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Original Research Article

A comparative analysis of qSOFA and SOFA scores for outcome prediction among obstetric patients admitted to intensive care unit at a tertiary care centre

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ABSTRACT

Background: Sepsis in obstetric patients remains a leading cause of maternal morbidity and mortality, requiring timely recognition and management. The sequential organ failure assessment (SOFA) score is widely used for organ dysfunction assessment, while the Quick SOFA (qSOFA) provides a rapid bedside tool. Their utility in obstetric sepsis, however, is challenged by pregnancy-related physiological changes.
Methods: This prospective observational study was conducted over 18 months (June 2023-November 2024) at L.L.R.M. Medical College, Meerut. Fifty women pregnant, postnatal (≤6 weeks), or postabortal (≤2 weeks) with sepsis diagnosed by SIRS criteria were included. Patients with ectopic pregnancy, malignancy, trauma, or chronic systemic disease were excluded. Clinical examination, laboratory investigations, and SOFA/qSOFA scoring were performed. Statistical analysis was done using SPSS v22 with Chi-square, Fisher's exact test, independent t-test, and ROC analysis.
Results: SOFA scores showed significant correlation with maternal outcomes: 70% recovered, 20% developed complications, and 10% died (p=0.015). ICU admission was associated with higher qSOFA scores in 80% of patients (p=0.007). SOFA demonstrated superior sensitivity (85%) and specificity (90%) for mortality prediction compared to qSOFA (70% and 75%, respectively; p=0.013).
Conclusion: qSOFA is a useful triage tool for rapid assessment, while SOFA provides greater prognostic accuracy. A combined approach may improve management of obstetric sepsis.

Keywords: Obstetric sepsis, SOFA score, qSOFA, Maternal outcomes, ICU prognosis

INTRODUCTION

Sepsis is a severe medical condition resulting from an immune response to bloodstream infections, triggering chemical releases that can cause tissue damage, organ dysfunction, and fatal outcomes. Early detection and prompt treatment are crucial to reducing complications and improving survival rates.[1] Obstetric sepsis occurs during pregnancy, postpartum, or post- abortal periods and can lead to life-threatening complications. Patients often present with unstable vital signs, including hypotension, tachycardia, tachypnoea, fever or hypothermia, jaundice, respiratory distress, and reduced urine output. Severe cases may progress to multiorgan dysfunction syndrome (MODS), affecting the lungs, heart, kidneys, liver, and brain. Immediate medical intervention is essential to minimize mortality. Several scoring models assess sepsis severity, with the SOFA score, introduced in 1994, being widely used. Unlike APACHE II and SAPS II, which evaluate patients in the first 24 hours of admission, SOFA tracks disease progression throughout hospitalization.[1] It assesses six organ systems-respiratory, cardiovascular, hepatic, coagulation, renal, and central nervous-scoring each from 0 (normal) to 4 (severe dysfunction). Higher

SOFA scores correlate with increased mortality, aiding clinical decision-making. To address the biochemical parameter limitations of SOFA, the Quick SOFA (qSOFA) was developed, relying on three criteria: systolic blood pressure <100 mmHg, altered mental status, and respiratory rate >22/min. A score ≥2 suggests a higher risk of poor outcomes. However, applying SOFA and qSOFA in obstetric populations is challenging due to physiological changes like altered immune function, CRP, leukocyte count, and pregnancy-induced blood pressure variations.[2] To overcome these challenges, the Society of Obstetric Medicine of Australia and New Zealand (SOMANZ) introduced the OmSOFA (Obstetrically Modified SOFA) score, tailored to pregnancy physiology.

A minimum score of 2 indicates end-organ dysfunction. Given lower baseline serum creatinine levels in pregnancy (35–80 µmol/l), OmSOFA modifies cut-offs: 0 for <90 µmol/l (1.01 mg/dl), 1 for 90–120 µmol/l (1.01–1.35 mg/dl), and 2 for >120 µmol/l (1.35 mg/dl). CNS dysfunction is assessed using alertness levels: "Alert" (0), "Arousable by voice" (1), and "Arousable by pain" (2), with deviations warranting a Glasgow Coma Scale (GCS) assessment. Additionally, given that mean arterial pressure naturally falls below 70 mmHg in pregnancy, baseline variations should be considered to avoid misinterpretation of disease severity.[3]

Aim and objective

Role of SOFA score in predicting maternal mortality and morbidity at the time of hospital admission to ICU. Predictive role of q SOFA and its drawback. Comparison of SOFA and q SOFA as prognostic predictors in pregnancy associated sepsis.

