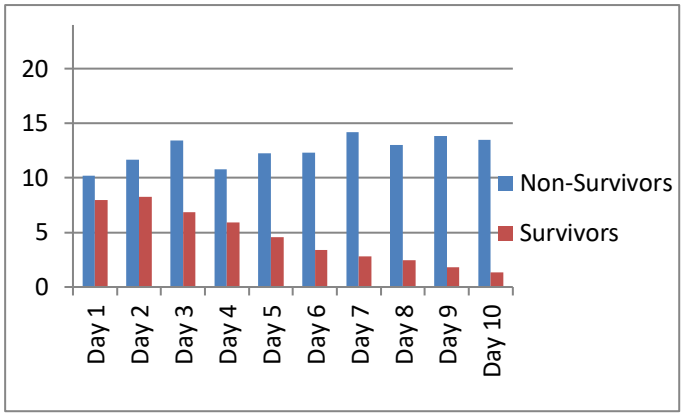
	Non-Survived (n = 18)	Survived (n=32)	P value
Ventilator support	16(88.9%)	14(43.8%)	0.002
Dialysis	2(11.1%)	8(25.0%)	0.295
Ionotropic Support	13(72.2%)	15(46.9%)	0.083
Duration of ICU stay	3.72+3.08	3.75+2.02	0.969

16 out of 18(88.9%) among non survivors required ventilator support whereas14 out of 32(43.8%) among survivors required ventilator support suggesting significant respiratory system involvement among non survivors (p=0.002). The mean duration of ICU stay did not vary between non-survivors and survivors (3.72 v/s 3.75).

13 out of 18 (72.2%) among non-survivors required inotropic support whereas 15 out of 32(46.9%) among survivors required inotropic support suggesting statistically significant hypotension among non-survivors (p=0.083). However, dialysis was required more among survivors than non-survivors (25% v/s 11.1%, p=0.295) but was not statistically very significant.

Serum creatinine among survivors who underwent dialysis varied between 6mg/dl to 10 mg/dl.

Graph 6: Evaluation of SOFA score among Non-survivors and Survivors



Out of 50 patients studied, SOFA score was significantly low especially on day 3 (6.84±2.96) in survivor group as compared to non survivor group whose mean day 3 value being (13.42±4.060).

Discussion

Respiratory system involvement is seen in 9 non-survivors and 21 survivors which was not significant statistically with p=0.279. According to Samir Desai, JD Laknahni et al study the most common organ involved was lung on the day of admission[4]. Central nervous system involvement is seen in 10 non-survivors and 7 survivors which is having statistical significance with p=0.01, which has a significant impact over the mortality rate.

All 50 patients had temperature above 100^0 F and pulse rate above 100 beats per minute. Out of 50 patients, 20 patients had BP less than 90/60. The nonsurvivors had a higher mean pulse rate of 123.44 than that of the survivor i.e 117.63 which is significant statistically with p=0.033. Lower blood pressure and greater requirement for inotropes was noticed among non-survivors compared to that of survivors. In this study, 72.2% mortality was observed among septic shock patients.

According to Studies, Glasgow coma scale at the time of admission is an independent predictor of mortality.[5] In this study, higher mean Glassgow coma scale was observed among survivors compared to non survivors on all days (day1,14.19 v/s 10.19) which was statistically very significant (p<0.001). According to Samir Desai, JD Lakhani et al, mean GCS on day 1 was 11 for non-survivor

group and 9.46 for survivor group which was not statistically significant.[4]

But mean GCS after day 3 was 5.3 for non survivor group and 15 for survivor group which is statistically significant giving a conclusion that persistent of altered sensorium after day 3 would be an alarming sign for treating physician.

In this study, there was no statistical significance regarding the mean serum creatinine among non-survivors and survivors on day 1 and also on initial few days (day1, 1.76 v/s 2.77, p=0.101). Even mean serum bilirubin was significantly different among survivors and non-survivors (day 1, 2.19 v/s 2.78, p=0.375).

In this study, ventillatory support was required by 16 out of 18(88.9%) among non-survivors whereas 14 out of 32(43.8%) among survivors required ventilator support suggesting significant respiratory system involvement among non-survivors (p=0.002).

In this study, ionotropic support was required by 13 patients out of 18 (72.2%) among non-survivors whereas 15 patients out of 32(46.9%) among survivors required inotropic support suggesting statistically significant hypotension among nonsurvivors (p=0.083).

2 out of 18(11.1%) among non-survivors required dialysis where as 8 out of 32(25%) required dialysis. Dialysis was required more among survivors than nonsurvivors but was not statistically very significant with p=0.295.

The mean duration of ICU stay did not vary between non survivors and survivors (3.72 v/s 3.75). It may be attributable to early death among non-survivors and early recovery among survivors.

According to Samir Desai, JD Lakhani et al study, the average length of hospital stay among survivers is 14.65 days of which 8.31 days were with in ICU[4]. Where as, the total hospital stay in non-survivors is 5.63 days most of which is in ICU, which meant that sepsis is a fatal disease and requires prolonged hospital stay and aggressive critical care management. SOFA score was validated for prognostification. In this study, SOFA score evaluation was done from day 1 till last day.

The SOFA score on day 1 was high among non survivors and low among survivors which was statistically significant (10.17 v/s 7.94, p=0.014). The most significant difference was observed on day 3. It was very high among non-survivors as compared to survivors which was statistically very significant (13.42 v/s 6.84, p <0.001). This was similar to many studies that have been done.

Vosylius et al., in their study showed that in patients with sepsis, severity of organ dysfunction was closely related to the outcome of patients admitted to medical ICU[6]. Better SOFA score on day 3 compared to that of day 1 was considered as the tool for predicting the outcome.

Vincent et al., in their study, in 40 ICU's in 16 countries showed that 44% of the non- survivors showed increase in the total SOFA score but it was only 20% of survivors who showed increase in SOFA score.[7]

Saulius Vosylius, Jurate Sipylaite in Vilnius, Lithuania observed that day 1 and day 3 SOFA score was significantly higher among non-survivors compared to that of survivors.

According to, Flavi Lopez Fereria; Daliana Peres Bota in Belgium early SOFA score less than 9 has a predicted mortality rate less than 33%, where as early SOFA score greater than 11 has a predicted mortality rate of 95%.[8]

The trend of sofa score was progressively declined in survivors while nonsurvivors had stable, higher or increasing SOFA score during first week.

According to Samir Desai , JD Lakhani : Day 3 SOFA score less than 9 had greater chances of survival, where as score more than 9 had greater chances of negative outcome. According to their study SOFA score greater than 9 has mortality rate 79.17% where as score less than or equal to 9 has mortality rate 8.70%.[4]

Studies have shown that in the SOFA scores; CVS, CNS, respiratory, renal, haematological and hepatic dysfunctions were independent risk factors for mortality.

In this study, also respiratory, cardiovascular and neurological variables helped in individual prognostication.. However, in this study renal and

hepatic parameters did not vary much among non survivors and survivors.

Limitations of the Study

- With a sample size of 50 patients this model requires external validation.
- The time of admission to ICU for each patient is different. Lead time bias is possible.
- Nosocomial complications and socio economic constraints are difficult to model in studies.
- History of prior antibiotic usage could not be ascertained by history.

Conclusion

Daily measurement of SOFA score during first week is useful tool in predicting the outcome. The trend of SOFA score was progressively declining in survivors while non-survivors had stable higher score during thefirst week.

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