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## Obstetric patients requiring critical care: Retrospective study in a tertiary care institute of Pakistan

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## Obstetric Patients Requiring Critical Care: Retrospective Study in a Tertiary Care Institute of Pakistan

### Abstract

**Background:** The outcome of obstetric patients admitted to the intensive care unit (ICU) depends on the number of factors. The objective of this study is to review the outcomes of these patients with regard to pregnancy status, source of admission, and their presenting illness at time of admission to ICU. **Materials and Methods:** A retrospective study was undertaken for all obstetric patients admitted to the ICU of a private tertiary care hospital of Pakistan from 2014 to 2018. The data were reviewed through ICU log sheet, electronic medical records, and online laboratory data. The data included patient demographics, pregnancy status, mode of admission, length of stay, laboratory investigation, presenting disease, and outcomes in terms of death or survival. **Results:** Obstetric patients accounted for 3.8% for all ICU admission with overall mortality of 11.1%. There was no statistically significant difference in the mortality rate with respect to presenting illness; however, mortality was highest (37.5%) in patients with pre-eclampsia. A majority (54.2%) of the ICU admission were due to hemorrhagic/hematological causes followed by cardiovascular causes (33.1%). A statistically significant increase in mortality rate was observed in patients admitted through emergency compared with patients from within hospital ( $P < 0.0005$ ). **Conclusion:** Patients coming through emergency as referral patients were found to have the highest mortality. There is dire need to uplift the primary and secondary tertiary care centers in developing countries, where early treatment can be provided and high-risk cases can be picked up with early referral to tertiary care center.

**Keywords:** Critical care, developing country, intensive care unit, maternal mortality, obstetric patients

### Introduction

Obstetric patients are usually young and healthy and mostly go through pregnancy and labor uneventfully. However, small proportion of these women will require admission to the intensive care unit (ICU), and provision of this care is a matter of life and death for them. Most women who ultimately require critical care have no prior risk factor, indicating toward a very important fact that the risk of serious maternal morbidity is relevant to all pregnancies and not only for patients who are considered high risk.<sup>[1]</sup>

These patients may present with preexisting diseases which further aggravates during pregnancy or acute diseases which may or may not be specific to pregnancy. The outcome of obstetric patients admitted to ICU depends on their presenting illness, current status at time of admission, and facilities available in the ICU.<sup>[2]</sup>

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Critically ill obstetric patients account for as much as 7% of the ICU admissions in developing countries, while they account for only 0.2%–0.9% in developed countries.<sup>[3,4]</sup> The reason for small percentage of ICU admission in developed countries is because of easy access to specialized centers for obstetric services and better healthcare facilities.<sup>[5]</sup> One study done in Finland shows critical care admission of obstetric patients to be in the range of 0.7%–2.1% per 100 deliveries with 0% mortality.<sup>[1]</sup> In contrast, one study from the tertiary care government institute in South India, catering to 1.7 million patients per year, shows admission of obstetric patient to be around 11.6% of total admission to critical care.<sup>[6]</sup>

When compared with other South Asian developing countries, Pakistan has the highest fertility rate of 3.4 births/woman and lowest public health expenditure of 0.8% of gross domestic product. Due to this imbalance, out of 5 million births taking place annually, only 205,000 women receive any form of trained healthcare.<sup>[7]</sup> According

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to the Population Council, an international, nonprofit, nongovernmental organization, nearly 8.6 million women become pregnant here in Pakistan, and of these, 1.2 million (or 15%) women are likely to face obstetric complications.<sup>[8]</sup> These patients are the potential candidates for ICU admission.

The objective of the retrospective analysis is to review the outcomes of patients admitted in the ICU with regard to pregnancy status, source of admission, and comorbidities leading to admission to ICU in a private tertiary care institution of Pakistan.

## Materials and Methods

A retrospective study was undertaken for all obstetric patients admitted to the ICU of Aga Khan University Hospital (AKUH) Karachi, between May 2014 and December 2018. AKUH is a 732-bedded hospital with 82 beds for patients requiring critical care, including medical intensive care unit (MICU), surgical intensive care unit (SICU), pediatric intensive care unit, neonatal intensive care unit, and cardiac intensive care unit. There are totally 18 beds for MICU and SICU, each unit having nine beds each. SICU is run by anesthesiologists and operates on an open model, while medical ICU is run by medicine physicians and operates on a closed model. All intensive care areas are approved by Joint Commission International Accreditation for standards and patient safety care.<sup>[9]</sup>

The admission criteria for the ICU included patient's need for respiratory support, intensive therapy, or monitoring. The decision for admission is made by joint consultation from critical care team, anesthesiologist, and primary team. The inclusion criteria for this retrospective study included all obstetric patients defined as pregnant at time of admission to ICU or delivered within 6 weeks prior to admission. The data were reviewed through ICU log sheet, electronic medical records, and online laboratory data. The data collected included patient demographics, pregnancy status at the admission to critical care (whether antenatal or post natal period), mode of admission (either through emergency or from within the hospital), length of stay in the critical care, laboratory investigation at the time of admission in ICU, type of disease responsible for admission in the ICU, and outcomes in terms of death or survival.

