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# Maternal Outcome in Obstetric Patients Requiring Critical Care in a Tertiary Referral Centre

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**Abstract**

**Background:** Obstetric admissions to the intensive care unit (ICU) are a subject of increasing interest, as it is an indirect indicator of maternal morbidity and mortality. The present study was undertaken to identify the risk factors influencing maternal outcome and also analyze the causes of obstetric ICU admissions, prognostic indicators, complications, duration of stay, interventions and maternal outcome.

**Method:** Total 50 critically ill obstetric patients requiring ventilatory support or major organ supportive therapy were admitted to the ICU at LTMMC and LTMGH, Sion Mumbai over a period of 18 months. Major equipment's were attached to each patients and an exhaustive Performa was developed to record the various data of patients.

**Results:** Postpartum hemorrhage (PPH) (11; 22%) and ectopic pregnancy (7; 14%) were observed in most of the patients. PPH was found to be the foremost important cause for ICU admission. Anaemia due to obstetric hemorrhage was the major risk factor (9 patients = 8 discharged and 1 expired) followed by previous LSCS (7 patients, 100% discharged) and infection (6 patients= 1 discharged and 5 expired). Mean SAPS II score and mean hospital mortality for expired patients was higher (44.13±8.95 and 34.47±17.68 respectively) as compared to survived patients (31.79±5.95 and 13.87±6.75 respectively). The area under ROC curve was 0.89 and it has a sensitivity of 87.5% and specificity of 52.4%.

**Conclusion:** Obstetric haemorrhage leading to haemodynamic instability remains the leading cause of ICU admission and SAPS II score provides reliable prediction of mortality without having to specify a primary diagnosis.

**Keywords:** Morbidity, Mortality, Antenatal /Postnatal, Anaemia, SAPS II score, Obstetric hemorrhage

## Introduction

Obstetric patients with a broad spectrum of pathophysiological conditions some of which are

preeclampsia, haemorrhage, and sepsis syndrome benefit from the technology and expertise of critical care obstetrics. Pregnancy possesses unique consideration for critical care and it is imperative that obstetricians and other members of the healthcare team should have a working knowledge of these factors. Because these women are usually young and in good health, their prognosis should be better than that of many other patients admitted to an intensive care. Depending on methods and protocols at various institutions, approximately 1% of obstetrical patients need some type of intensive observation and management. Women with complications specific to pregnancy have the greatest need for obstetrical intensive care [1, 2].

Despite the drastic decrease in maternal morbidity over the last few decades because of improvements in obstetric care, maternal mortality remains to be a challenge in the developing world. Although patients receiving obstetric care are young and healthy in general, there is a high potential for catastrophic complications related to the pregnancy and the delivery. Only a few studies have been published in concern to ICU admissions of obstetric patients in the developing world, in which maternal mortality rates have ranged from 28% to 60% [3, 4], as compared to the rates ranging from 3% to 20% in studies conducted in the developed world [5].

Based on the fact that the risk factors defining pronounced maternal morbidity and maternal mortality in the developing world are not well established, the present study was conducted to evaluate the obstetric admissions to the ICU in the setting of a tertiary referral hospital in an attempt to identify the risk factors influencing maternal outcome. Also, to assess the severity and outcome with the help of a scoring system, analyze the most important prognostic indicators and its significance on maternal mortality rate, investigate the indications, interventions and clinical outcome of pregnant and newly delivered and post-abortal women, also determine the current spectrum of disease in an obstetric population resulting in admission to ICU in tertiary care centre.

**Materials and Methods**

The present observational study was carried over a period of 18 months at Lokmanya Tilak Municipal Medical College and Hospital, Mumbai. Total 50 antenatal and postnatal women were enrolled as the study group and these patients were either registered at or are referred to Sion hospital. Inclusion criteria were all pregnant women irrespective of the duration and site of pregnancy, women during first 6 weeks of postpartum period irrespective of mode of delivery, women within 6 weeks of abortion, and all booked and unbooked cases during pregnancy and within 6 weeks of postpartum and post-abortal period. All non-obstetric patients and patient's or patient party's refusal were excluded from the study.

