Comparative analysis of SOFA and QSOFA in patient presenting with suspected infection to Emergency department-Prospective Observational study

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Abstract

Sepsis is redefined as a life-threatening organ dysfunction caused by a dysregulated host response to infection. The members of the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) proposed scoring system QSOFA (quick Sequential Organ Failure Assessment) score using simple clinical criteria-to potentially assist bedside assessment in identifying, among patients with infection, likely to develop sepsis.

The identification of these patients with possible sepsis is important in ED because timely recognition and appropriate, effective treatment will substantially improve patient's survival.

Earlier screening tools had variation in diagnostic accuracy and poor predictive value.ED physicians had to rely on clinical judgment supported by clinical criteria which were earlier validated to identify sepsis among patients with infection. Now the treatment standards have changed from early goal directed therapy to bundle care -one hour bundle (culture, antibiotic, lactate measurement, fluid resuscitation and vasopressin support). Sepsis induced organ dysfunction can be identified by an increase in the SOFA score of at least 2 points or qSOFA which will help ED physicians to more rapidly identify patients with sepsis and appropriate timely treatment.

Keywords: NIL

Introduction

Sepsis is redefined as a life-threatening organ dysfunction caused by a dysregulated host response to infection.[1]Sepsis is a significant burden of disease accounting to an annual global incidence at 31.5 million cases, with 19.4 million cases of severe sepsis, resulting in 5.3 million deaths.[2] It is also observed that survival following sepsis associated with long-term physical, cognitive, and psychosocial morbidity, and an increased mortality rate up to 2years after an event. The members of the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3) proposed scoring system QSOFA (quick Sequential Organ Failure Assessment) score using simple clinical criteria-to potentially assist bedside assessment in identifying, among patients with infection, likely to develop sepsis.[3]

Numerous studies compared these newer scoring systems to previous sepsis criteria in ICU, which proved newer scoring systems performing better . As there were only limited studies available comparing SOFA and QSOFA as prognostic marker in

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Emergency Department ,this study was undertaken in our ED

QSOFA:

The Quick SOFA Score (quickSOFA or qSOFA) was introduced by the 2016 SCCM/ ESICM task force, a simplified version of the SOFA Score as an bedside assessment score outside the ICU as a way to early identification of patients at risk for poor outcome due to sepsis.[4]

Assessment	qSOFA score
Low blood pressure (SBP ≤ 100 mmHg)	1
High respiratory rate (≥ 22 breaths/min)	1
Altered mentation (GCS < 15)	1

The qSOFA score is easy to calculate since it only has three components, each of which are readily identifiable at the bedside and are allocated one point. The presence of 2 or more qSOFA points near the onset of infection was associated with a greater risk of death or prolonged intensive care unit stay.

SOFA / Sequential organ failure assessment score:

The score is based on six different scores, one each for the respiratory, cardiovascular, hepatic, coagulation, renal and neurological system. The SOFA score has been endorsed by the Society of Critical Care Medicine (SCCM) and the European Society of Intensive Care Medicine (ESICM) as a tool to facilitate the identification of patients at risk of dying from sepsis[1,2,6]

Organ system Measurement	SOFA SCORE				
	0	1	2	3	4
Respiration PaO2/FiO2 MmHg	Normal	<400	<300	<200 With respiratory support	<100 With respiratory support
Cardiovascular Hypotension	Normal	MAP<70 mmHg	Dopamine <5 or Dobutamine (any dose)	Dopamine >5 or epinephrine <0.1 or norepinephrine <0.1	Dopamine >15 or epinephrine >0.1 or norepinephrine>0.1
Coagulation Platelets x103/mm3	Normal	<150	<100	<50	<20
Liver Bilirubin mg/dl	Normal	1.2-1.9	2.0-5.9	6.0-11.9	>12

Central nervous system Glasgow coma score	Normal	13-14	10-12	6-9	<6
Renal Creatinine mg/dl (or) Urine output	Normal	1.2-1.9	2.0-3.4	3.5-4.9 <500ml/day	>5 <200ml/day

Sepsis – Sepsis is now defined as life-threatening organ dysfunction caused by a dysregulated host response to infection. As an organ dysfunction score, SOFA can be used to identify those whose organ dysfunction is "life-threatening" such that an increase in the SOFA score ≥2 is associated with a mortality of ≥10 percent.

