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Original Research Article

Study on clinical profile, scoring systems and outcomes of obstetric patients in our intensive care unit

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ABSTRACT

Background: Obstetric patients in ICU, pose a clinical challenge to intensivists and obstetricians. The objective of our study was to evaluate the incidence, indications and interventions in these patients. Secondly to assess whether clinical scores can help to estimate severity of the condition, predict mortality and morbidity in these patients.
Methods: It was a retrospective observational study including all antepartum and postpartum patients admitted to ICU between January 2018 to June 2020.
Results: Majority of patients needing ICU care were in the antepartum period (82.8%). Multigravida (55.2%) and unbooked cases (60.4%) constituted a major proportion of patients. Hypertensive disorders of pregnancy followed by sepsis amounted for common etiologies. Transfusions (43.2%), ventilatory support (26%) followed by inotropic support (14.9%) were the interventions required in the majority number of patients. Maternal mortality rate was 2.23%. Out of the clinical scores, OEWS (Obstetric early warning score) was a better modality to assess the severity of the disease and the need for ICU care.
Conclusions: A multidisciplinary approach and close coordinated care of obstetric patients can reduce the maternal mortality rate. Early identification of critically ill obstetric patients using clinical scores can help us in triaging patients to high dependency units/ICU. OEWS is a very simple score which helps us in identifying patients needing intensive care.

Keywords: ICU care, Obstetric patients, OEWS, Interventions, Severity scores

INTRODUCTION

According to WHO, Maternal death is defined as death of a woman while pregnant or within 42 days of termination of pregnancy, from any cause related to or aggravated by pregnancy or its complications.[1] As per WHO data 2010, the incidence of maternal mortality rate (MMR) was 210 maternal deaths per 100000 live births. India accounts for 19% global maternal deaths.[2] The incidence of pregnant women admitted to ICU in developed countries is 2 to 4 per 1000 deliveries as compared to 2 to 13.5 per 1000 deliveries in developing countries.[3] Management of critically ill obstetric patients pose a challenge to intensivists and obstetricians, as the patients are young and healthy but can rapidly deteriorate without warning signs. Indications of admission to ICU in obstetric patients can be antepartum or post-partum. Most of these patients are lost to follow up on delivery and present late to hospital in the postpartum period due to untoward complications. Obstetricians and treating physicians should be aware of the common conditions needing ICU care in these patients.

Clinical severity scores or prognostic scoring systems like APACHE II (acute physiology and chronic health evaluation), and SOFA (sequential organ failure assessment score) are used routinely for every patient in ICU as it helps in predicting the severity of disease and mortality prediction at the time of presentation. Usage of

above scores in obstetric populations overestimates the mortality risk as seen by previous studies.[4,5] OEWS was designed exclusively for obstetric patients which is clearly based on physiological variables and is very simple. In the Indian population, whether these scores are helpful in estimating mortality and morbidity has been less studied.

This study was conducted in a tertiary care center in South India to see the incidence and common etiologies in the obstetric population requiring intensive care management. Can the clinical scores be used as tools to assess the severity of the condition and to predict mortality and morbidity?

METHODS

This was a retrospective observational study conducted in Bangalore Baptist Hospital located in Bangalore, Karnataka. Bangalore Baptist Hospital is a 340 bedded tertiary care center with a 40 bedded intensive care unit. After obtaining institutional clearance, retrospective data was retrieved from our medical records department. We included all antepartum and postpartum (up to 42 days after delivery) women admitted to our ICU between January 2018 to June 2020.

Demographic data, clinical profile, provisional and final diagnosis with relevant laboratory data was collected for each patient. Interventions done in ICU like transfusions, ventilatory support (invasive/non-invasive), renal replacement therapy, inotropic support and surgical interventions were recorded. Outcome measures in terms of mortality, length of ICU stay and length of hospital stay were reviewed. Clinical scores like APACHE II, SOFA, OEWS were calculated from the parameters available at and within 24 hours after admission.

Statistical analysis

All the data collected was analysed through SPSS software 21.0. Data was represented as frequencies, percentages, mean and standard deviation, median and interquartile range. Comparison for quantitative variables was done through Student's t test and Mann-Whitney U test for independent samples for parametric or non parametric data respectively. A probability value (p value) of <0.05 was considered statistically significant.