## Statistical methods

Patient relevant data were entered in the software Microsoft Excel. Data were analyzed after importation into a statistical package for Social Sciences Software version 19. Continuous variables were reported as median and interquartile range, while categorical variables were reported as number and percentage. Chi-square or Fisher's exact test was used to observe difference between death and survival. A *P* value of  $\leq 0.05$  is considered statistically significant.

## Results

Data were collected for a period of 4 years and 5 months from May 2014 and December 2018. During this period, 1999 patients were admitted in either SICU or MICU; out of these, 72 patients were pregnant at the time of admission or delivered within 6 weeks prior to admission. Therefore, critically ill obstetric patients accounted for 3.8% for all ICU admission during the study period. Table 1 summarizes the demographics, length of stay in ICU, and laboratory findings at the time of admission to ICU.

There were 83.3% (60/72) of patients who required ventilator support; of them, 8 (13.3%) patients expired and 53 (88.3%) survived with overall mortality of 11.1% (8/72). Table 2 summarizes the outcomes of obstetric patients admitted to ICU in relation to their pregnancy status as whether they required ICU admission during the antenatal or postnatal period and their source of admission either through emergency or from within the hospital. There were more patients admitted in the ICU in the postnatal period when compared with the antenatal period; however, there was no statistical difference in their outcome. A difference in the outcome was observed for patients admitted through emergency compared with those admitted from within the hospital, with a statistically significant (*P* = 0.0005) increase in the mortality rate of patients admitted through emergency [Table 2].

Comparison of outcomes of patients with different presenting illnesses requiring admission to the ICU is shown in Table 3. There was no statistically significant

**Table 1: Demographics and laboratory findings (n=72)**

Variables	Median (25 <sup>th</sup> -75 <sup>th</sup> percentile)
Age (years)	32 (26-35)
ICU stay (days)	2 (1-3)
Hb (g/dL)	9.6 (8.45-10.97)
WBC (10 <sup>9</sup> /L)	13.4 (8.77-17.45)
Creatinine (mg/dL)	0.7 (0.50-1.17)
Platelets (10 <sup>9</sup> /L)	124 (79-198)
International normalized ratio	1.10 (1-1.3)

ICU=Intensive care unit; Hb=Hemoglobin; WBC=White blood cell

**Table 2: Outcome of patients in relation to pregnancy status and source of admission to the intensive care unit (n=72)**

Variables	Total n=72	Expired n=8	Survived n=64	<i>P</i>
Antenatal status				
Antenatal	13 (18.1%)	3 (37.5%)	10 (15.6%)	0.151
Postnatal	59 (81.9%)	5 (62.5%)	54 (84.4%)	
Source of admission				
Emergency	10 (13.9%)	6 (75%)	4 (6.3%)	0.0005
Operating rooms or wards	62 (86.1%)	2 (25%)	60 (93.8%)	

Results are presented as *n* (%)

**Table 3: Comparison of outcomes of patients with different presenting illnesses requiring admission to the intensive care unit (n=72)**

Complications	Total n=72	Expired n=8	Survived n=64	P
CVS	26 (36.1%)	5 (62.5%)	21 (32.8%)	0.128
Cardiomyopathy	7	2	5	
Mitral stenosis	2	0	2	
IHD	1	0	1	
Pre-eclampsia	1	0	1	
Eclampsia	10	3	7	
PIH	5	0	5	
Respiratory	2 (2.8%)	1 (12.5%)	1 (1.6%)	0.211
Pneumonia	1	0	1	
ARDS	1	1	0	
Renal (AKI)	5 (6.9%)	2 (25%)	3 (4.7%)	0.092
Hematological	39 (54.2%)	3 (37.5%)	36 (56.3%)	0.827
APH	3	0	3	
PPH	28	0	28	
Dengue	1	1	0	
DIC	6	2	4	
Low PLT	1	0	1	
CNS	4 (5.6%)	1 (12.5%)	3 (4.7%)	0.382
Meningitis	1	0	1	
MCA aneurysm	1	0	1	
Intracranial bleed	1	1	0	
Stroke	1	0	1	
GI	6 (8.3%)	0 (0%)	6 (9.4%)	0.999
Liver failure	3	0	3	
Cirrhosis	1	0	1	
HELLP	1	0	1	
Hepatic Encephalopathy	1	0	1	
Sepsis	10 (13.9%)	2 (25%)	8 (12.5%)	0.307
Ventilator	60 (83.3%)	8 (100%)	52 (81.3%)	0.337
Others	5 (6.9%)	0	5 (7.8%)	0.999
Rupture uterus	2	0	2	
GDM	1	0	1	
Anaphylactic	1	0	1	
Amniotic	1	0	1	