Septic shock – Patients with a SOFA score ≥2 who also have a vasopressor requirement and an elevated lactate >2 mmol/L (>18 mg/dL) despite adequate fluid resuscitation have a predicted mortality of 40 percent.

SIRS Criteria

SIRS is a serious condition related to systemic inflammation, organ dysfunction, and organ failure. It is a subset of cytokine storm, in which there is abnormal regulation of various cytokines. SIRS is also closely related to sepsis, in which patients satisfy criteria for SIRS and have a suspected or proven infection.[5]

Finding	Value
Temperature	<36 °C (96.8 °F) or >38 °C (100.4 °F)
Heart rate	>90/min
Respiratory rate	>20/min or $PaCO_2$<32 mmHg (4.3 kPa)
WBC	<4x109/L (<4000/mm³), >12x109/L (>12,000/mm³), or 10% bands

Table 1: Association of Mortality with Age

When two or more of these criteria are met with or without evidence of infection, patients may be diagnosed with "SIRS." [7] Patients with SIRS and acute organ dysfunction may be termed "severe SIRS."[8] SIRS may occur in several conditions related, or not, to infection. Noninfectious conditions classically associated with SIRS include autoimmune disorders, pancreatitis, vasculitis, thromboembolism, burns, or surgery.

Bundle Care

The most important change in the revision of the SSC bundles is that the 3-hr and 6-hr bundles have been combined into a single "hour-1 bundle" with the explicit intention of beginning resuscitation and management immediately.

1. Rapidly administer 30 ml/kg crystalloid for hypotension or lactate ≥ 4 mmol/L.
2. Apply vasopressors if patient is hypotensive during or after fluid resuscitation to maintain MAP ≥ 65 mm Hg
3. Measure lactate level. Re-measure if initial lactate is >2mmol/L.
4. Obtain blood cultures prior to administration of antibiotics.
5. Administer broad-spectrum antibiotics.

Materials And Methods

Study Site :

The study was conducted at Ananthapuri Hospitals and Research Institute, Thiruvananthapuram with approval from Institutional Ethics Committee and Written Informed Consent from all patients who participated in the study.

Inclusion Criteria:

Patients with suspected sepsis.

Patient satisfying atleast two criteria of systemic inflammatory syndrome. Patient aged >18 years

Exclusion Criteria:

Patient aged >80years

Patient on immunosuppressive drugs

Materials And Methods

As per the inclusion and exclusion criteria mentioned above, eighty one Patients presenting to the Emergency department, Ananthapuri hospital & research institute during with symptoms or clinical signs suggesting infection in emergency department was included in the study. Vital signs recorded and relevant laboratory investigations were done .These data were used to calculate SOFA score ,SIRS & QSOFA in ED and patients were followed up in intensive care unit on day 7 (short term ICU stay) and day 14 (long term ICU stay) of admission. Treatment outcome –Primary

Mortality(Survival and Non survival) and secondary-Morbidity in terms of length of ICU stay (less than 7days – short term , more than 7 days – long term) was recorded

Discussion

The study was a prospective observational study aimed at comparing SOFA and Qsofa score as a prognosticative tool in sepsis/ infective patient presenting to our ED.81 patients with signs of infection were included.Patients on immunosuppressive drugs were not included as they were at more risk of developing severe infection and may falsely influence the results.Extremes of age > 80 yr were not included as their age associated mortality may falsely record a higher mortality rate with sepsis Based on age, study population was divided into groups (age <50 and >50) and

