# Using qSOFA and SIRS scores in predicting the outcomes of patients with sepsis in Emergency Department of Menoufia University Hospitals

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**Background**
Sepsis is a life-threatening illness in which an infection causes widespread inflammation and organ failure. Quick Sequential Organ Failure Assessment (qSOFA) is a screening tool, which was established by the sepsis-3 task force and depends on respiration rate, systolic blood pressure and altered mental state. The SIRS criteria were too nonspecific to accurately identify cases of systemic inflammation brought on by infection.
**Objective**
To determine the predictive performance of qSOFA, and SIRS scores for adverse outcomes of patients presenting to the Emergency Department of Menoufia University Hospitals with suspected infection.
**Patients and methods**
This comparative research was performed in the Emergency Department of Menoufia University Hospital. The study was conducted to 60 patients presented to the resuscitation room of the Emergency Department with infection from April 2022 to November 2022.
**Results**
There was a statistically significant difference among the examined groups concerning Relation between survival and vital data. There was no statistically significant difference among the examined groups concerning Demographic data (age, sex), comorbidities of the studied patients, Source of infections, cause of sepsis and Outcomes of the studied patients ($n$=60).
**Conclusion**
When it came to identifying cases of sepsis, the qSOFA score was both sensitive and predictive. The qSOFA score was very useful in predicting mortality from both the ER and later on in the hospital.

**Keywords:**
emergency, qSOFA score, sepsis, SIRS score

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## Introduction

Sepsis is characterized by the malfunctioning of several organs due to an unbalanced immune response to infection [1]. Bacteremia combined with sepsis has been linked to a greater mortality rate than sepsis alone [2].

The Surviving Sepsis campaign (created by the Society of Critical Care Medicine (SCCM) and the European Society of Intensive Care) provides management plans; this is because the survival benefit has been associated with prompt identification of sepsis and early administration of antimicrobials [3].

The Systemic Inflammatory response Syndrome (SIRS) is the early reaction of the host to a nonspecific injury that may be infectious, and was first defined in 1992 by the American College of Chest Physicians (ACCP) and the SCCM [4].

In an effort to rationalize blood culture procurement and identify individuals at a greater risk of bacteraemia [5], established a clinical prediction strategy to stratify cases with a likelihood of acquiring bacteraemia coming to the ED in 2008.

Due to its improved predictive accuracy for in-hospital mortality, the fast Sequential (Sepsis Related) qSOFA was launched in 2016 by SEPSIS-3 to identify cases at a high likelihood of death from sepsis coming to the ED [6].

A statewide SEPSIS KILLS route was implemented by the Clinical Excellence Commission (CEC) in all

EDs in 2011. Blood cultures, antibiotics given within an hour of triage, and fluid resuscitation were all part of the bundled treatment that this method encompassed [7].

The SEPSIS-2 definition of sepsis was used as the foundation for the CEC route, with local 'Between the Flags' factors substituted for infection and SIRS criteria [8].

The purpose of this research is to compare the predictive efficacy of the Sequential Organ Failure Assessment (SOFA) and the Sequential Infection Response Scale (SIRS) in identifying cases at risk for infection-related poor outcomes in the emergency department at Menoufia University Hospitals.

## Patients and method

This comparative study performed in the Emergency department of Menoufia University hospital. The study was done over 60 patients triaged to the resuscitation room with sepsis according to inclusion and exclusion criteria from April 2022.

Cases were separated randomly into 2 groups: Group A which is composed of 30 cases were evaluated according to SIRS score criteria and Group B which is consisted of 30 patients will evaluated according to qSOFA score criteria.

This research was approved by the local ethics committee of the Faculty of Medicine, Menoufia University.

### Inclusion criteria

Age>18 years old, both sexes and All patients (Stable and unstable).

### Exclusion criteria

Patients presented to ED with complaints other than infections and Pediatric patients.

### Patients fulfilling the above criteria, after taking an informed consent, were subjected to

History taking, Assessment and management with the ABCDE protocol, Investigation (Laboratory investigations, Blood culture, Arterial blood gases (ABG), 12 lead ECG, Urine analysis and Radiological investigation including eFAST, chest radiograph), SIRS and qSOFA scores were determined in each case individually and The outcome of each patient was recorded.

### Statistical analysis

Data were gathered, tabulated, and statistically analyzed with the use of an IBM compatible personal computer running version 26 of the Statistical Package for the Social Sciences (SPSS) (SPSS Inc. IBM SPSS statistics for windows, Armnok, NY: IBM Corp).

There were two different kinds of statistical analysis carried out: descriptive statistics and analytical statistics (for example).

