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PREDICTING CLINICAL OUTCOME OF ICU PATIENTS WITH SUSPECTED INFECTIONS USING Q-SOFA SCORE

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ABSTRACT
Aim: The present study was conducted to evaluate the association between QSOFA score with measures of clinical outcome in patients with suspected infections admitted to ICU.
Methods: The Observational Prospective Study was conducted among 60 adults of age greater than or equal to 18 years admitted to Justice K.S Hegde Hospital in Medical ICU with suspected infections. The study population was stratified based on the presence or absence of confirmed or suspected infection.
Results: There were 40 males and 60 females in the present study. 26 patients had ventilator support. A maximum of the patients stayed in 2 days in hospital followed by 3 days in hospital. In the present study, the majority of the patients qSOFA score of 3 followed by a qSOFA score of 2. 36 patients had vasopressor therapy and 24 patients had in-hospital mortality. The group statistics of qSOFA score with vasopressor therapy, in-hospital mortality, bad prognosis, and ventilator support did not show significant results.
Conclusion: P value was significantly lower in all outcome groups of mortality; ICU stay and vasopressor requirement stating the significance of Qsofa in predicting bad outcomes. The sensitivity of this measurement was found to be 75 percent with a specificity of 85 percent which is of high standards. PPV of Qsofa score was 80 percent with NPV was 81 percent with an accuracy rate of 81 percent which was not expected. Overall, the study proves that this simple assessment tool assessable even to a paramedic is of immense value in the prognostication of a bad outcome.

Keywords: Qsofa score, clinical outcome, suspected infections, ICU

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1. INTRODUCTION

The global burden of sepsis poses significant human and economic costs. Recent studies reported 31.5 million cases of sepsis, leading to 5.3 million sepsis-related deaths annually worldwide.[1-4] This burden is disproportionately felt in developing countries, which are often limited in access to both diagnostics and therapeutics.[5] The third international consensus definitions for sepsis and septic shock (Sepsis-3) proposed the sequential (sepsis-related) organ failure assessment (SOFA) as an updated definition of sepsis to replace the systemic inflammatory response syndrome (SIRS; Sepsis-2) criteria.[6]

Additionally, they introduced the quick sequential (sepsis-related) organ failure assessment score (qSOFA) as a novel risk score to identify patients with infection who are at risk of poor outcomes including in-hospital mortality and long intensive care unit (ICU) length of stay.[2-4] In the Sepsis-3 validation study for predicting in-hospital mortality, qSOFA was equivalent to SOFA and superior to SIRS among patients outside the ICU, and inferior to SOFA but equivalent to SIRS among patients in the ICU.[4] As with many risk predictors, qSOFA was initially derived and validated only in well-resourced settings.[3,4] In response, a large retrospective secondary analysis evaluated qSOFA in 10 developing countries across sub-Saharan Africa, Asia and the Americas, and reported that qSOFA was associated with hospital mortality but with variable predictive validity.[7] Other smaller studies have reported similar findings.[8,9]

qSOFA is of particular immediate interest for under-resourced settings because it relies on bedside physical exam findings alone, without requiring laboratory studies such as those needed for SOFA and SIRS calculations, among other risk scores that may be unavailable or prohibitively expensive. An inexpensive and accessible tool to guide risk stratification could prove useful in optimising allocation of scarce acute and critical care resources such as ICU beds, and in identifying patients at high risk for poor outcomes early in their treatment course.[10] However, the predictive accuracy of qSOFA might be limited according to recent studies, particularly in the initial evaluation of high-risk patients in the emergency department (ED).[11,12] In the original qSOFA study, ED populations were not analyzed separately from the larger study population, and the poor discriminative ability of qSOFA has raised concerns about its role for ED patients requiring early recognition and timely intervention.[13,14]

The present study was conducted to evaluate the association between qSOFA score with measures of clinical outcome in patients with suspected infections admitted to ICU.

2. MATERIALS ANS METHODS

The Observational Prospective Study was conducted among 60 adults admitted to Justice K.S Hegde Hospital in Medical ICU with suspected infections.