association of age with respect to mortality and morbidity was studied. It was inferred that there was no significant difference in terms of mortality and morbidity with age .Association of gender in respect to mortality and morbidity was studied, which showed that gender as an individual factor had no significant influence in mortality and morbidity.With regards to source of infection, Respiratory system was common source of infection followed by Genitourinary and Others (especially skin and soft tissue infection) .Among the culture, Mixed organism was major isolate, followed by kleibseilla and E.coli . Most of the culture results were unavailable either due to early death or poor yield /growth in initial samples.SOFA in terms of predicting mortality had sensitivity 46%, specificity 62% diagnostic accuracy 41%. Qsofa performed better than in predicting mortality with sensitivity 91% but lacked specificity 27%, diagnostic accuracy 80%.In terms of predicting morbidity , SOFA had sensitivity 92%, specificity 33% with diagnostic accuracy 73%. Where as Qsofa had sensitivity 42%, specificity 64% & diagnostic accuracy of only 38%.ROC for SOFA and QSOFA in predicting mortality and morbidity showed no significant difference.Among the cases survived 48, 25% had significant morbidity in terms of prolonged ICU stay. Significant morbidity implies length of ICU stay for more than 7 days .Length of ICU stay - Secondary outcome had significant impact on overall patient survival. When the intensive care stay increases, the risk of hospital acquired infection increases .Also exposure to multiple antibiotics also has an impact in immunity and survival . A number of organism has been isolated from patients in secondary cultures in absence of fever or significant inflammatory response.

Limitation Encountered In This Study Were

1. Sofa score had lab values to interpret and calculate which needed time for the values to be available. So SOFA score was difficult to calculate in ER, as the stay of pt in our is less than an hour. The lab values were collected from patient records in ICU and sofa score was interpreted.
2. When initial ABG was unavailable for calculating PaO2/FiO2, a surrogate SaO2/FiO2 was used to calculate Sofa score.

3. Culture results were unavailable for 58% of patients either due to early mortality within 24-48 hrs or poor yield in initial sample.

4. Patient with initial culture yield poor had significant mortality and morbidity, highlighting the importance of secondary outcome - Length of intensive care stay. In hospital stay, had hospital acquired infection and secondary positive cultures were not considered in this study

Conclusion

The following were noted in our study

1. Sofa is better predictor of morbidity than Qsofa
2. Qsofa performed better than Sofa in predicting mortality
3. Qsofa scoring can be done in ER , as it depends on only clinical assessment criteria.
4. Respiratory infection is most common source of sepsis presenting to our Er

From the study it has been observed that "One hour sepsis bundle " Timely administration of antibiotics within 1st hour can be carried out in Emergency department , in patients of Qsofa >2 as it can be easy and quickly interpreted without waiting for laboratory parameters.

Reference

1. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, Bellomo R, Bernard GR, Chiche JD, Coopersmith CM, Hotchkiss RS. The third international consensus definitions for sepsis and septic shock (Sepsis-3). Jama. 2016 Feb 23;315(8):801-10.

2. Fleischmann C, Scherag A, Adhikari NK, Hartog CS, Tsaganos T, Schlattmann P, Angus DC, Reinhart K. Assessment of global incidence and mortality of hospital-treated sepsis. Current estimates and limitations. American journal of respiratory and critical care medicine. 2016 Feb 1;193(3):259-72.

3. Seymour CW, Liu VX, Iwashyna TJ, Brunkhorst FM, Rea TD, Scherag A, Rubenfeld G, Kahn JM, Shankar-Hari M, Singer M, Deutschman CS. Assessment of clinical criteria for sepsis: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). Jama. 2016 Feb 23;315(8):762-74.

4. Angus DC, Van der Poll T. Severe sepsis and septic shock. New England Journal of Medicine. 2013 Aug 29;369(9):840-51.

5. Dombrovskiy VY, Martin AA, Sunderram J, Paz HL. Rapid increase in hospitalization and mortality rates for severe sepsis in the United States: a trend analysis from 1993 to 2003. Critical care medicine. 2007 May 1;35(5):1244-50.

6. Shankar-Hari M, Phillips GS, Levy ML, Seymour CW, Liu VX, Deutschman CS, Angus DC, Rubenfeld GD, Singer M. Developing a new definition and assessing new clinical criteria for septic shock: for the Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). Jama. 2016 Feb 23;315(8):775-87.

7. Carneiro AH, Póvoa P, Gomes JA. Dear Sepsis-3, we are sorry to say that we don't like you. Revista Brasileira de terapia intensiva. 2017 Jan;29:4-8.