CVS=Cardiovascular system; GDM=Gestational diabetes mellitus; ARDS=Acute respiratory distress syndrome; HELLP=Hemolysis, elevated liver enzyme levels, low platelet levels. Data are expressed as n (%)

difference in the mortality rate of patients with different presenting illnesses. Mortality was highest (37.5%) in patients presenting with pre-eclampsia as three out of eight deaths were in patients presenting with pre-eclampsia. A majority (54.2%) of the ICU admission were due to hemorrhagic/hematological causes followed by cardiovascular causes (33.1%). Two deaths from major obstetric hemorrhage were due to development of disseminated intravascular coagulation (DIC).

## Discussion

This study highlights the fact that obstetric hemorrhage was the cause of admission in a majority of patients which is in concordance with the report from international epidemiological studies.<sup>[10,11]</sup> Obstetric hemorrhage has been found to be directly related to maternal death in developing

countries.<sup>[12]</sup> Systemic review by the World Health Organization revealed obstetric hemorrhage as the leading cause of maternal mortality in Asia and Africa.<sup>[13]</sup>

The results from this study showed a significant improvement in the mortality rate from obstetric hemorrhage when compared with previous report from the same institution (2.7% vs. 12%).<sup>[2]</sup> Morbidly adherent placenta (MAP) was found to be the cause of hemorrhage in a majority of the cases in this study (42.8%) and in a previous study (33%) from the same institution.<sup>[2]</sup> The rising trend of repeat cesarean section has been implicated as a cause of MAP and obstetric ICU referrals.<sup>[14]</sup>

An overall decline in mortality (11.1% vs. 21.6%) was also observed in critically ill obstetric patients compared with a previous report from the same institution.<sup>[2]</sup> The cause of

mortality was highest in patients admitted with eclampsia (37.5%) followed by cardiomyopathy and complications such as DIC, acute respiratory distress syndrome, sepsis, and intracranial bleed.

The mortality was significantly associated with mode of admission as six out of eight patients who died were referred from other hospitals and admitted through emergency. The results are comparable to the study done in the tertiary care government hospital of south India, where high mortality was associated with referred patients from peripheral hospitals.<sup>[6]</sup> Unfortunately, many peripheral hospitals in developing countries are unequipped to deal with the obstetric emergencies, and by the time these patients reach tertiary care hospitals, they already have high APACHE and predicted mortality.<sup>[6]</sup>

There exists heterogeneity in access to healthcare system of low- and middle-income countries. This is often apparent in countries having a two-tiered system consisting of both public hospitals and private hospitals, with mean cost of \$3300 for receiving treatment in the critical care unit.<sup>[2]</sup> The findings of this study done in private care tertiary hospital reveal an overall improvement in the mortality of critically ill obstetric patients, but the data are not an overall representation of a developing country.

In conclusion, obstetric hemorrhage was found to be the most common indication for ICU admission with eclampsia and cardiomyopathy as major causes of death followed by complications such as DIC, sepsis, and intracranial bleed. Patients coming through emergency as referral patients were found to have the highest mortality. Even though the finding of this study is showing an overall improvement in the maternal mortality of obstetric patients requiring critical care, quality care is very variable in any developing country having two-tiered system consisting of both public hospitals and private hospitals.

Resource-limited countries face a number of challenges due to poor infrastructure of healthcare system. There is dire need to uplift the primary and secondary tertiary care centers where early treatment can be provided and high-risk case can be picked up with early referral to tertiary care center. There is a need for proper allocation of fund to the government hospital as a large number of patients cannot afford to get critical care in the private hospital. Through this study, it can be observed that improvisation of care can reduce the maternal mortality as observed by reduction in the maternal mortality over the time.

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## Conflicts of interest

There are no conflicts of interest.

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