## Results

The age of group A ranged from 32–86 years with mean±SD of 64.87±12.56 years, while that of group B ranged from 34–80 years with mean±SD of 59.47 ±9.34. Group A included 20(66.6%) males and 10 (33.3%) females. While group B involved 19 (63.3%) males and 11 (36.7%) females. As regard co- morbidities, group A included 15 patients with hypertension, 21 patients with diabetes mellitus and 17 patients with chronic kidney disease (50%, 70% and 56.7%, respectively). While group B included 20 patients with hypertension, 19 patients with diabetes mellitus and 18 patients with chronic kidney disease (66.7%, 63.3% and 60%, respectively). There is no significant difference among the 2 groups regarding age, sex and history of chronic disease (Table 1).

The source of infections among studied patients, which they were in the form of chest infection that show high percentage in qSOFA group, UTI, soft tissue and intra-abdominal infections, and there were a non-

**Table 1 Demographic data (age, sex) and comorbidities of the examined patients (*n*=60)**

| | Group | | T-Test | |
|---|---|---|---|---|
| | Group A | Group B | *t* | *P* value |
| Age (Years) | | | | |
| Range | 32–86 | 34–80 | 1.890 | 0.064 |
| Mean±SD | 64.867±12.555 | 59.467±9.343 | | |
| Chi-Square | *N* (%) | *N* (%) | $X^2$ | *P* value |
| Sex | | | | |
| Male | 20 (66.67) | 19 (63.33) | 0.073 | 0.787 |
| Female | 10 (33.33) | 11 (36.67) | | |
| HTN | | | | |
| Yes | 15 (50.00) | 20 (66.67) | 1.714 | 0.190 |
| No | 15 (50.00) | 10 (33.33) | | |
| DM | | | | |
| Yes | 21 (70.00) | 19 (63.33) | 0.300 | 0.584 |
| No | 9 (30.00) | 11 (36.67) | | |
| CKD | | | | |
| Yes | 17 (56.67) | 18 (60.00) | 0.069 | 0.793 |
| No | 13 (43.33) | 12 (40.00) | | |

significant difference among both groups concerning the origin of sepsis as *P* value >0.05 (Table 2).

There were non-significant difference between both groups in the outcomes which were in the form of ICU and ward admission, surgical operations, outpatient discharge or death as *P* value was >0.05. Most patients of the studied groups were admitted to ICU (Table 3).

The relation between the vital signs and mortality rate, where;

In group A, there were a highly significant effect of SBP, DBP and GCS on mortality rate as *P* value was <0.001 and there was non- significant relation between RR, TEM and survival rate as *P* value >0.05. In group B, there were a highly significant effect of SBP, DBP, RR, HR and GCS on survival rate as *P* value was <0.001 and there was a significant relation between TEM and it as *P* value <0.05 (Table 4).

The sensitivity and specificity of SIRS scores. There was high sensitivity 100% and the specificity was

**Table 2 Source of infections and cause of sepsis in the studied patients**

| | Group | | Chi-Square | |
|---|---|---|---|---|
| | Group A *N* (%) | Group B *N* (%) | $X^2$ | *P* value |
| Suspected source of infection | | | | |
| UTI | 8 (23.33) | 5 (13.67) | 0.709 | 0.871 |
| Soft tissue and skin infection | 7 (23.33) | 1 (8.33) | | |
| Chest infection | 7 (30.00) | 19 (65.67) | | |
| Intra-abdominal infection | 5 (23.33) | 4 (10.33) | | |
| Presence of sepsis | | | | |
| Sepsis | 27 (86.67) | 29 (83.33) | 2.222 | 0.136 |
| Not Sepsis | 3 (13.33) | 1 (16.67) | | |

**Table 3 Outcomes of the studied patients (*n*=60)**

| | Group | | Chi-Square | |
|---|---|---|---|---|
| | Group A *N* (%) | Group B *N* (%) | $X^2$ | *P* value |
| Outcome | | | | |
| ICU admission | 13 (43.33) | 13 (43.33) | 4.533 | 0.339 |
| Ward admission | 7 (23.33) | 8 (26.67) | | |
| Discharge | 5 (16.67) | 1 (3.33) | | |
| Surgical | 1 (3.33) | 4 (13.33) | | |
| Death | 4 (13.33) | 4 (13.33) | | |

