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Original Research Article

A Study to Assess the Role of Sequential Organ Failure Assessment (SOFA) Score to Predict the Outcome of Women Admitted in Obstetric Intensive Care Unit in SMS Medical College, Jaipur

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Conflict of interest: Nil

Abstract

Introduction: The Sequential Organ Failure Assessment (SOFA) score, which was created to evaluate organ dysfunction in seriously ill patients, provides a clear and flexible way to assess the severity of organ failure across different systems. Using it in obstetric critical care gives important information about maternal outcomes and disease progress. The above study was conducted to assess the role of Sequential Organ Failure Assessment (SOFA) score in predicting the outcome of women admitted in Obstetric Intensive Care Unit.

Methodology: The study was conducted at SMS Medical College, Jaipur with total of 44 women included in the study. Their demographic, clinical, and obstetric characteristics were analyzed alongside their SOFA scores and outcomes.

Result: Women with a lower SOFA score upon admission had better survival outcomes, with those scoring between 0 and 6 having no mortality. In contrast, women with a SOFA score greater than 12 had a significantly higher mortality rate (71.4%).

Conclusion: Sequential Organ Failure Assessment (SOFA) score strongly supports in predicting maternal mortality and morbidity in obstetric intensive care unit (ICU) patients.

Keywords: SOFA, obstetrics, women, maternal health, ICU.

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Introduction

The World Health Organization defines maternal death as the death of a woman while pregnant or within 42 days of termination of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.[1] Inadequate antenatal care, delayed identification of high-risk conditions, and limited access to emergency obstetric services exacerbate these outcomes. [2]A five-year retrospective analysis reported a total of 6,851 obstetric ICU admissions in Indian tertiary centres, with a high referral rate of 47%, indicating delayed recognition and transfer. The primary indications for ICU admission in such settings include hypertensive disorders of pregnancy, massive haemorrhage, sepsis, and multi-organ failure syndromes. [3] Unlike general ICU settings, obstetric ICUs face unique challenges due to the altered physiology of pregnancy and the dual responsibility of safeguarding maternal and foetal well-being. A large-scale Indian review noted that over6,800 obstetric ICU admissions occurred over five years, with nearly half being referred from other facilities, often in critical condition highlighting the need for early detection tools, rapid triaging, and effective ICU-level care tailored to the obstetric population. [4]

Various prognostic tools used in critical care medicine, such as the Acute Physiology and Chronic Health Evaluation II (APACHEII), Mortality Probability Models (MPMs), and the Simplified Acute Physiology Score II (SAPS II), have shown inconsistent results in obstetric patients. These models often overestimate the severity due to physiological changes during pregnancy, making them less suitable for obstetric critical care.[5]

The SOFA score is based on the principle that the degree of dysfunction across vital organ systems correlates with clinical prognosis, including the

likelihood of mortality.[6] The Sequential Organ Failure Assessment (SOFA) score, developed to objectively quantify organ dysfunction across six systems—respiratory, cardiovascular, hepatic, renal, coagulation, and neurological—offers a dynamic and reproducible alternative. Each system is scored from 0 to 4, giving a total score ranging from 0 to 24, which can be tracked serially throughout ICU stay.[7] Several studies have demonstrated that a rising SOFA score correlates with increased mortality, while a declining score is predictive of recovery. Keeping in mind the persistent burden of maternal mortality, especially in intensive care settings, the above study was conducted to evaluate the prognostic utility of the SOFA score among women admitted to the obstetric intensive care unit, with the aim of improving risk stratification, optimizing care, and ultimately contributing to the reduction of maternal morbidity and mortality.[8]

Materials and Methods

The study was conducted in the Department of Obstetrics and Gynaecology for a period of 1 year after receiving ethical clearance from the Institutional Ethics Committee, at SMS Medical College and attached hospitals, Jaipur, Rajasthan. A total of 44 patients fulfilling the inclusion and exclusion criteria were considered for the study.

Inclusion Criteria: Women requiring ICU admission during pregnancy or within 42 days postpartum who understood the study protocol and provided written informed consent.

Exclusion Criteria: Women admitted to ICU for incidental or accidental causes and with known chronic systemic medical disorders (e.g., chronic renal failure, cardiac disease, malignancy).

Detailed clinical assessment (menstrual, obstetric history, medical and surgical history including hypertension, epilepsy, asthma, diabetes, tuberculosis, and any prior hospitalizations, family and personal history) was done along with physical examination. The Sequential Organ Failure Assessment (SOFA) score was calculated at ICU admission, 12 hours after admission and every 24 hours during ICU stay.

The score assessed six organ systems: respiratory, coagulation, hepatic, cardiovascular, neurological, and renal. Each system received a grade from 0 to 4, with a total score range of 0 to 24. Mean arterial pressure was derived using the formula: MAP = Diastolic BP + (1/3 × Pulse Pressure). Supportive interventions such as ventilatory support, vasopressor use, transfusions, dialysis, surgical procedures, and ICU-acquired complications were recorded along with necessary laboratory investigations done. Ultrasonography was performed when indicated. Data was entered into MS Excel and analyzed using SPSS version 26.0.A p-value less than 0.05 was considered statistically significant.

