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Original Research Article

Evaluation of sepsis in obstetric score: a novel scoring system for obstetric population, a tertiary care centre study

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ABSTRACT

Background: Sepsis remains the second leading cause of maternal mortality, affecting approximately 5.7 per 10,000 pregnancies. Delayed recognition and escalation of care contribute to preventable deaths. The Sepsis in Obstetrics Score (SOS), designed by Albright et al. to predict critical care needs in pregnant and postpartum women, has limited validation data. This study evaluates SOS in predicting maternal and neonatal outcomes in septic obstetric patients.
Methods: A prospective study was conducted on 50 pregnant, post-abortal, and postpartum women with sepsis at GSVM Medical College, Kanpur. Patients with pre-existing organ disease were excluded. SOS was calculated using clinical and laboratory parameters, with scores <6 classified as non-severe and ≥6 as severe sepsis. Outcomes assessed included ICU admission, organ dysfunction, maternal and neonatal mortality, and hospital stay. ROC analysis determined the optimal cutoff for predicting mortality.
Results: Mortality rose with higher SOS scores: 5.3% (0–2), 18.2% (3–5), 30% (6–8), and 71.4% (9–11). ICU admission and multi-organ failure were significantly more frequent in the ≥6 group. Neonatal outcomes were worse among high-score mothers, with more NICU admissions (5 vs. 1) and stillbirths (9 vs. 6). ROC analysis showed good predictive accuracy (AUROC 0.859, $p<0.001$). A cutoff ≥5 predicted mortality with 92.3% sensitivity, 62.2% specificity, and 70% diagnostic accuracy, outperforming the traditional ≥6 threshold by identifying high-risk women earlier.
Conclusions: SOS is a reliable triage tool for obstetric sepsis. A threshold ≥5 enables earlier ICU transfer, timely intervention, and improved maternal and perinatal outcomes, supporting its integration into routine obstetric care.

Keywords: Intensive care unit, Maternal mortality, Organ dysfunction

INTRODUCTION

Sepsis has been identified as the second leading cause of maternal mortality in the United States, affecting an estimated 5.7 per 10,000 pregnancies.[1-3,10] Despite advancements in general sepsis care over time, the proportion of maternal deaths attributed to sepsis has not shown significant change since 1987, when the Centers for Disease Control and Prevention (CDC) began tracking pregnancy-related mortality causes.[1,4] It has been reported that up to 73% of these deaths could have been prevented, with delays in recognition, treatment, and escalation of care frequently cited as contributing factors.[5,6] Early recognition is often hindered by the overlap between normal physiological changes in pregnancy and the pathophysiological indicators of sepsis, making timely diagnosis challenging.[13,14] Additional delays in recognition have also been linked to inadequate patient education regarding early warning signs that warrant medical attention. Initiation of appropriate antimicrobial therapy within one hour of presentation is often not achieved, contributing to treatment delays.[1,5,6]

Table 1: Sepsis in obstetric score (SOS).

Variable	High abnormal range				Normal	Low abnormal range			
Scores	**+4**	**+3**	**+2**	**+1**	**0**	**+1**	**+2**	**+3**	**+4**
Temp (°C)	>40.9	39-40.9		38.5-38.9	36-38.4	34-35.9	32-33.9	30-31.9	<30
SBP (mmHg)					>90		70-90		<70
Heart rate (bpm)	>179	150-179	130-149	120-129	<119				
Respiratory rate (bpm)	>49	35-49		25-34	12-24	10-11	6-9		<5
SpO2 (%)					>92	90-91		85-89	<85
WBC (103/mm^3)	>39.9		25-39.9	17-24.9	5.7-16.9	3-5.6	1-2.9		<1
%Immature neutrophile			>10		<10				
Lactates (mmol/l)			>4		<4				