RESULTS

Total number of admissions to our ICU in the span of 30 months was 4046 patients, out of which the obstetric patients needing intensive care were 134 patients. Incidence of obstetric admissions to our ICU was 3.3%. The total number of deliveries in our hospital during the study period was 7530. Obstetric admissions to ICU were 134 which constituted 1.7% of total deliveries.

The mean age group of the patients was 27.04±5.23 years with the age group between 20 to 29 years constituting 59.7% of the patients followed by 33.6% between 30 to 39 years.

Table 1: Non obstetric causes of ICU admission (N=39, 29.1%).

Indication for ICU admission	Number of cases
Anemia	8
Peripartum cardiomyopathy	4
Seizures	4
ITP	3
Congenital heart disease	3
Anaphylaxis	2
ARDS	2
HIV	2
Dyselectrolytemia	2
Intracranial bleed, subarachnoid hemorrhage	2
Pulmonary embolism	1
Pancreatitis	1
Others	5

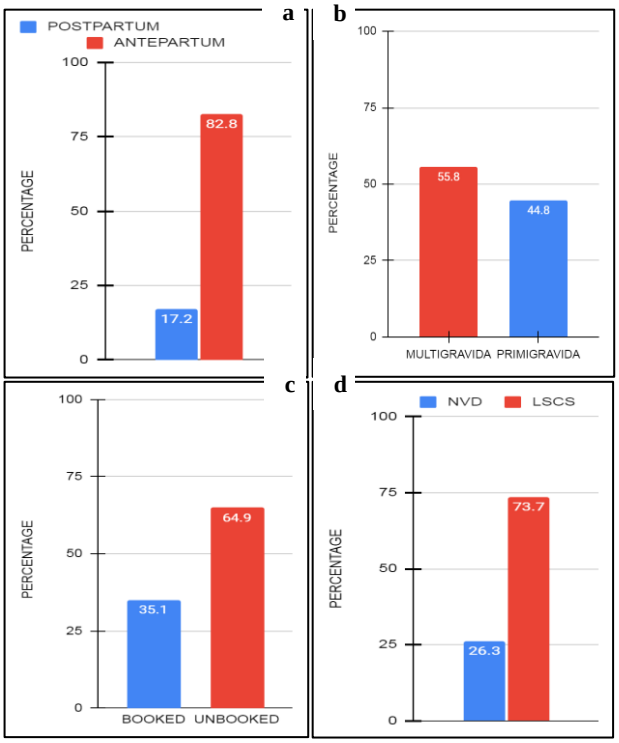

Figure 1 (a-d): Clinical profile of patients.
1d- mode of delivery, NVD- normal vaginal delivery, LSCS- lower segment caesarean section

Out of the admissions to ICU, 82.8% of patients required intensive care in the antepartum period, 17.2% in their postpartum period (Figure 1a).

55.2% of patients were multigravida and 44.8% were primigravida (Figure 1b). Majority of cases requiring ICU care (60.4%) were having their antenatal check in another

hospital or referral center (Figure 1c). However, 72.4% of patients had their delivery in our hospital.

Mode of delivery- 73.7% of patients underwent LSCS, 26.3% had normal vaginal delivery (Figure 1d).

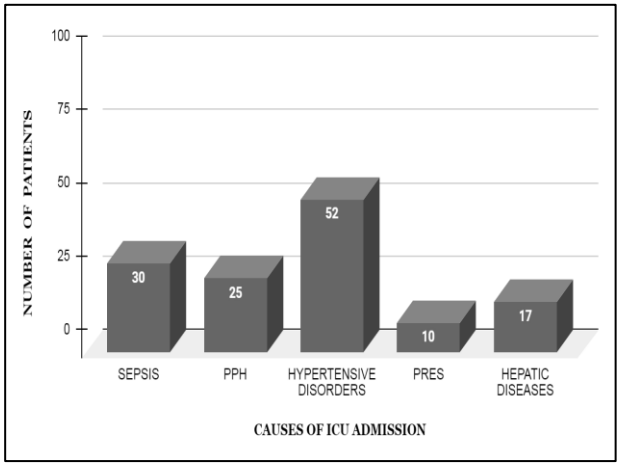

Figure 2: Obstetric causes for ICU admission.

Most common etiologies in pregnant and postpartum patients needing intensive care were sepsis, postpartum hemorrhage, preeclampsia, eclampsia, PRES (Posterior reversible Encephalopathy syndrome), liver diseases (viral hepatitis, acute fatty liver of pregnancy and HELLP (hemolysis, elevated liver enzymes and low platelet count) syndrome (Figure 2). Three cases of congenital heart disease (ostium primum atrial septal defect, ostium secundum atrial septal defect, ventricular septal defect with Eisenmenger syndrome) were admitted in the antenatal period due to complications of pregnancy.

