

# Analysis of clinical characteristics of the obstetric patients admitted to intensive care unit at a tertiary care institute



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## ABSTRACT

**Background:** Pregnancy and puerperium usually progress uneventfully but may get complicated requiring admission to the intensive care unit (ICU). The obstetric patients admitted to ICU have been reported to have higher mortality in comparison with non-obstetric patients. **Aims and Objectives:** The study was conducted to identify the risk factors and diseases associated with maternal ICU admissions and to find out the case fatality rate (CFR). **Materials and Methods:** One hundred and forty maternal patients who required ICU admission at a tertiary care hospital were retrospectively analyzed. **Results:** The mean age of the patients was 24.71 years. About 81.43% patients were antenatal, 17.14% were postnatal while 1.43% patients were postabortal. The risk factors for the admission to ICU were younger age, rural background, lower socio-economic status, and last trimester of pregnancy. The obstetric indications for ICU admissions were hypertensive disorders of pregnancy (54.28%), obstetric hemorrhage (12.86%), peripartum cardiomyopathy (2.86%), and septic abortion (0.71%). The common non-obstetric indications for ICU admissions were pre-existing cardiac diseases and severe anemia (7.86% each) and pulmonary edema (3.57%). Maternal mortality was observed in 32.09% patients. The non-obstetric causes were found to have higher CFR (59.46%) than obstetric causes (21.65%) of maternal ICU admission. **Conclusion:** Early identification of the patients at risk for ICU admission and timely care of these patients is likely to reduce the maternal ICU admissions. The causes associated with higher case fatality particularly require dedicated ICU care.

**Key words:** Pregnancy; Intensive care unit; Maternal mortality; Case fatality rate

## INTRODUCTION

The obstetric patients may develop complications requiring admission to the intensive care unit (ICU). Various studies have reported the percentage of pregnant or puerperal women who require ICU admission between 0.7% and 13.5% with large variation among different countries and institutions.<sup>1</sup> The incidence of admission is higher in developing countries. Risk factors for ICU admission include rural area of residency, low to middle socioeconomic status, poor nutrition, lesser gestational age, and inadequate

antenatal consultations.<sup>2,3</sup> Obstetric ICU admissions may be due to obstetric causes (hypertensive disorders of pregnancy, antepartum hemorrhage, etc.) or exacerbation of the pre-existing medical diseases (heart diseases, severe anemia, etc.).<sup>4,5</sup> Regardless of the therapeutic advances, maternal mortality in the ICU continue to occur.<sup>6,7</sup> The obstetric patients admitted to the ICU have been reported to have higher mortality in comparison with non-obstetric patients.<sup>4</sup> Lack of awareness and absence of regular antenatal care (ANC) make the critically ill patients to be referred late and sometimes in moribund state.<sup>2</sup> Early

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identification of the high-risk pregnancy, a high index of suspicion for the signs of complications, and timely treatment given at the primary health centers and higher centers can decrease the maternal mortality.<sup>4</sup> Although the incidence of admission to ICU and mortality is higher in developing countries, there are fewer studies reporting on critical illness during pregnancy.<sup>8,9</sup> Furthermore, changing trends in causes of maternal mortality, for example, tropical diseases such as dengue and malaria have been reported in developing countries like India.<sup>4</sup> Better knowledge of the clinical characteristics and case fatality rate (CFR) of obstetric ICU admissions will be a step ahead for reduction of maternal mortality. In view of the above objectives, the present study was conducted on obstetric patients admitted to the ICU of our institute.

### Aims and objectives

The study was conducted to identify the risk factors and diseases associated with maternal ICU admissions and to find out the case fatality rate (CFR).

## MATERIALS AND METHODS

The present study was carried out in the Department of Obstetrics and Gynecology, Pt. B.D. Sharma PGIMS Rohtak (Haryana, India) after approval from the Institutional Ethical Committee (BREC/24/967, dated December 2, 2024). The study included 140 consecutive obstetric patients admitted to the ICU of our institute. The available records of the patients were analyzed regarding age, residence (urban/rural), socioeconomic status, obstetric history, pre-existing medical illness, number of antenatal visits, trimester at the time of ANC visit, gestational age at admission, mode of delivery (normal delivery/cesarean section), indication of ICU admission, outcome of patient (discharge or death of the patient), and cause of maternal mortality (if occurred).