Furthermore, delays in escalation of care are commonly associated with a failure to recognize the severity of the condition and the clinical signs of critical illness.[6] Several scoring systems like Sequential Organ Failure Assessment (SOFA), quick SOFA (qSOFA), Modified Early Warning Score (MEWS), and Rapid Emergency Medicine Score (REMS), etc., were defined for identify sepsis and its severity.[7] An emergency department scoring system, the 'Sepsis In Obstetric Score' (SOS) was described by Albright et al specifically designed for the obstetric population to assess the likelihood of requiring critical care admission in pregnant and postpartum women presenting with sign of sepsis.[8]

METHODS

This was prospective study conducted at Obstetrics and Gynecology Department, Ganesh Shanker Vidyarthi (GSVM) Medical College Kanpur from 2 years (March 2023- March 2025).

All pregnant, post-abortal and postpartum female.[11]

Sample size calculation

By Slovin's formula (A simple way to determine the minimal sample size needed for a research study).

$n=N/(1+Ne^2)$

n=The desired sample size

N= The total size of the population

e=The margin of study (0.05%)

A total 50 patients were included in this study.

Procedure

After taking informed consent from participants(n=50) SOS scores were used on them and used the development of Organ Failure as a marker of the need for critical care.[9] criteria used to diagnose 'organ failure' are listed in Table 2.

Ethical approval

Given by Ethical Committee of GSVM medical college Kanpur.

Statistical analysis

The data were entered and analysed using IBM SPSS Statistics version 29. Categorical variables were summarized as frequencies and percentages, and associations between SOS score, maternal outcomes, neonatal outcomes, ICU admission, and organ failure were analysed using the Chi-square test, with statistical significance defined at P<0.05.

Table 2: Diagnostic criteria for organ failure.

Organ failure	Features
Pulmonary	Arterial hypoxemia (PaO2/FiO2<300)
Cardiac	Increased capillary refill time Arterial hypotension (SBP<90mmHg, MAP <70)
Renal	Acute oliguria (urine output<0.5ml/kg/hr for at least 2hrs Creatinine increase >0.5mg/dl in 24hrs period
Hepatobiliary	Coagulation abnormality (INR>1.5) Thrombocytopenia (platelet count<1lakh) Hyperbilirubinemia (total bil >4mg/dl) Absent bowel sound
Neurological	Abnormal GCS

All the patients were followed, and clinical parameter were noted on day 1 and laboratory investigation were sent as per scoring system. this were repeated on alternate days until the sign of sepsis disappear or mortality of the patient occurs, highest score was used in statistics. Minimum score is 0 and the maximum score was 20. When the value

comes <6 termed as non-severe Sepsis and when the value comes >or equal to 6 termed as Severe sepsis.[12]

Following maternal and foetal parameter were studied

Need of ICU, organ dysfunction, maternal mortality, NICU admission, neonatal mortality, improvement in condition, hospital stays.

RESULTS

The interpretation of the SOS (Sepsis in Obstetric Score) in relation to patient outcomes shows a clear trend: as the SOS score increases, the risk of maternal mortality rises significantly, while the likelihood of discharge decreases. Patients with a low SOS score (0–2) had the best outcomes, with 94.74% discharged and only 5.26% mortality, indicating low risk. In the moderate range (3–5 and 6–8), outcomes begin to worsen, with discharge rates dropping to 81.82% and 70.0%, and mortality increasing to 18.18% and 30.0%, respectively. This reflects a growing severity of illness and a need for closer monitoring. In the high-risk group (SOS score 9–11), outcomes are poor only 28.57% were discharged, while 71.43% died, showing a strong correlation between high SOS scores and adverse maternal outcomes. there were 30% patients with an SOS score between 12–16, possibly indicating that this range is either rare or associated with very poor prognosis. Overall, the data clearly supports that higher SOS scores are associated with significantly worse maternal outcomes, making it a valuable tool for identifying high-risk obstetric patients and guiding timely interventions.

Table 3: Demographic data.