Critically ill obstetric patients requiring ventilatory support or major organ supportive therapy were admitted to the ICU. Our ICU is located on 1st floor of emergency building having 12 beds where obstetric and gynaecological patients can be admitted. Major equipments include three L and T multiparameter monitors (electrocardiogram (ECG), non-invasive blood pressure (NIBP)/ invasive blood pressure (IBP), heart rate (HR), oxygen saturation (SpO2), respiratory rate, temperature), microprocessor controlled ventilator with weaning modes (Nelcor Puritan Bennett) for each bed, crash cart, defibrillator, suction machine and electrocardiographic machine. An exhaustive Performa was developed to record the various data of patients admitted to obstetric ICU. The data collected included basic demographic data, obstetric and medical history, status of pregnancy before hospital admission, hospital course, ICU course, treatment taken and the specific

interventions done, patient's outcome predicted with SAPS II Scoring system during first 24 hours and causes of maternal death (whenever applicable).

**Data analysis**

Data were analyzed using the Statistical Package for Social Sciences (version 13, SPSS, Chicago, IL). For normally distributed demographic data, results were given as mean and standard deviations (SD). The Student t-test was used to compare mean variables in survivors and non-survivors. The chi-square test was used to compare categorical variables in survivor and non-survivor groups. P 'value' of less than 0.05 was considered significant.

**Observations and Results**

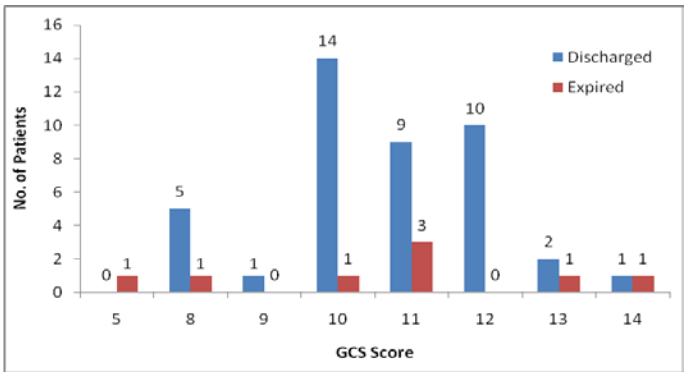
Among the 50 patients, maximum numbers of patients were in the age group of 21-25 years (42%) with mean age of patient was 25.21 years. Table 1 show the association between demographic data i.e. age, baseline clinical characteristics (Antenatal/Postnatal Status, parity and ANC registered) and outcome. There was no correlation found between age group, antenatal /postnatal status, parity, ANC registration and outcome.

Table 1: Association between demographic data, baseline clinical characteristics and Outcome

| Age (in Years) | Outcome | | | Total | P value |
|---|---|---|---|---|---|
| | Discharged (n=42) | Expired (n=8) | | | |
| ≤20 | 3 (100%) | 0 (0%) | | 3 (6%) | 0.327 |
| 21-25 | 18 (85.7%) | 3 (14.3%) | | 21 (42%) | |
| 26-30 | 14 (73.7%) | 5 (26.3%) | | 19 (38%) | |
| >30 | 7 (100%) | 0 (0%) | | 7 (14%) | |
| Antenatal/Postnatal Status | ANC | 8 (66.7%) | 4 (33.3%) | 12 (24%) | 0.060 |
| | PNC | 34 (89.5%) | 4 (10.5%) | 38 (76%) | |
| Parity | Primigravida | 13 (76.5%) | 4 (23.5%) | 17 (34%) | 0.297 |
| | Multigravida | 29 (87.9%) | 4 (12.1%) | 33 (66%) | |
| ANC Registered | Yes | 29 (85.3%) | 5 (14.7%) | 34 (68%) | 0.716 |
| | No | 13 (81.3%) | 3 (18.7%) | 16 (32%) | |

The minimum GCS score was 5 and maximum GCS score was 14. Majority of patients i.e. 15 (30%) had GCS score of 10 of which 14 (93.3%) got discharged and 1 (6.7%) expired. Details of association between Glasgow Coma Scale (GCS) and outcome are shown in figure 1.