8. Levy MM. Fink M. p., Marshall JC, Abraham E. et. al. 2001 sCCM/EsICM/ACCp/ATs/sIs International sepsis Definitions Conference. Critical Care Med. 2003;31:1250-6.
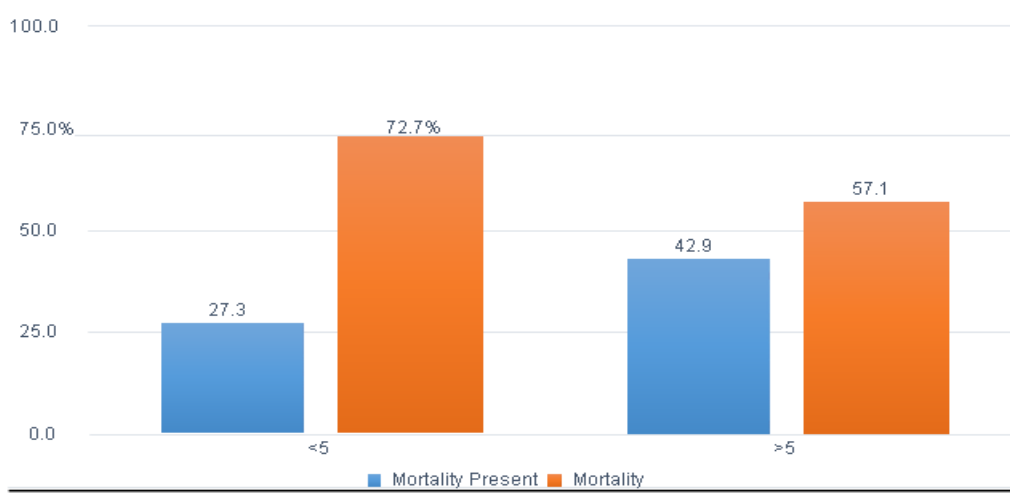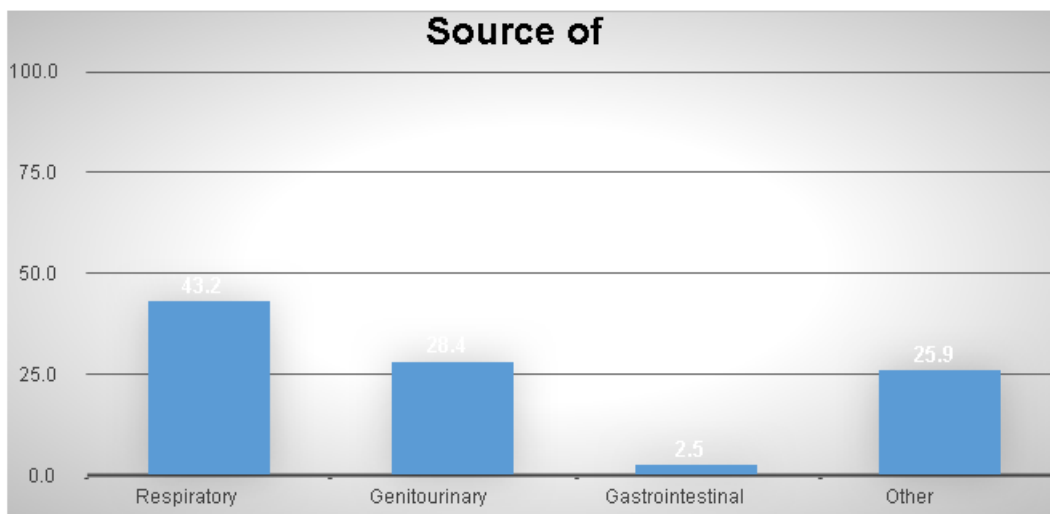
Table 2: Distribution of the Patients in Terms of Source of Infection

Organism	Frequency	Percentage
Mixed	10	12.3%
Klebsiella Pneumoniae	9	11.1%
Escherichia coli	6	7.4%
H1N1 Influenza Virus	3	3.7%
Enterococcus Faecalis	2	2.5%
Pseudomonas	2	2.5%
EBEnterobacter	1	1.2%
Providentia	1	1.2%
Not available	47	58.0%
Total	81	100.0%