**Table 4 Relation between survival and vital data**

| | Study group A | | | |
|---|---|---|---|---|
| Variables | Non survived (*n*=4) | Survived (*n*=26) | t-test | *P* value |
| SBP | 75.00±19.14 | 118.70±13.47 | 6.256 | <0.001** |
| DBP | 40.00±11.54 | 72.60±9.87 | 6.439 | <0.001** |
| Heart rate | 122.00±24.54 | 96.02±15.88 | 3.139 | 0.002* |
| RR | 25.50±6.590 | 18.09±2.82 | 1.480 | 0.142 |
| Temperature | 38.00 ±0.99 | 38.30±0.85 | 0.441 | 0.660 |
| GCS | 3.75±1.50 | 14.90±0.43 | 43.365 | <0.001** |
| | | Study group B | | |
| Variables | Non survived (*n*=4) | survived (*n*=26) | | |
| SBP | 60±25.69 | 118±18 | 6.241 | <0.001** |
| DBP | 32.36±17 | 60.3±15 | 3.667 | <0.001** |
| Heart rate | 120.5±18.51 | 100±16 | 12.165 | <0.001** |
| RR | 30±4.55 | 17±3.87 | 5.459 | 0.001* |
| Temperature | 34.25±0.83 | 37.21±0.5 | 4.215 | 0.012* |
| GCS | 6.00±3.16 | 14.97±0.21 | 9.561 | <0.001** |

*indicates that p value is significant as it is less than 0.05.

42.31% for the mortality rate between the studied patients (Table 5).

The sensitivity and specificity of qSOFA scores. There was high sensitivity 100% and the specificity was 69.32% for the mortality rate between the studied patients (Table 6).

**Table 5 ROC curve between Death and Alive out comes of SIRS group**

| ROC curve between death and alive out come | | | | | | |
|---|---|---|---|---|---|---|
| | Cutoff | Sens. | Spec. | PPV | NPV | Accuracy |
| SIRS score | >1 | 100.0 | 42.31 | 21.1 | 100.0 | 74% |

**Table 6 ROC curve between death and alive outcomes of qSOFA group**

| ROC curve between death and alive out come | | | | | | |
|---|---|---|---|---|---|---|
| | Cutoff | Sens. | Spec. | PPV | NPV | Accuracy |
| qSOFA score | >2 | 100.0 | 69.23 | 33.3 | 100.0 | 84.6% |

## Discussion

The concept of sepsis as well as the criteria for diagnosing it required to be revised because there has been mounting criticism over the lack of specificity of the SIRS criteria. In the beginning of 2016, a group of experts in sepsis collaborated to produce a new international agreement about the definition of sepsis. They characterized sepsis as a life-threatening organ failure that is brought on by an improperly controlled host response to infection [1].

#### The main results of the study were as following

Regarding demographic and comorbidities criteria; age of group A ranged from 32–86 years with mean±SD of 64.87±12.56 years, while that of group B ranged from 34–80 years with mean±SD of 59.47±9.34. Group A included 20(66.6%) males and 10 (33.3%) females. While group B involved 19 (63.3%) males and 11 (36.7%) females. As regard co- morbidities, group A included 15 patients with hypertension, 21 patients with diabetes mellitus and 17 patients with chronic kidney disease (50%, 70% and 56.7% respectively). While group B included 20 patients with hypertension, 19 patients with diabetes mellitus and 18 patients with chronic kidney disease (66.7%, 63.3% and 60%, respectively). There is no significant difference among the 2 groups concerning age, sex and history of chronic disease.

On the other hand, **Khari *et al.*** [9] recruited 100 cases with a mean age of 58.2±17.9 years in their research. Fifty were males and fifty were ladies. Ninety cases had several reported conditions.

A total of 976 cases with sepsis were involved in an investigation by **Kilinc Toker *et al.*** [10], all of whom were hospitalized to the emergency room throughout the course of the five-year research period. The majority were female ($n$=514) while the minority were male ($n$=462). An average of 72.5±13.7 years had passed in their lives on average. Patients' median ages were 72.6±14 years for women and 72.3±13.3 years for men. Chronic kidney disease (CKD) was the most prevalent co-morbidity, affecting 18.9% of patients ($n$=184).

Regarding the source of infections among studied cases, which they were in the form of chest infection that show high percentage in qSOFA group, UTI, soft tissue and intra-abdominal infections, and there was a non-significant difference among both groups concerning the origin of sepsis as $P$ value >0.05.

Our results were supported by study of **Kilinc Toker *et al.*** [10] according to their findings, the respiratory system was the most prevalent site of infection (24.5%, $n$=239), with the urinary system coming in second (23.8%, $n$=232).

Similarly, **Khari *et al.*** [9] showed that thirty people had infections in their respiratory systems, twenty-six people had infections in their gastrointestinal systems, forty people had infections in their skin and soft tissues, and four people had infections in locations not previously considered.