Surgical interventions other than LSCS were needed in 30 patients. 8 patients underwent dilation and curettage for incomplete abortion, 9 patients underwent laparotomy and tubal ligation for ruptured ectopic pregnancy. In patients with postpartum hemorrhage, 2 patients had Bakri balloon insertion, 2 patients had Haymann sutures, and 2 patients underwent bilateral uterine artery ligation as a treatment modality to control bleeding. 5 patients underwent cesarean hysterectomy for placental abnormalities like increta, accreta, and percreta. Majority of patients who underwent surgical procedures were admitted in the critical care unit in view of hemorrhagic/hypovolemic shock or need for ventilatory support post operatively.

Non-invasive or invasive ventilatory support was required in 35 (26%) number of patients, 20 patients (14.9%) required inotropic support, and 3 (2.2%) patients required dialysis for acute renal failure. 58 (43.2%) patients required blood transfusion, out of which 23 (17.1%) patients required more than 5 units of blood products during their hospital stay (Figure 3).

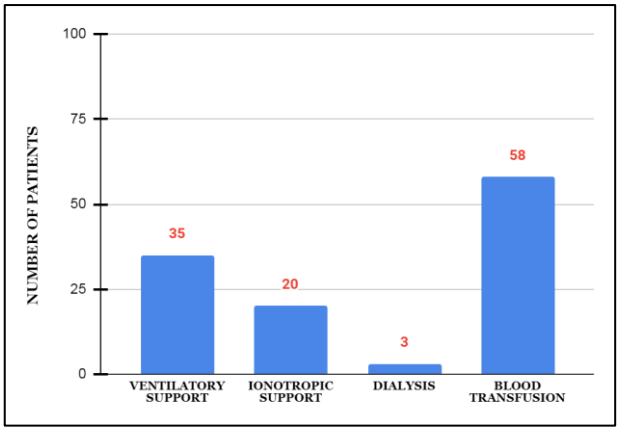

Figure 3: Need for intervention.

Table 2: Outcomes of patients.

Variables (N=134)	Frequency (n)	Percentage
Patient status		
Discharged	130	97
DAMA	1	0.7
Death	3	2.2
ICU stay ≤48 hours		
Yes	85	63.4
No	49	36.6
Hospital stay ≥7 days		
Yes	88	65.7
No	46	34.3

Out of 134 patients, we observed 3 deaths (Table 2). Patient 1 was referred from another hospital with preeclampsia, atonic PPH following preterm normal vaginal delivery. The patient was on invasive ventilatory support, inotropic support and underwent subtotal hysterectomy. Mortality was secondary to hypovolemic shock and pulmonary edema.

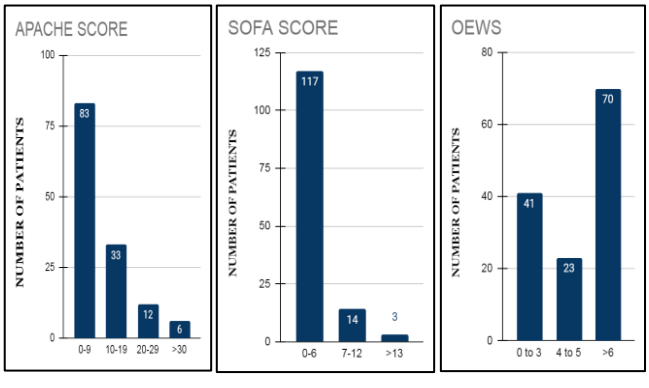

Figure 4: Various scores and categorization of obstetric patients requiring ICU care as per score.

Patient 2 was referred from outside hospital post LSCS with sepsis, post cardiac arrest hypoxic ischemic encephalopathy on tracheostomy. Patient was on

ventilatory support, inotropic support and mortality was secondary to refractory septic shock.

Patient 3 was referred to our hospital in cardiac failure with history of ventricular septal defect Eisenmenger syndrome, in 30 weeks of gestation. The patient was managed on non-invasive ventilatory support, inotropic support, and underwent LSCS. Post LSCS, patient had cardiac decompensation, pulmonary edema, arrhythmias and cardiac arrest.