Parameters		Non-severe sepsis (n=30)	Severe-sepsis (n=20)
Age group (in years)	20-25	13 (43.3%)	8 (40.0%)
	26-30	13 (43.3%)	6 (30.0%)
	31-35	3 (10.0%)	5 (25.0%)
	>35	1 (3.3%)	1 (5.0%)
Occupation	Unemployed	29 (96.7%)	12 (60.0%)
	Employed	1 (3.3%)	8 (40.0%)
Religion	Hindu	26 (86.7%)	15 (75.0%)
	Muslim	4 (13.3%)	5 (25.0%)

Table 4: Interpretation of SOS score in terms of patient outcome (n=50).

SOS score	Total no of discharge patient	Total no of maternal mortality
0-2	18 (94.74%)	01 (5.26%)
3-5	09 (81.82%)	02 (18.18%)
6-8	07 (70.0%)	03 (30.0%)
9-11	02 (28.57%)	05 (71.43%)
12-16	03 (30%)	00 (00%)
17-20	00 (00%)	00 (00%)

Table 5: Association between interpretation of SOS score and maternal outcome and organ failure parameters (n=50).

Outcome of patient	Non severe sepsis (<6)	Severe sepsis (>6)	P value
Discharge	27	10	0.002
Expired	3	10	
Organ failure			
No	25	00	
One	05	09	
Two	02	05	
Three	00	02	
Four	00	01	
Five	00	01	

Table 6: Outcome of patient (n=50).

Score	ICU stay	UISEMH stay	Outcome of patient	
			Patient discharge	Maternal mortality
<6	08	22	27	3
>6	12	14	8	12

Table 7: Outcome of baby after delivery.

Score	Outcome of baby after delivery		
	Admitted in NICU (baby)	Not admitted in NICU (baby)	IUD/still birth (baby)
<6	1	24	06
>6	5	15	09

Table 8: ROC curve analysis showing diagnostic performance of SOS score: total in predicting outcome of patient: expired vs outcome of patient: discharged, shifted (n=50).

Parameter	Value (95% CI)
Cutoff (P value)	≥5 (<0.001)
AUROC	0.859 (0.738 - 0.979)
Sensitivity	92.3% (64-100)
Specificity	62.2% (45-78)
Positive predictive value	46.2% (27-67)
Negative predictive value	95.8% (79-100)
Diagnostic accuracy	70.0% (55-82)
Positive likelihood ratio	2.44 (1.57-3.79)
Negative likelihood ratio	0.12 (0.02-0.83)
Diagnostic odds ratio	19.71 (2.31-168.48)

The area under the ROC curve (AUROC) for SOS Score: Total predicting Outcome of Patient: Expired vs Outcome of Patient: Discharged, Shifted was 0.859 (95% CI: 0.738

- 0.979), thus demonstrating good diagnostic performance. It was statistically significant (p=<0.001).

At a cutoff of SOS score

Total ≥5, it predicts outcome of patient: expired with a sensitivity of 92%, and a specificity of 62%.

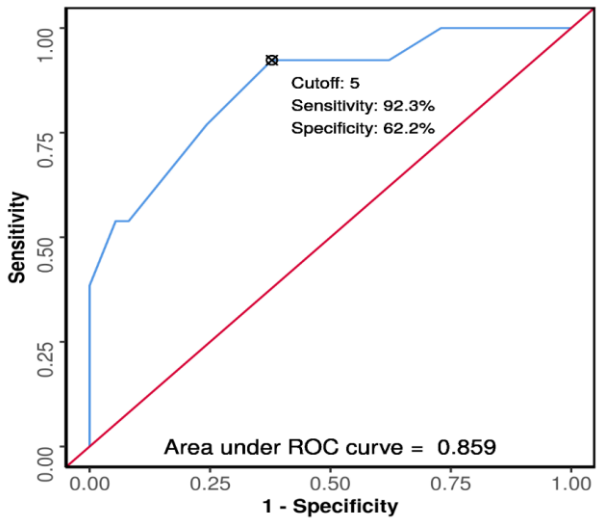

Figure 1: ROC curve.