Figure 1: Association between Glasgow Coma Scale (GCS) and Outcome (N=50)




Out of 50 cases, 39(78%) required ventilation of which 32(82.1%) got discharged and 7(17.9%) expired. Rest 11 (22%) did not require ventilation of which 10 (90.9%) got discharged and 1 (9.1%) expired. Thus, there was no correlation found between mechanical ventilation and outcome, (P value =0.479).

Chronic renal disease affected was 1(2%) which got discharged (100%), (p=0.659). 2 (4%) was having hepatic disease and both expired (100%) and 3(6%) were TB affected and all three died (100%). The association of hepatitis and tuberculosis with maternal mortality was statistically significant (p value of <0.001).

All the patients with diagnosis of AFI-myocarditis, APH, Atonic PPH, Eclampsia, Peripartum cardiomyopathy, Placenta previa, PPH, Pre eclampsia with AKI, RHD, Rupture uterus, Secondary PPH, Status epilepticus, TB meningitis were discharged (100% outcome as discharge)

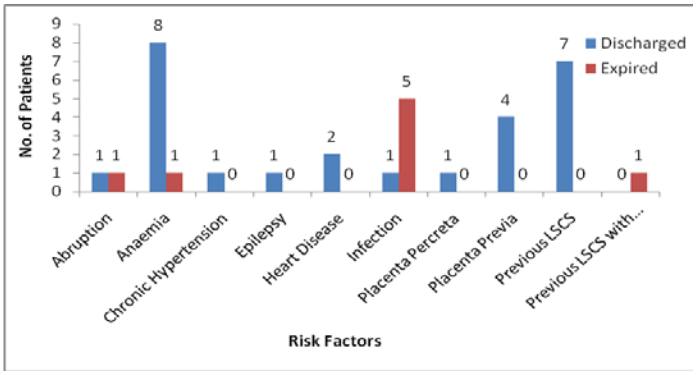
whereas all the patients with diagnosis of AFI-ARDS, APH-AKI, ARDS, HELLP with DIC, PPH DIC, TB meningitis were expired (100% outcome as expired). Thus, the association of diagnosis of AFI with ARDS, APH with AKI, ARDS, HELLP with DIC, PPH DIC, TB meningitis with maternal mortality was statistically significant, (Table 2). PPH was found to be major cause for ICU admission of obstetric patients.

Table 2: Association between Diagnosis and Outcome

| Diagnosis | Outcome | | Total | P value |
|---|---|---|---|---|
| | Discharged (n=42) | Expired (n=8) | | |
| AFI with ARDS | 0 (0%) | 1 (100%) | 1 (2%) | 0.020* |
| AFI with Myocarditis | 1 (100%) | 0 (0%) | 1 (2%) | 0.659 |
| APH | 1 (100%) | 0 (0%) | 1 (2%) | 0.659 |
| APH with AKI | 0 (0%) | 1 (100%) | 1(2%) | 0.020* |
| ARDS | 0 (0%) | 1 (100%) | 1 (2%) | 0.020* |
| Atonic PPH | 2 (100%) | 0 (0%) | 2 (4%) | 0.528 |
| Eclampsia | 4 (100%) | 0 (0%) | 4 (8%) | 0.362 |
| Ectopic Pregnancy | 6 (85.7%) | 1 (12.5%) | 7 (14%) | 0.893 |
| HELLP with Encephalopathy | 3 (75%) | 1 (25%) | 4 (8%) | 0.608 |
| HELLP with DIC | 0 (0%) | 1 (100%) | 1 (2%) | 0.020* |
| Peripartum Cardiomyopathy | 2 (100%) | 0 (0%) | 2 (4%) | 0.528 |
| Placenta Previa | 1 (100%) | 0 (0%) | 1 (2%) | 0.659 |
| PPH | 11 (100%) | 0 (0%) | 11 (22%) | 0.101 |
| PPH DIC | 0 (0%) | 1 (100%) | 1 (2%) | 0.020* |
| Preeclampsia with AKI | 2 (100%) | 0 (0%) | 2 (4%) | 0.528 |
| RHD | 2 (100%) | 0 (0%) | 2 (4%) | 0.528 |
| Rupture Uterus | 4 (100%) | 0 (0%) | 4 (8%) | 0.362 |
| Secondary PPH | 2 (100%) | 0 (0%) | 2 (4%) | 0.528 |
| Status Epilepticus | 1 (100%) | 0 (0%) | 1 (2%) | 0.659 |
| TB Meningitis | 0 (0%) | 1 (100%) | 1 (2%) | 0.020* |
| Chi-Square Test, P Value *Significant | | | | |