Patients were categorized into two groups with ICU stay more than and less than 48 hrs, hospital stay more than 7 days and less than 7 days. The mean duration of ICU stay and hospital stay were 3±3.1 days and 7.6±5.4 days respectively (Table 2). Association between APACHE II, SOFA and OEWS scores were done using Mann-Whitney U test with ICU stay, hospital stay and need for intervention.

Table 3: Association of scores with outcomes using Mann-Whitney U test.

Scores	Outcomes	Median (IQR)	Mann-Whitney	P value
APACHE	**ICU stay**			
	ICU stay <48 hours	7 (5)	907.000	<0.001*
	ICU stay >48 hours	12 (14)		
	Hospital stays			
	Hospital stay <7 days	8 (6)	1529.500	0.020*
	Hospital stay >7 days	9 (11)		
	Need for intervention			
	Yes	9 (11)	1026.000	<0.001*
	No	6 (4)		
	Transfusion			
	Yes	9 (11)	1728.000	0.032*
	No	7 (8)		
SOFA	**ICU stay**			
	ICU stay <48 hours	1 (2)	738.000	<0.001*
	ICU stay >48 hours	5 (5)		
	Hospital stays			
	Hospital stay <7 days	2 (3)	1379.000	0.002*
	Hospital stay >7 days	4 (6)		
	Need for intervention			
	Yes	3.5 (4)	955.500	<0.001*
	No	1 (2)		
	Transfusion			
	Yes	3 (4)	1874.500	.135
	No	2 (4)		
OEWS	**ICU stay**			
	ICU stay <48 hours	4 (5)	1132.000	<0.001*
	ICU stay >48 hours	7 (6)		
	Hospital stays			
	Hospital stay <7 days	5 (5)	1383.500	0.003*
	Hospital stay >7 days	7 (8)		
	Need for intervention			
	Yes	6 (6)	1197.500	0.001*
	No	3.5 (4)		
	Transfusion			
	Yes	5 (7)	2152.000	0.815
	No	5 (6)		

We observed a significant association between APACHE II, SOFA, OEWS scores and ICU stay, hospital stay and need for intervention with a significant p value <0.05. Patients who needed ICU care for more than 48 hours and hospital stay more than 7 days had higher APACHE II, SOFA and OEWS scores compared to patients with ICU stay less than 48 hrs and hospital stay less than 7 days (Table 3).

Patients requiring interventions like ventilatory support, inotropic support and dialysis had higher APACHE, SOFA AND OEWS scores compared to patients who didn't require any intervention. However, in patients requiring blood transfusion, there was no significant association with APACHE II, SOFA and OEWS scores (p value >0.05) using the Mann-Whitney U test (Table 3).

DISCUSSION

Our hospital is a tertiary care center offering obstetric and neonatal care for all socioeconomic groups of patients. Majority of patients under our obstetric care are booked in our hospital, however a significant number of unbooked cases are referred due to various complications during pregnancy or peripartum period. Our obstetric department has a high-risk labor room, where patients requiring close hemodynamic monitoring, oxygen requirements, and frequent monitoring by the obstetricians are admitted. Patients who deteriorate requiring further intensive care in view of worsening shock, respiratory parameters, and clinical status are shifted to ICU.

Maternal admissions into the ICU constituted about 3.3% of overall ICU admissions and 1.7% of total deliveries in the 30 months of study period compared to 1.29% of all deliveries in the study by Bahadur et al, 0.8% of all deliveries in the study by Verma et al and 0.14% by Gupta et al.[6-9]

The higher rate of ICU admissions of obstetric patients in our study could be due to the presence of renowned obstetricians in our center and the significant number of patients coming for obstetric care. Since our hospital is a tertiary care referral center, complicated obstetric cases are referred to us for multidisciplinary care.

The mean age group of the patients in our study was 27±5 years, comparable to other studies by Bahadur et al, Gupta et al.[7,8] Majority of patients admitted to ICU were multigravida (55.2%) similar to Gupta et al and Verma et al.[8,9] 82.8% of patients needed ICU care in their antenatal period as compared to Joseph et al, Bhadade et al.[10,11]

As our hospital is a tertiary care center, 60.4% (unbooked) cases admitted to ICU were referred from other hospitals for further management as they were not well equipped to manage obstetric emergencies which is comparable to the study by Ashraf et al.[12]

Out of the maternal admissions to the ICU, 70.9% had predominant obstetric causes and 29.1% had non obstetric causes. Peripartum cardiomyopathy, idiopathic thrombocytopenic purpura, congenital heart disease, seizures unrelated to eclampsia constituted the majority of the non-obstetric etiologies (Table 1).