METHODS

This prospective observational (cohort) study was conducted in the Department of Obstetrics and Gynaecology, L.L.R.M. Medical College and associated S.V.B.P. Hospital, Meerut, over 18 months starting from June 1, 2023. It included pregnant, postnatal (within six weeks of delivery), and post-abortal (within two weeks of abortion) patients presenting with features of sepsis. Informed consent was obtained, and ethical approval was secured. Patients with ectopic pregnancy, malignancies, hepatic disorders, autoimmune diseases, severe trauma, COPD, or those unable to secure beds were excluded. The study aimed to estimate qSOFA scores in pregnancy-associated sepsis (PAS) cases and correlate them with ICU admissions. Based on Albright et al.'s study, with $\alpha = 5\%$ and power =90%, 20 cases per group were required. Due to time and resource availability, at least 25 PAS cases with ICU admission and 25 without ICU admission were studied, totalling 50 subjects.

Patients were assessed using SIRS criteria (MABP <65 mmHg, SBP ≤90 mmHg, HR ≥110/min, RR ≥22/min, temperature ≥38°C or ≤36°C, WBC ≥14,000/mm^3 or ≤4,000/mm^3), with those meeting at least two classified as obstetric sepsis cases. After stabilization, demographics, vitals, obstetric, menstrual, family, and personal history were recorded, along with a complete examination. In antenatal patients, fetal heart sounds (FHS) and uterine contractions were assessed using Cardiotocography (CTG). Investigations included CBC, LFT, KFT, CRP, lactate, blood/urine culture, pus culture (if applicable), serum electrolytes, ABG, viral markers, and coagulation profile. The SOFA and qSOFA scores were calculated to assess organ dysfunction.

SOFA scoring included respiratory, coagulation, liver, cardiovascular, CNS, and renal function parameters, while qSOFA scoring used SBP ≤100 mmHg, RR ≥22/min, and GCS ≤14 to estimate mortality risk (≥2=mortality ≥10%). Data were analysed using SPSS v22, with categorical data presented as frequencies and proportions, tested using Chi-square/Fisher's exact test, and continuous data as mean±SD, analysed via independent t-test. The predictive accuracy of SOFA and qSOFA was assessed using the ROC curve.

RESULTS

The results of this study are presented in detail, covering the sociodemographic profile, clinical characteristics, and outcomes of the 50 obstetric patients assessed. The findings are summarized in tables (with numbers and percentages) and illustrated through figures (bar and pie diagrams) for clarity.

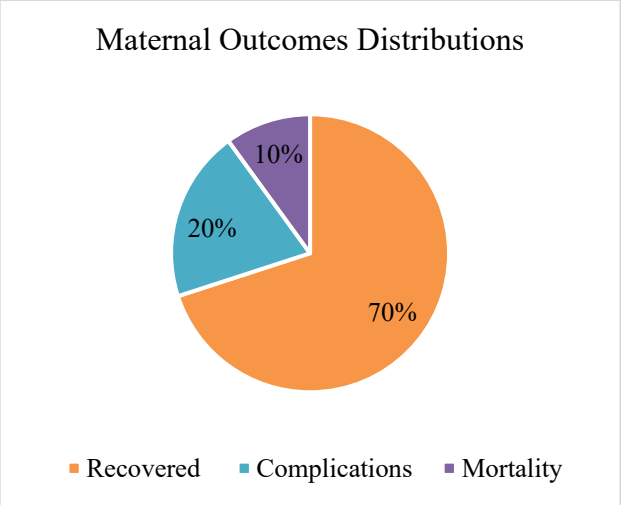

Figure 1: Compares maternal outcomes.

The sociodemographic profile of 50 patients was assessed using the Kuppuswamy Scale. The distribution across socioeconomic classes is presented in Table 1. A majority of patients belonged to the lower-middle (40%) and upper-lower (30%) classes, followed by the lower class (20%) and upper-middle class (10%). The differences were statistically significant with a p value of 0.034. Maternal outcomes among the 50 patients were assessed using

SOFA scores, as shown in Figure 1. The data indicates that 70% of patients recovered, 20% developed complications, and 10% died. The correlation between maternal outcomes and SOFA scores was statistically significant (p=0.015).