All patients with risk factors of chronic hypertension, epilepsy, heart disease, placenta previa, placenta percreta, previous LSCS were discharged i.e. 100% discharged, whereas all patients with previous LSCS with abruption expired (100% mortality). 50% of patients with abruption as risk factor were discharged and 50 % patients expired. 88.9% patients with anemia were discharged and 11.1% were expired. As patients with infection as risk factor 16.7% patients were discharged and 83.3% patients were expired, (Figure 2). The association of infection and previous LSCS with abruption as a risk factor for maternal mortality was statistically significant.

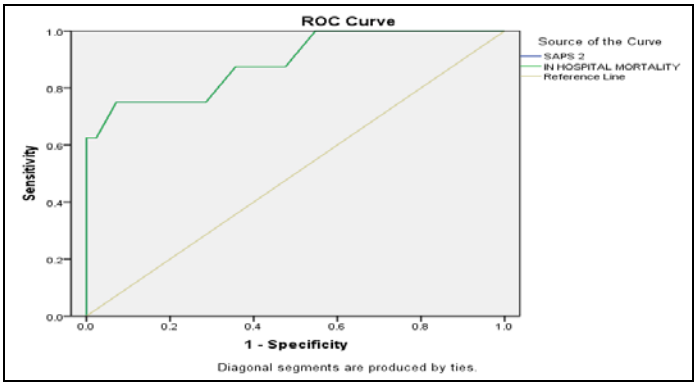
Figure 2: Association between Risk Factors and Outcome




Mean SAPS II score and mean hospital mortality for expired patients was higher (44.13±8.95 and 34.47±17.68 respectively) as compared to survived patients (31.79±5.95 and 13.87±6.75 respectively). The difference was significant (p value < 0.001).

Figure 3 shows the ROC curve that was plotted using SAPS II scores. The area under ROC curve was 0.89, which again shows a good fit. It has a sensitivity of 87.5% and specificity of 52.4%. 95% CI value and cut-off value was 0.0-1.0 and 32.0 respectively.

Figure 3: ROC curve



**Discussion**

The present study was carried out to assess the ICU admitted critically ill obstetric patients and their outcome in an attempt to assess the need for dedicated critical care facilities. Since most of the mortality occurred in wards or emergency outpatient areas without utilization of ICU services, a delay in identification of criticality of such patients could be a major cause for underutilization of the ICU. Low socio economic statuses, lack of education and poor antenatal care have been found to have a considerable effect on obstetric complication and outcome. However we could not find any association of factors like level of literacy, rural /urban background and distance travelled for reaching the hospital with higher incidence of ICU admission or poor outcome. The lack of antenatal care has not been associated as risk factor for ICU admission as was also observed in current study.

SAPS II score system validated our data well in obstetric patients admitted to ICU. If it were higher than 43, it would have been 100% sensitive. So it is apparent that SAPS II score is quite useful in predicting the prognosis, particularly in terms of mortality. Majority of the patients were either directly coming to our hospital in poor condition, treated by either quacks or dais or referred from peripheral health centres. They belonged to low socioeconomic strata, had not received antenatal care and also had come without adequate treatment - these factors accounting for high mortality in these patients. They were also found to be having low hematocrit levels and were undernourished. Caesarean sections and caesarean hysterectomy were the most common surgeries associated with ICU transfers. Marked association was observed between postpartum haemorrhage, whether during normal delivery or caesarean section, and hemorrhagic shock and acidosis, which led to ICU admission and mortality. Tang et al [6], in their review found massive postpartum haemorrhage as the single most common cause of ICU admission (53%), followed by preeclampsia and eclampsia.