INCLUSION CRITERIA

- Adults of age greater than or equal to 18 years admitted to Justice K.S Hegde Hospital in Medical ICU with suspected infections.
- Suspected infection case was defined as those participants whose body fluids (blood, ascitic fluid, urine, and cerebrospinal fluid) were sent for cultures and/ or those who had been started on antibiotics (oral or parenteral)

EXCLUSION CRITERIA

- Immunocompromised patients
- Patients unwilling to provide informed consent for the study
- Patients with solid and hematological malignant tumors

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- Pregnant and lactating women

The study population was stratified based on the presence or absence of confirmed or suspected infection. Confirmed or suspected infection was defined as a primary ICU admission diagnosis of infection, as recorded prospectively by the clinical team or an antibiotic order at the time of ICU admission. Antibiotic orders have been used in prior studies as a component of confirmed or suspected infection[15,16] but culture orders, used to remove antibiotics other than for acute infection, were not currently available in the database. This potential source of bias is addressed in sensitivity analyses.

The primary exposure variable was qSOFA at the time of the ICU admission. qSOFA includes one point each for altered mental status (Glasgow Coma Score <15), systolic blood pressure ≤100 mmHg, and respiratory rate ≥22 breaths/minute. Data were collected at the time of ICU referral (e.g. from the emergency department (ED), wards or another hospital) and updated at the time of ICU admission. SIRS criteria included exposure in a secondary analysis. qSOFA and SIRS calculations used the worst values for each component collected during this referral to admission window. Owing to the low frequency of qSOFA scores of 0 (4.8%) and SIRS criteria of 0 (0.3%) in this ICU population, qSOFA scores and SIRS criteria of 0 and 1 were pooled as the reference levels.

The primary outcome was in-ICU mortality, defined as death in the ICU or a palliative discharge from the ICU. The database does not follow patients longitudinally after ICU discharge and, as a result, hospital and other longer-term outcomes were not available.[16] To align with prior validation studies of qSOFA in developing countries, a priori covariates in baseline risk models included age, sex, and HIV status.[7] Descriptive statistical analyses were performed on the total cohort of patients admitted to the ICU. Multivariable logistic regression was used to evaluate the association with in-ICU mortality first of a baseline risk model including only the a priori covariates age, sex, and HIV status, and then of the baseline risk model plus qSOFA score or SIRS criteria. Discrimination of each model was assessed using the area under the receiver operating characteristic curve (AUROC). Finally, the additive contribution of qSOFA or SIRS was assessed by performing likelihood ratio (LR) testing between the baseline model and the baseline plus qSOFA or SIRS model. All of the above analyses were stratified by infection status.

The qSOFA exposure variable, in-ICU mortality outcome variable, and all adjustment variables had either complete data or were missing in less than 1.5% of patients, allowing for complete case analyses. SIRS criteria used in the secondary comparative analyses were missing in 14.6% of patients, driven almost entirely by the sole laboratory input of white blood cell count (missing in 14.6% of patients compared with 0.8 - 3.4% missing for the non-white blood cell count SIRS criteria). White blood cell count derangements are likely to correlate with derangements in the other SIRS criteria that were missing at low levels; thus, a complete case approach was performed for these secondary analyses.

To reduce the risk of misclassifying patients into the suspected or confirmed infection groups who were receiving antibiotics for peri-procedural prophylaxis but who did not have a true active or suspected infection, qSOFA analyses were repeated, further restricting the suspected or confirmed infection group to patients referred to the ICU by a medical rather than surgical service, and to patients with a primary ICU admission diagnosis of infection as recorded prospectively by the ICU team. All analyses were done using Stata v14.1 (StataCorp LP, USA).

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3. RESULTS

Table 1: Baseline characteristics

Variables	N	%
Gender		
Male	40	63.6
Female	20	36.4
Ventilator support		
Yes	26	44.4
No	34	55.6
ICU stay in days		
1	7	11.1
2	16	30.2
3	12	19.0
4	8	12.7
5	9	14.3
6	4	6.3
7	4	6.3

There were 40 males and 60 females in the present study. 26 patients had ventilator support. A maximum of the patients stayed in 2 days in hospital followed by 3 days in hospital.

Table 2: qSOFA, vasopressor therapy, and in-hospital mortality

Variables	N	%
qSOFA		
1	18	30.2
2	16	25.4
3	26	44.4
Vasopressor therapy		
Yes	36	57.2
No	24	42.8
In-hospital mortality		
Yes	24	39.8
No	36	60.2

In the present study, the majority of the patients qSOFA score of 3 followed by a qSOFA score of 2. 36 patients had vasopressor therapy and 24 patients had in-hospital mortality.

