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Using SOFA Score to Predict Mortality Among Patients Admitted in Obstetric ICU at Tertiary Care Institution in India

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Abstract

Introduction: **C**ritical care in Obstetrics (CCOB) is an emerging area of Obstetrics with many pregnant mothers requiring critical care due to better primary care. Present study is done to evaluate use of maximum SOFA score in predicting mortality amongst mothers admitted at Obstetric ICU in a tertiary care center at Gujarat, India.

Methodology: The maximum SOFA score of 212 pregnant mothers admitted to Obstetric ICU during the study period was calculated using the sum of the result of each of the six components of scoring. Interventions required during ICU stay and outcome of pregnant mothers with respect to maximum SOFA score was noted.

Results: Majority (74.5%) pregnant mothers had maximum score of 6 to 10, 13.2% had score of 11 to 15, 8.9% had scores between 16 and 20, while 3.4% had score of between 21 and 25. There was no mortality in the SOFA score group of 6–10, while 7.1% mortality was noted in SOFA group 11 to 15, 84% mortality in SOFA group of 16–20 and 100% in 21 to 25 group.

Conclusion: SOFA score is a good indicator of risk of mortality amongst the Obstetric ICU admissions. Higher SOFA score is associated with higher mortality. Anyone with SOFA score with less than 15 has good chances of survival subject to appropriate care in critical care unit. Furthermore, data is very well comparable with international standards and suggest availability of similar quality care in Indian settings.

Keywords: Obstetric ICU; SOFA score; maternal mortality.

Introduction

Potentially severe complications occur in approximately 15% of pregnancies, resulting in 529.000 maternal deaths annually worldwide.[1] Maternal deaths occur due to pregnancy complications as well as from sub-optimal quality of health services.[2] Ensuring proper antenatal care, early identification of pregnancy complications with appropriate management, equitable access to basic and emergency skilled care is critical for saving the lives of mothers and their newborns.[1,3] Maternal death is the final stage of severe maternal morbidity (SMM)[4,5] due to various reasons. Marked alterations in organ function[6,7] are part of the pathophysiologic process of SMM.[7–10] The patterns of organ dysfunction vary widely.[11] Studies that have evaluated SMM in intensive care units (ICU) have reported that the degree of organ dysfunction, the number of failing organs, and the duration of the condition were variables directly related to higher maternal mortality.[8,9,12–14]

Many scoring systems, e.g. APACHE II, Mortality Probability Models, etc. have been used in many critical care settings to assign the severity of disease and to predict the outcome. The Sequential Organ Failure Assessment (SOFA) score[7] was developed and later validated as a tool for quantifying the degree of organ dysfunction and the prognosis of severely ill patients.[15–18] Total maximum SOFA score, a measurement resulting from and complementing the SOFA score, takes into consideration the maximum degree of alteration in organ function noted in the ICU.[18] The patterns of occurrence of organ dysfunction in women with severe complications of pregnancy, and the outcome of these patients has not been studied adequately. The objective of this study is to evaluate the applicability of maximum SOFA score (severity of the organ involvement) in predicting the outcome of Obstetric ICU admissions with respect to survival.[19] Further accurate results can be obtained by including number of failing organs or duration of condition, which have not been considered in present study.

Objectives of the Study

- To study pattern of maternal mortality at different SOFA score among pregnant women admitted in Obstetric ICU at tertiary care institutions.
- To study association and distribution of SOFA score and lifesaving critical interventions for pregnant women.
- To compare SOFA score wise mortality rates from Gujarat, India with internationally published literature on SOFA score based mortality rates from other countries and institutions.

Materials and Methods

This study has been carried out in a dedicated Obstetric ICU at New Civil Hospital, Surat after obtaining approval from the Institutional Ethics Committee. This is a government hospital attached to Government Medical College at Surat and is the Tertiary Care Center to the population of South Gujarat handling around 9000 deliveries annually.

The Obstetric ICU is six bedded unit within Obstetric department, managed by a multidisciplinary team comprising of an intensivist, obstetricians, resident doctors, medical officers, staff nurses with on call physicians and availability of all necessary equipment to provide assisted ventilation. The ICU receives patients from the same hospital as well as patients referred from outside. The critical care management is done by the intensivist-anesthetist team, while the Obstetric management including the surgical intervention is done by the Obstetricians. The Obstetric ICU admits around 50 patients annually based on the admission criteria provided in the "Operational Guidelines for Obstetric ICU/HDU of Government of India". The present study enrolled all obstetric ICU admissions over seven months study period (July 2017 to January 2018). Data regarding the baseline variables (age, parity, educational status, obstetric history, antenatal visits), indication for admission to ICU, SOFA score, interventions required and outcome was collected from the medical records of the patients after discharge from the obstetric ICU.