ICU admission data based on qSOFA scores is summarized in Table 2. Among the 50 patients, 80% required ICU admission and 20% did not. This association between qSOFA scores and ICU admission was statistically significant (p=0.007). The drawbacks of SOFA and qSOFA are outlined in Table 3. SOFA requires laboratory results and is time-consuming, whereas qSOFA is faster and bedside-based but less sensitive for early sepsis detection. Table 4 compares their diagnostic accuracy for predicting mortality. SOFA demonstrated superior sensitivity (85%) and specificity (90%) compared to qSOFA (70% and 75%, respectively). The association was statistically significant (p=0.013).

Table 1: Sociodemographic profile (Kuppuswamy Scale).

Socioeconomic class	Number (n=50)	%	P value
Lower	10	20	0.034
Upper-lower	15	30	0.034
Lower-middle	20	40	0.034
Upper-middle	5	10	0.034

Table 2: ICU admissions based on qSOFA.

ICU admission	Number (n=50)	%	P value
Yes	40	80	0.007
No	10	20	0.007

Table 3: Drawbacks of SOFA and qSOFA.

Drawback	SOFA	qSOFA	P value
Time-consuming	Yes	No	N/A
Requires lab results	Yes	No	N/A
Less sensitive in early sepsis	No	Yes	N/A

Table 4: Comparison of SOFA and qSOFA in predicting mortality.

Score	Sensitivity (%)	Specificity (%)	P value
SOFA	85	90	0.013
qSOFA	70	75	0.013

DISCUSSION

Sepsis continues to be one of the leading contributors to maternal morbidity and mortality globally, particularly in low and middle-income countries where delays in diagnosis, referral, and initiation of critical care often worsen outcomes. In this prospective observational study, we investigated the predictive utility of SOFA and qSOFA scores among obstetric patients with sepsis admitted to a tertiary care intensive care unit. Our findings demonstrate that both scores have important clinical roles; however, SOFA exhibited higher sensitivity and specificity for predicting mortality, whereas qSOFA proved useful as a rapid triage tool at the bedside.

In our study population, 70% of women recovered, 20% developed complications, and 10% died. The statistically significant correlation between higher SOFA scores and adverse maternal outcomes (p=0.015) confirms its prognostic value. This aligns with Vincent et al., who first described SOFA as a measure of organ dysfunction with strong association with ICU mortality.[1] Raith et al also showed that SOFA had greater prognostic accuracy compared with qSOFA and SIRS in critically ill patients.[2] Similarly, Seymour et al validated SOFA as a robust predictor of sepsis-related mortality in large multicentric cohorts.[3] The findings extend these observations into obstetric populations, reinforcing that despite physiological alterations of pregnancy, SOFA remains a reliable prognostic tool.

With respect to ICU admission, our results showed that 80% of patients with elevated qSOFA scores required intensive care (p=0.007), highlighting qSOFA's clinical utility for early identification of high-risk patients. This mirrors the observations of Kang et al who demonstrated that qSOFA correlated with ICU admission in trauma patients.[4] However, the sensitivity of qSOFA for mortality prediction in our cohort was only 70%, compared with 85% for SOFA. This limitation is consistent with Kilinc Toker et al who found qSOFA underestimated early sepsis severity compared to SOFA.[5] Freund et al also reported that qSOFA had lower sensitivity than SOFA in emergency department patients, though it remained a useful bedside triage tool.[6]

Our comparative analysis further revealed that SOFA had superior sensitivity (85%) and specificity (90%) for predicting mortality compared to qSOFA (70% and 75%, respectively, p=0.013). This echoes prior studies. Raith et al confirmed SOFA's superiority over qSOFA in predicting in-hospital mortality, while Shankar-Hari et al noted that qSOFA may miss early sepsis cases, underscoring the need for more comprehensive assessments.[7] Grooth et al further emphasized that SOFA's integration of laboratory values captures subtle physiological deterioration, enhancing prognostic accuracy.[8]