Results

Table 1: Distribution of cases as per sensitivity & specificity of Admission SOFA Cut-off (≥10)

Metric	Value (%)
Sensitivity	80
Specificity	88.2
PPV	66.7
NPV	93.8

*PPV-Positive Predictive Value
*NPV–Negative Predictive Value

For the admission SOFA cutoff of ≥10, the sensitivity was 80.0%, indicating the proportion of true positives correctly identified. The specificity was 88.2%, reflecting the proportion of true negatives identified. The positive predictive value (PPV) was 66.7%, meaning the likelihood that patients with a positive test result actually had a poor outcome. The negative predictive value (NPV) was 93.8%

Table 2: Distribution of cases as per composite SOFA-component matrix– admission scores, outcome & ICU length-of-stay (LOS)

SOFA Component	Median Score Survivors (IQR)	Median Score Non-survivors (IQR)	p-value†	Mortality in Score≥2 (%)	Mean LOS ±SD (days) Score 0-1	Mean LOS±SD (days) Score≥2
Respiratory (PaO₂/FiO₂)	2 (1–2)	3 (2–4)	0.02	28.6	3.7 ±1.4	6.0 ±2.3
Cardiovascular (MAP/pressors)	1 (0–2)	3 (2–3)	0.01	35	3.5 ±1.3	6.4 ±2.5
Renal (Creatine/ Urine output)	1 (0–1)	2 (1–3)	0.04	33.3	3.8 ±1.5	6.6 ±2.6
Coagulation (Platelets)	0 (0–1)	2 (1–3)	0.03	36.4	3.6 ±1.4	6.2 ±2.2
Liver(Bilirubin)	0 (0–1)	1 (1–2)	0.05	30	3.9 ±1.6	6.0 ±2.0
CNS(GCS)	1 (0–2)	3 (2–4)	0.008	66.7	3.4 ±1.2	7.1 ±2.7

*Mann-Whitney U test for median score difference.

Across all six organ systems, non-survivors entered the ICU with markedly higher median component scores, most strikingly for the CNS (median3vs1, p < 0.01). A component score ≥ 2 doubled to trebled mean ICU stay and, except for liver dysfunction, raised mortality above 28 %. CNS dysfunction was both the least frequent (13.6 %) and the deadliest (66.7 % case-fatality), underscoring its prognostic weight. These parallel increases in organ-specific scores, LOS, and death rates reinforce the additive nature of multisystem failure captured by the composite SOFA.

Discussion

The Sequential Organ Failure Assessment (SOFA) score is a well- established tool used to evaluate the extent of organ dysfunction and predict the prognosis of critically ill patients in ICUs. Higher cumulative SOFA scores are associated with increased risk of mortality. In general ICU settings, SOFA scoring has shown consistent predictive value, especially in cases of sepsis and multi-organ failure.

The above study was conducted at the Obstetric ICU of SMS Medical College, Jaipur, to assess the role of SOFA scores in predicting the outcomes of critically ill obstetric patients.

Table 1 demonstrated that the Hosmer-Lemeshow test confirmed good calibration of the SOFA score, with predicted and observed deaths closely matching across risk deciles. Agarwal et al. (2020)[9] also found that the SOFA score had excellent calibration for predicting mortality in obstetric ICU patients, ensuring its accuracy in various settings.

Table 2 the composite SOFA-component analysis demonstrated that non-survivors consistently entered the ICU with higher median component scores across all six organ systems, with the most striking difference in the CNS domain (median score 3 vs 1, p < 0.01).

This underscores the prognostic weight of neurological dysfunction in obstetric critical illness. Indeed, in the present cohort, although neurologic dysfunction was less frequent (13.6%), it was associated with the highest mortality (66.7%). Cardiovascular, renal, coagulation, and respiratory dysfunctions also correlated significantly with mortality, each component score ≥2 nearly doubling mean ICU stay (from ~3.5 days to 6–7 days) and increasing mortality above 28%.

Hepatic dysfunction (bilirubin-based) had the least discriminative power (p = 0.05), with lower mortality compared to other systems. This finding aligns with prior literature, such as the study by Anand and Gokhale (2020)[10], where liver parameters alone were less predictive than renal or CNS involvement. The cumulative SOFA, however, remained robust, as reflected by its high AUC of 0.912 in ROC analysis in this study.

Thus, Table 2 strengthens the argument that while overall SOFA score is an excellent predictor, component-level insights add clinical value. In particular, early recognition of CNS, coagulation, and renal dysfunction may help prioritize interventions and resource allocation in obstetric ICUs.

Conclusion

In conclusion, above study demonstrates the strong predictive ability of the Sequential Organ Failure Assessment (SOFA) score in predicting maternal mortality and morbidity in obstetric intensive care unit (ICU) patients. It highlights the utility of SOFA in assessing critical illness severity, guiding clinical decisions, and improving prognostic accuracy. Given its accuracy, the SOFA score should be used routinely to assess the prognosis of obstetric ICU patients and guide management strategies to improve outcomes.

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