The total maximum SOFA score of all subjects was calculated as follows: assigning a score of 0 to 4 for each of the six indicators given in Table 1 considering the poorest result of each variable recorded during the ICU stay.

Table 1: SOFA score distribution sheet

Sr. No.	Indicator	Value	SOFA score distribution sheet				SOFA score achieved
			1	2	3	4	
1	Respiration PaO_2/FiO_2 mm Hg		<400	<300	<200	<100	
2	Coagulation Platelets $X10^3$ mm^3		<150	<100	<50	<20	
3	Liver Bilirubin mg/dl		1.2–1.9	2.0–5.9	6.0–11.9	>12.0	
4	Cardiovascular Hypotension		MAP <70 mm Hg	Dopamine <5 or Dobutamine (any dose)	Dopamine >5 or Epinephrine <0.1 or Nor epinephrine <0.1	Dopamine >15 or Epinephrine >0.1 or Nor epinephrine >0.1	

Sr. No.	Indicator	Value	SOFA score distribution sheet				SOFA score achieved
			1	2	3	4	
5	CNS Glasgow Coma Scale		13–14	10–12	6–9	<6	
6	Renal Creatinine mg/dl		1.2–1.9	2.0–3.4	3.5–4.9	>5.0	
Overall SOFA score							

Arterial blood gas analysis was performed in indicated cases only on advice of the intensivist and hence the PaO_2 values of all subjects were not available in the medical records.

Results

During the study period 212 subjects were admitted to the Obstetric ICU. During this period there were 5173 deliveries in institution, resulting in an Obstetric ICU admission rate of around 4.1%. The indications for admission to the Obstetric ICU are presented in Table 2.

The distribution of subjects with respect to the SOFA score is presented in Fig. 1.

Majority of the subjects (74.5%) had SOFA score of 6 to 10, while 3.3% subjects had SOFA scores between 21 and 25.

Table 2: Indication for admission in Obstetric ICU

Primary Indication for Admission	No. of Subjects (n = 212)	Overall Percentage (%)
Primary Obstetric Indication	123	58.02
Obstetric Hemorrhage	51	24.06
Hypertensive disorder of pregnancy	67	31.60
Sepsis	5	2.36
Primary Non Obstetric Indication	89	41.98
Severe Anemia	26	12.26
Pulmonary disease	13	6.13
Cerebral disease	1	0.47
Infective Etiology	14	6.60
Cardiac disease	23	10.85
Miscellaneous	12	5.66

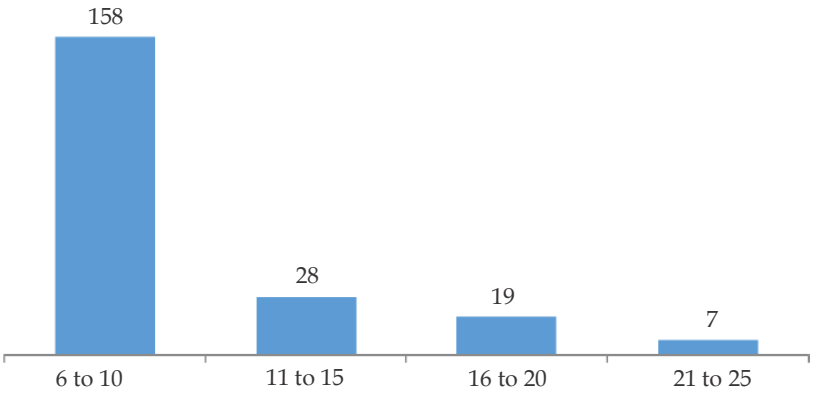

Fig. 1: SOFA score of pregnant mothers on admission.

Disease specific management of the Obstetric ICU admissions was done in consultation with departments of Medicine, Surgery, Anesthesiology. The need for assisted ventilation, inotropic support and blood component transfusion was analyzed with respect to the SOFA score in Table 3.

Table 3: The distribution of subjects with respect to the SOFA score

SOFA Score	Assisted Ventilation (*n* = 74)	Inotropic (*n* = 49)	Blood Transfusion (*n* = 130)
6 to 10 (*n* = 158)	35 (22.15%)	0 (0%)	90 (56.96%)
11 to 15 (*n* = 28)	15 (53.5%)	25 (89.29%)	22 (78.57%)
16 to 20 (*n* = 19)	17 (89.5%)	17 (89.47%)	13 (68.42%)
21 to 25 (*n* = 7)	7 (100%)	7 (100%)	5 (71.43%)

Requirement for assisted ventilation increased from approximately 22% in patients with SOFA score between 6 and 10 to nearly 90% and more in patients with SOFA score of 16 or higher. The need for inotropic support was around 90% between SOFA score of 11 to 20, which rose to 100% for score above 21. The rise in need for transfusion was not that acute with rise in the SOFA score.