DISCUSSION

The present study evaluates the utility of the SOS in predicting maternal outcomes, ICU admission, and neonatal outcomes among 50 patients with maternal sepsis. Our findings confirm that the SOS score effectively stratifies risk, with rising scores strongly correlating with increased ICU admissions, prolonged hospital stay, and maternal mortality. Patients with a score of 0–2 exhibited the best prognosis, with 94.7% discharged and only 5.3% mortality, reflecting a low-risk group where intensive care was rarely required. Outcomes progressively worsened with higher scores, with mortality rates reaching 30% in the 6–8 range and 71.4% in 9–11, while discharge rates dropped to 70% and 28.6%, respectively. These results are consistent with the validation study by Albright et al which demonstrated that scores ≥6 reliably identify patients at risk for severe morbidity, underscoring the score's role as a triage tool for early escalation and ICU consideration.[8]

ICU admission and hospital utilization showed a direct relationship with SOS categories. Among patients scoring <6, only 8 required ICU admission and mortality was limited to 3 cases, whereas those scoring ≥6 accounted for 12 ICU admissions and 12 maternal deaths, despite comprising only 40% of the cohort. These findings emphasize the importance of proactive ICU transfer for patients with scores ≥6, a threshold also supported by our ROC analysis, where a cutoff of ≥5 predicted mortality with 92% sensitivity and 70% overall accuracy. Like prior reports Bauer et al, Kendle et al our data highlight that delayed escalation is a key factor in sepsis-related maternal deaths, and structured scoring systems like SOS can mitigate this by standardizing early recognition and triage.[2,6]

Neonatal outcomes and organ dysfunction further underscore the prognostic value of the SOS. Mothers with scores >6 had more frequent NICU admissions (5 vs. 1) and stillbirths (9 vs. 6) compared with those scoring <6, confirming that worsening maternal condition compromises foetal survival. Additionally, all cases with ≥2 organ failures were confined to the high-score group, with two patients developing four or more failures, both resulting in death. These observations reflect the systemic deterioration associated with high scores, paralleling findings from Creanga et al and Turner who reported that multi-organ dysfunction is a late but lethal phase of obstetric sepsis.[4,7] Collectively, these results validate the SOS as a practical and reliable bedside tool for obstetric sepsis, with low scores (<5) safely identifying low-risk patients, intermediate scores (5–8) mandating close monitoring, and scores ≥9 requiring ICU-level intervention. Adoption of such structured approaches may optimize resource allocation in obstetric care, improve maternal and neonatal survival, and reduce preventable sepsis-related deaths.

A cutoff score of ≥5 showed high sensitivity 92.3%, specificity 62.2%, positive predictive value 46.2% and negative predictive value 95.8% which is not consistent with the result of Rachna Agarwal which shows low sensitivity (68.9%), better specificity (80.9%), high positive predictive value (83%) for SOS (at a cutoff score of 6). The reason could be sepsis in pregnancy can present and take any course and can affect any organ.[1,3,5]

The limitations of this study include its small sample size, single-centre design, heterogeneity of sepsis presentation, lack of adjustment for neonatal confounders, observational nature, and the absence of long-term maternal and neonatal follow-up.

CONCLUSION

The SOS is a practical and reliable bedside tool for predicting maternal outcomes, ICU admission, and neonatal complications in cases of maternal sepsis. By demonstrating that a cutoff of ≥5 offers high sensitivity for identifying women at risk of adverse outcomes, our findings support the SOS as an effective triage aid for early escalation of care, while also highlighting differences from prior validation studies that underscore the heterogeneous nature of sepsis in pregnancy. Importantly, the study confirms that higher SOS scores correlate with increased maternal mortality, ICU utilization, and poor neonatal outcomes, thereby reinforcing the score's role in guiding timely interventions, optimizing resource allocation, and ultimately reducing preventable sepsis-related maternal and neonatal deaths.

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