The applicability of these tools in obstetrics has been debated, given pregnancy-related physiological changes such as lower baseline creatinine, reduced systemic vascular resistance, and altered coagulation profiles. To address these issues, Bowyer et al and the SOMANZ guidelines proposed the obstetrically modified SOFA (OmSOFA), adapting thresholds to pregnancy physiology.[9] While our study used the standard SOFA score, its significant association with maternal outcomes

suggests that it retains value in obstetric patients. However, larger comparative studies between SOFA and OmSOFA are warranted. The maternal mortality rate (10%) is comparable with previous studies of obstetric sepsis, where mortality ranges from 5–15% depending on healthcare access.[10] Acosta et al. reported a similar figure in a UK national cohort, with severe maternal sepsis contributing substantially to critical care admissions.[11] Globally, WHO analyses by Say et al. have confirmed sepsis as one of the leading causes of maternal mortality, accounting for 10–15% of deaths.[12] These consistent findings highlight the ongoing relevance of sepsis as a global maternal health priority. Morbidity also remains substantial 20% of women in our study developed complications. This parallels the results of Souza et al who documented high rates of maternal near-miss and severe morbidity from sepsis in multi country surveys.[13] Moreover, neonatal outcomes were affected, as has been noted in prior studies linking maternal sepsis to preterm birth, low birth weight, and neonatal mortality.[14] These associations underline the intergenerational impact of maternal sepsis.

The clinical implications of our findings are important. The dual application of qSOFA and SOFA appears optimal qSOFA for rapid, bedside screening and triage, and SOFA for detailed prognostic assessment once laboratory results are available. This tiered approach could be particularly valuable in low-resource settings, where delays in diagnosis and referral are common. As emphasized by Carle et al structured scoring systems standardize assessment and improve communication between providers, thereby improving timely escalation of care.[15] Early recognition using qSOFA, followed by comprehensive evaluation using SOFA, could reduce both maternal and neonatal adverse outcomes. The study also points to potential future directions. Incorporating biochemical markers such as lactate and procalcitonin into sepsis scoring may enhance accuracy, bridging the gap between qSOFA's simplicity and SOFA's comprehensiveness. Shapiro et al demonstrated that serum lactate is strongly predictive of mortality in sepsis, while Assicot et al highlighted the role of procalcitonin as a biomarker of bacterial sepsis.[16,17] Integrating such markers into modified SOFA frameworks for obstetric populations could provide earlier and more precise risk stratification.

Furthermore, long-term follow-up of survivors of obstetric sepsis is essential, as sepsis has been associated with lasting cardiovascular, renal, and psychological sequelae.[18] Incorporating long-term maternal and neonatal outcomes into future research would help in understanding the true burden of obstetric sepsis beyond acute hospitalization. Finally, multicentric studies with larger cohorts are needed to validate the findings of the present study, evaluate the applicability of OmSOFA, and refine management strategies for obstetric sepsis. This study offers important insights, though certain considerations remain. Conducted at a single tertiary center with a modest sample size, the findings highlight the need for larger, multicentric validation. Standard SOFA and qSOFA scores were applied however, pregnancy-related physiological changes suggest future exploration of obstetrically modified scores such as OmSOFA. The focus on immediate maternal outcomes ensured clarity, while long-term maternal and neonatal follow-up may strengthen future work. Exclusion of chronic comorbidities-maintained cohort homogeneity, though broader inclusion could enhance applicability. These factors underscore opportunities for further research while reinforcing the value of this study in evaluating prognostic tools for obstetric sepsis.

In summary, the present study demonstrates that both SOFA and qSOFA scores are valuable tools in the evaluation of obstetric sepsis. SOFA offers superior sensitivity and specificity for mortality prediction, while qSOFA is a rapid bedside tool that can guide initial triage. A combined strategy may optimize the management of obstetric sepsis, balancing speed and accuracy. Our findings are consistent with prior literature and extend the evidence base into obstetric care, supporting the integration of these scores into standardized sepsis protocols for improved maternal and neonatal outcomes.

CONCLUSION

The study highlights the significant correlation between socioeconomic status and maternal outcomes in patients with pregnancy-related acute kidney injury (PRAKI), with a majority belonging to the lower-middle and upper-lower socioeconomic classes. Maternal recovery was observed in 70% of cases, while complications and mortality rates stood at 20% and 10%, respectively, with statistical significance. ICU admissions were required in 80% of cases based on qSOFA scores, underscoring the severity of the condition.

The comparison between SOFA and qSOFA scores revealed that while SOFA demonstrated higher sensitivity (85%) and specificity (90%) in predicting mortality, it was more time-consuming and required laboratory results. In contrast, qSOFA, though quicker and independent of lab investigations, had lower sensitivity (70%) and specificity (75%), making it less reliable in early sepsis detection. These findings suggest that while qSOFA is useful for rapid bedside assessment, SOFA remains a more robust predictor of maternal outcomes in PRAKI cases, emphasizing the need for a comprehensive evaluation approach in critically ill obstetric patients.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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