There was no correlation found between age and outcome. Most of the admitted patients were postnatal admissions and there was no correlation between postnatal admission in ICU and their outcome. These findings are similar to the study conducted by Gupta et al [7]. Maximum patients transferred to ICU were multigravida. 62 % patients were registered but there was no correlation between ANC registration and outcome.

It has been observed that hemodynamic instability and respiratory complications needing inotropic and ventilatory support remain the most common reasons for ICU admissions and the need may predict poor outcome. In current study 78% required ventilation which is comparable with the study done by Jain et al, (85; 94.4%) [8]. Pre-eclampsia with postpartum haemorrhage was maximum contributor to admissions in ICU but other medical conditions like renal involvement in the form of acute kidney injury and hepatic involvement as hepatitis E has worsen the condition. 2% cases had chronic renal disease of which both survived and 4% had hepatic involvement of which all died and 3% were tuberculosis affected all who went into ARDS and died. These findings are correlated with the study done by Farr et al [9].

Post-partum haemorrhage was found to be the foremost important cause for ICU admission. Obstetric haemorrhage was leading cause of mortality in 32% of the patients, similar findings were observed in Gupta et al study [7]. Several investigators have reviewed critical care in obstetrics patients admitted to the intensive care unit, and a variety of scoring tools have been applied to predict the probability of mortality in critically ill patients [7, 10-16]. In present study, SAPS II scoring system was applied. The mean SAPS II score for expired patients was

higher i.e 44.13, compared to that of survived patients (31.79) and difference was significant (p value < 0.001) which is comparable with the study conducted by Tempe et al [17]. In a recent study by Gilbert et al [18] in 2003 of 233 obstetric patients admitted to medical ICU, SAP II score accurately predicted hospital mortality among patients admitted to ICU for medical reasons but performed poorly in predicting deaths for patients admitted for only obstetric reasons and for postpartum haemorrhage. Present study concluded that SAPS II is a good predictor of mortality in obstetric patients. Differences in patient populations, viz., with respect to race, socioeconomic status and nutritional status, besides late arrivals in critical state at our institution, might account for the observed variations.

A new potential application for the SAPS II, which was originally developed to predict in-hospital mortality rates and to assess the quality of care. However, the SAPS II does not integrate the status of patients at ICU discharge, which would have been desirable for this score to help with end-of-life decision-making. It is obvious that the score alone will never replace human decision-making in this type of situation. It may be that the SAPS II is more or less effective depending on the subgroup examined. Indeed, the subgroup analysis we conducted according to reason for admission produced quite different curves. For example, the SAPS II seems to be less useful for patients admitted for coma or respiratory distress than it is for patients admitted for any kind of shock.

The limitation of current study was that data were collected retrospectively, bias could exist and the sample size was small. Moreover, differences in access to health care, ICU admission criteria and disease severity and admission indication (medical, obstetrical reasons) make comparison difficult. So, future research should be directed in using the SAPS II score prospectively for predicting mortality.

**Conclusion**

Obstetric haemorrhage leading to haemodynamic instability remains the leading cause of ICU admission and SAPS II score provides reliable prediction of mortality without having to specify a primary diagnosis.

The present study suggested that it is important for ICUs to be prepared to manage critically ill obstetric patients. The most important issue to remember in such cases is that intensivists need to care for two lives. A team approach with an active involvement of the obstetrician is essential. Management strategies regarding mechanical ventilation, nutrition, antibiotic therapy, sepsis management etc need to be suitably modified on the basis of physiological changes seen during pregnancy, perpurieum and the associated medical diseases.

Attention should be focused on prevention of factors leading to high score. Improvement in antenatal care to primarily achieve optimum hematocrit levels and availability of blood products and teaching/education of rural units and health personnel would help in decreasing mortality, particularly due to hemorrhage. Also there should be a short period of training in the ICU for all residents of obstetrics and gynaecology and other clinical specialties for better healthcare should be mandatory.

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