Our results revealed that there was non-significant difference among both groups in the outcomes which were in the form of ICU and ward admission, surgical operations, outpatient discharge or death as $P$ value was >0.05. Most patients of the studied groups were taken to the ICU.

A total of 350 individuals were analyzed in the research by **Yeşil *et al.*** [11]. Among the 211 cases who experienced the composite result within 30 days, 84 (24%), 78 (22.3%), and 154 (44%), respectively, died, were admitted to the ICU, or were hospitalized outside of the ICU.

Of the 2115 cases studied by **Sivayoham *et al.*** [12], 282 (13.3%) died while hospitalized. Derivation cohort: 1078 cases, 140 (13%) ended up passing away.

The present study showed that the relation between the vital signs and mortality rate, where; in group A, there

were a highly significant effect of SBP, DBP and GCS on mortality rate as *P* value was <0.001 and there was non- significant relation between RR, TEM and survival rate as *P* value >0.05. In group B, there were a highly significant effect of SBP, DBP, RR, HR and GCS on survival rate as *P* value was <0.001 and there was a significant relation between TEM and it as *P* value <0.05.

Our results were supported by study of **Brink *et al.*** [13], as they reported Those individuals who passed away were considerably older, had greater heart rates, lower oxygen saturations, and greater respiratory rates, lower systolic blood pressures, when they presented to the ED. Out of the 18%, 8% of the dead had positive cultures. All 490 patients whose deaths were recorded may have had their causes of death recovered. The cause of mortality in 63.4% of these individuals was identified as sepsis.

Patients who died within 28 days (*n*=231, 24.9%) had greater heart rates and respiration rates, lower systolic BP, and poorer GCS scores compared to those who survived. This was also seen in a study by **Kim *et al.*** [14].

**Kilinc Toker *et al.*** [10] found that cases meeting qSOFA and qSOFA+L criterion 2 in the ED had a higher death rate. There was no statistically significant difference among in-hospital deaths according to the SIRS, qSOFA, or qSOFA+L criteria.

Our results showed that regarding ROC curve between Death and Alive out comes of SIRS group: the sensitivity and specificity of SIRS scores. There was high sensitivity 100% and the specificity was 42.31% for the mortality rate between the studied patients. Regarding ROC curve between Death and Alive outcomes of qSOFA group: the sensitivity and specificity of qSOFA scores. There was high sensitivity 100% and the specificity was 69.32% for the mortality rate between the studied patients.

While, in the study of **Yeşil *et al.*** [11], Predicting a composite result was evaluated, and it was shown that qSOFA had a sensitivity of 0.34, SIRS had a specificity of 0.81, the first combination had a sensitivity of 0.84, and the second combination had a specificity of 0.31.

In addition, Finkelsztein *et al.* [15] found that qSOFA was superior to SIRS criteria in predicting in-hospital mortality (area under the receiver operating characteristic curve [AUC], 0.74; 95% CI, 0.66-0.81; *P*=0.03). Discrimination-wise, the qSOFA outperformed the SIRS for days without ICU admission (*P*=0.04), but not for days without ventilator use (*P*=0.19), organ failure (*P*=0.13), or renal impairment (*P*=0.17).

In addition, a Cut off value of qSOFA >0 was related to 100% sensitivity and 53.3% specificity for prediction of death within 1 week, as reported by Khari *et al.* [9]. We calculated an AUC of 0.76.One week mortality could be predicted with a sensitivity of 100% and specificity of 20% using a cutoff value of SIRS >0. There was a 0.627 AUC. Predicting the requirement for mechanical ventilation with a qSOFA cutoff value of >1 was related with 88.9% sensitivity and 82.9% specificity. 0.917 was the AUC. Predicting the requirement for mechanical ventilation with a cutoff value of SIRS >1 was related with a sensitivity of 88.9% and a specificity of 63.41%. Averaged across time, the AUC was 0.839.

There are a number of caveats to this study. The main limitation of our research is that we do not know the present condition of the cases who presented to the emergency room and were subsequently transferred. Furthermore, we have a high death rate because of the enormous volume of extremely ill patients brought to our facility. The investigation was conducted at only one location, which is a major limitation since it means the findings may not be generalizable. Our research may not apply to younger groups because its subjects were frail elderly people with additional comorbidities. Therefore, multicenter prospective studies are needed.

## Conclusion

In the process of diagnosing sepsis, the qSOFA score proved to be both highly sensitive and predictive. The qSOFA score demonstrated a significant discriminative capacity to predict mortality both in the emergency and once the patient was admitted to the hospital.

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#### Conflicts of interest

There are no conflicts of interest.

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