In obstetric causes, hypertensive disorders of pregnancy (preeclampsia, eclampsia) accounted for 45.6% of cases, followed by sepsis (22.3%), postpartum hemorrhage (18.6%) and hepatic diseases secondary to pregnancy (13.4%). These results are comparable to studies done by Chawla et al and Saha et al who also found hypertensive disorders of pregnancy as the commonest condition requiring ICU admission.[13,14]

Total numbers of patients requiring intervention were 67 (50%), the majority of patients came to ICU secondary to deterioration of their respiratory parameters needing noninvasive or invasive ventilatory support. Remaining 67 patients in the ICU who did not need intervention were those who improved with optimal fluid resuscitation for hemodynamic instability, required high oxygen support and who needed close monitoring in view of multiorgan dysfunction.

The mean duration of ICU stay was 3±3.1 days which was comparable to studies done by Joseph et al and Bahadur et al.[7,10]

Maternal mortality rate in our study was 2.23% with 3 deaths which is very low as compared to other studies.[4,7,10] Our patients had lower APACHE II and SOFA scores. We have dedicated high risk labor rooms for patients who show clinical signs of impending obstetric emergency. Early identification of patients who require intensive care before deterioration is done by round the clock observation by obstetricians and if required by physicians in these high-risk labor rooms. A multidisciplinary approach to the patient in ICU and close coordinated care by both obstetricians and critical care physicians was responsible for a low mortality rate.

Within 24 hours of admission to ICU, Clinical severity scores were calculated for all patients using the clinical and laboratory parameters. On analysis it was seen that majority of obstetric patients requiring ICU admission or transfer in had APACHE II score between 0-9 (estimated mortality of 4%), SOFA score between 0-6 (estimated mortality less than 10%) whereas patients with OEWS >6 (requiring high grade response) constituted majority of obstetric patients requiring ICU care (Figure 4).

The mean APACHE II score was 10.51±7.79, with a predicted mortality rate of 21.3%. In our study the actual mortality rate was 2.2% which suggests that APACHE II score overestimated mortality which has also been documented by other studies.[4,15] The observed mortality rate is always lower than the predicted mortality rate in obstetric patients as the score is calculated based on the physiological changes in pregnancy rather than the pathological changes. These changes are reversible following delivery. Prompt management of various obstetrical emergencies helps in reducing the morbidity and mortality in the parturient.

OEWS was found to have statistically significant association when compared to need for intervention, patients requiring ICU stay more than 48 hours and hospital stay more than 7 days which was at par with

APACHE II and SOFA score. OEWS was found to have significant correlation with length of ICU stay and hospital stay. This was similar to the study done by Khergade et al with respect to OEWS scores.[16]

OEWS can be used to risk stratify the patients requiring high level care. In our study we have observed that 71 patients out of 134 patients requiring ICU care had OEWS of >6. OEWS is very simple to calculate, user friendly and depends on physiological variables which play a major role during pregnancy and there is no need to wait for any laboratory parameters which is the case with APACHE II and SOFA. However, it cannot be used to predict mortality risk as with the other scores. Teaching the calculation of OEWS to all health care physicians and nurses in an obstetric unit can help in early identification and timely management of high-risk obstetric patients requiring ICU or high dependency unit care.

There are some limitations. Our study is a retrospective study, and we did not include patients from high-risk labour rooms, which also constitutes a major number of patients requiring adequate care. As our mortality rate was low, we could not validate our scores to predict the mortality. In the unbooked cases referred to our hospital we could not get details of the adequacy of antenatal care, or any delay in referring patients.

CONCLUSION

Maternal mortality and morbidity is high in developing countries in spite of increasing health care facilities, providing adequate antenatal care in peripheral areas and prompting institutional deliveries. Early identification, risk stratification, prompt referral and multidisciplinary approach in treating obstetric emergencies is the key to reduce the maternal mortality rate. In our study, we found that identifying high risk obstetric patients and treating them appropriately in ICU has contributed to a low mortality rate. Hypertensive disorders of pregnancy were the most common cause for ICU admission. As a scoring system for obstetric patients needing ICU care the OEWS was a better modality than APACHE and SOFA score in our study. The importance of high risk labour rooms cannot be overemphasized. All health care professionals involved in management of obstetric patients should undergo mandatory training in obstetric critical care.

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