Table 3: Group statistics

qSOFA		N	Mean	Standard Deviation	P Value
Ventilator support					
	Yes	28	2.74	.44	4.98
	No	32	1.66	.802	p<0.001
In-hospital mortality					
	Yes	24	2.84	.374	5.268
	No	36	1.68	.78	p<0.001

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Bad prognosis					
	Yes	26	2.80	.402	5.168
	No	34	1.68	.784	p<0.001
Vasopressor Therapy					
	Yes	34	2.68	.624	5.982
	No	26	1.42	.502	p<0.001

The group statistics of qSOFA score with vasopressor therapy, in-hospital mortality, bad prognosis, and ventilator support did not show significant results.

4. DISCUSSION

Sepsis is a major health problem affecting millions of people each year and accounts for high mortality among hospitalized patients worldwide.[17] A recent meta-analysis reported a global estimate of 31.5 million cases of sepsis with potentially 5.3 million deaths annually.[18] The overall hospital mortality rate in patients with sepsis ranges between 20% and 40%, reaching as high as 50% in patients with septic shock.[19-21] Efforts to improve the survival rate of patients with sepsis and septic shock are still needed.[22,23] Identifying patients at a high risk of sepsis and septic shock would be the first step to initiating proper therapeutic strategies. The quick sequential organ failure assessment (qSOFA) is a simple scoring system using three physiological parameters (respiratory rate (RR) ≥ 22 breaths/min, altered mental status (AMS), and systolic blood pressure (SBP) ≤100 mmHg (1 point each; score range of 0–3 points)). It was originally proposed as a screening tool to identify patients with suspected infection outside the intensive care unit (ICU) who are at high risk for poor outcomes, including hospital mortality, in accordance with the new sepsis-3 definition.[24]

There were 40 males and 60 females in the present study. 26 patients had ventilator support. A maximum of the patients stayed in 2 days in hospital followed by 3 days in hospital. In the present study, the majority of the patients qSOFA score of 3 followed by a qSOFA score of 2. 36 patients had vasopressor therapy and 24 patients had in-hospital mortality. The group statistics of qSOFA score with vasopressor therapy, in-hospital mortality, bad prognosis, and ventilator support did not show significant results. The original qSOFA study was conducted among patients from outside the ICU, and it revealed that the rate of patients with severe infection was relatively low and that ED populations were not analyzed separately.[8] Several studies investigated the role of qSOFA as a screening tool in the ED. Moskowitz et al[25] compared qSOFA and systemic inflammatory response syndrome criteria in predicting the need for critical care intervention (vasopressor use, assisted ventilation, continuous insulin infusion, ≥4000 mL intravenous fluid within 12 h of ICU admission, placement of invasive catheters, or RRT) in patients with suspected infection who presented to the ED. They showed that the sensitivity of qSOFA+ was only 13% in predicting the need for critical care intervention. Among patients with a qSOFA of 1, 23.5% received a critical care intervention. Williams et al[26] demonstrated that qSOFA+ had high specificity but poor sensitivity (96.1%; 95% CI, 95.7–96.6% and 29.9%; 95% CI, 27.9–31.8%, respectively), with an AUC of 0.73 (95% CI, 0.72–0.74) for organ dysfunction. Henning et al[27] performed a secondary analysis of three prospectively collected observational cohorts of ED patients with infection. They showed that qSOFA+ had a sensitivity of 52% (95% CI 46–57%) and specificity of 86% (95% CI 85–87%) in predicting mortality. One study showed relatively high sensitivity (70%, 95% CI 59–80) in predicting in-hospital mortality; however, the worst value during the ED stay was used to calculate the qSOFA score in the study.[28] Our study was consistent with previous studies

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and suggests that qSOFA alone has limitations for evaluating patients with suspected infection in the ED. Therefore, qSOFA should be interpreted with caution.[29,30]

5. CONCLUSION

P value was significantly lower in all outcome groups of mortality, ICU stay and vasopressor requirement stating the significance of Qsofa in predicting bad outcomes. The sensitivity of this measurement was found to be 75 percent with a specificity of 85 percent which is of high standards. PPV of Qsofa score was 80 percent with NPV was 81 percent with an accuracy rate of 81 percent which was not expected. Overall the study proves that this simple assessment tool assessable even to a paramedic is of immense value in the prognostication of a bad outcome. This cost-effective time and life-saving tool can be even used by treating doctors in the periphery for guiding referrals or hiking up treatment foreseeing the worst.

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