The outcome of OB-ICU admissions was categorized into "transferred to ward", "death" and "discharge against medical advice (DAMA)". The subjects were transferred to the ward after they fulfilled the criteria for discharge from OB-ICU. None of the subjects who were transferred out of the OB-ICU were readmitted to the OB-ICU. The details of outcome are presented in Table 4.

Mortality among patients increased with increase in SOFA score from nil mortality among patients with SOFA score between 5 and 10 to more than 85% among patients with SOFA score of 16 or higher.

The SOFA score wise mortality was compared to the estimated mortality risk in another study[19] done in Brazil in relation to SOFA score in Fig. 2.

Table 4: Details of outcome with respect to the SOFA score

SOFA Score	Transferred to Ward	Death	DAMA
6 to 10 (*n* = 158)	158 (100%)	0 (0%)	0 (0%)
11 to 15 (*n* = 28)	25 (89.29%)	1 (7.1%)	2 (7.14%)
16 to 20 (*n* = 19)	1 (5.26%)	16 (84%)	2 (1.53%)
21 to 25 (*n* = 7)	0 (0%)	7 (100%)	0 (0%)
Overall	184 (86.8%)	24 (11.3%)	4 (1.9%)

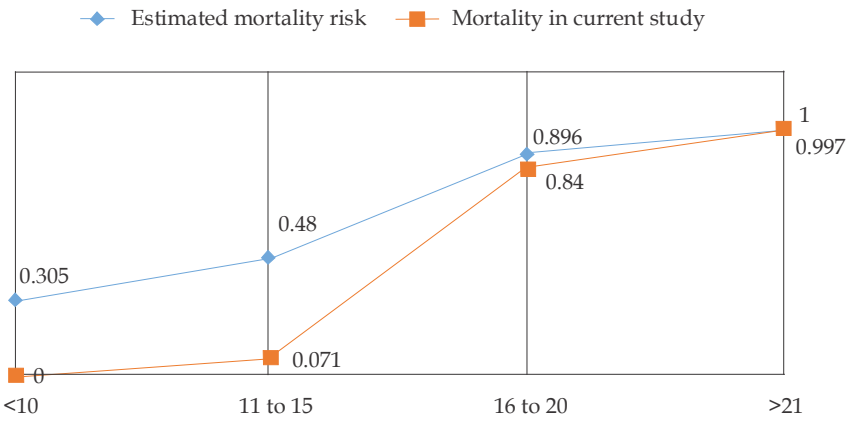

Fig. 2: SOFA score wise mortality.

Discussion

The present study investigated the degree of maximal organ dysfunction assessed by the maximum SOFA score during ICU stay in 212 cases of Obstetric ICU admissions admitted during seven months study period.

The APACHE II and SAPS II scores are commonly used in Obstetric ICUs but this study used maximum SOFA score because of the ease of calculation and ability to analyze the entire process of pathophysiology of organ dysfunction in pregnancy complications.

The limitations of this study were the inclusion

of subjects admitted for non-Obstetric reasons, the non-consideration of individual organ involvement which could be considered as topic for further study.

Majority (74.5%) of our Obstetric ICU admissions had SOFA score of less than 10, probably because we have a Hybrid Obstetric ICU which caters to patients needing HDU care too.

Out of 212 subjects admitted in Obstetric ICU during study period, 87% were discharged or shifted to HDU or wards, 2% took DAMA for personal reasons and 11% expired.

This study revealed a lower mortality risk with maximum SOFA scores of less than 15 as compared to other studies in literature, probably because of the numbers of subjects in the SOFA score less than 15 group (n = 186), many of whom fulfilled the HDU criteria for admission into the Hybrid Obstetric ICU. The current study revealed similar mortality risk in subjects with SOFA score more than 15 (n = 26) as compared to other studies reported in literature.

Conclusion

The total maximum SOFA score performs well in estimating the degree of organ dysfunction in Obstetric ICU admissions and can be used in prognosticating outcome in these subjects. It is a simple tool based on usually available laboratory resources and can be considered as an auditing strategy for critical obstetric care. It stresses on the need of providing specialized focuszed Obstetric critical care units at tertiary care centers to avert maternal death and reduce maternal morbidity.

Conflict of Interest: The authors report no conflict of interest.

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