## RESULTS

A total of 140 patients admitted to the ICU were studied retrospectively. The age ranged from 18 to 50 years. The mean age at presentation was 24.71 years. The maximum number of patients (47.14%) was in the age group of 21–25 years. About 78.57% of the patients were from the lower socio-economic status. There were 81.43% antenatal patients. The maximum patients (77.86%) were in the third trimester of pregnancy. The demographic profile of the patients is given in Table 1. The most common (45.71%) mode of delivery was cesarean section (Table 2). The obstetric diseases contributed to 70.71% while non-obstetric causes contributed to 29.29% of ICU admissions. The obstetric diseases which necessitated ICU admissions

**Table 1: The demographic profile of the patients**

S. No.	Parameter	No. of patients	Percentage
1.	Age groups		
	• ≤20 years	30	21.43
	• 21–25 years	66	47.14
	• 26–30 years	27	19.28
	• 31–35 years	11	7.86
	• >35 years	6	4.29
2.	Residential area		
	• Urban	47	33.57
	• Rural	93	66.43
3.	Socioeconomic status		
	• Upper lower	69	49.29
	• Lower	41	29.29
	• Upper middle	10	7.14
	• Lower middle	20	14.28
4.	Parity		
	• Primigravida	64	45.71
	• Multigravida	76	54.29
5.	Time of admission to ICU		
	• Antepartum	114	81.43
	• 1 <sup>st</sup> trimester	2	1.43
	• 2 <sup>nd</sup> trimester	3	2.14
	• 3 <sup>rd</sup> trimester	109	77.86
	• Postpartum	24	17.14
	• Post abortal	2	1.43

ICU: Intensive care unit

were hypertensive disorders of pregnancy (54.28%), followed by obstetric hemorrhage (12.86%), peripartum cardiomyopathy (2.86%), and septic abortion (0.71%) (Table 3). The most common non-obstetric diseases which necessitated ICU admissions were pre-existing cardiac diseases and severe anemia (7.86% each), followed by pulmonary edema (3.57%), acute fatty liver of pregnancy (AFLP, 2.86%), acute kidney injury (2.14%), non-obstetric sepsis (1.43%), etc. (Table 4). Out of total 140 admissions, six patients left against medical advice, among the remaining 134 patients, 67.91% patients survived, and rest 32.09% expired. The non-obstetric causes of ICU admissions were found to have higher CFR (59.46%) than obstetric causes (21.65%) (Table 5).

## DISCUSSION

Pregnancy, delivery, and puerperium can be complicated by “severe maternal morbidity” necessitating ICU admission. “Severe maternal morbidity” is defined as “a very ill pregnant patient or recently delivered woman who would have died had it not been but luck and good care was on her side”.<sup>10</sup> Intensive care services are essential for this group of obstetric patients. The management of critically ill obstetric patients presents a challenge to the attending intensive care specialists due to concerns of fetal viability, altered maternal physiology, and diseases specific to pregnancy.<sup>11</sup>

**Table 2: Mode of delivery/operative procedures among study population**

S.No.	Mode of delivery/Operative procedure among the study population	No. of patients	Percentage
1.	Antepartum patients (n=114)* <sup>+</sup>		
	• Normal vaginal delivery	36	25.71
	• Lower segment cesarean section	64	45.71
	• Vacuum-assisted vaginal delivery	1	0.71
	• Forceps assisted vaginal delivery	2	1.43
	• Cesarean hysterectomy	2	1.43
	• Second trimester hysterectomy	1	0.71
	• Hysterotomy	1	0.71
	• Laparotomy for ruptured ectopic	2	1.43
2.	Postpartum patients (n=24)**		
	• Postpartum hysterectomy	2	1.43
	Laparotomy for repair of rupture uterus	2	1.43
3.	Postabortal (n=2) <sup>#</sup>	1	0.71

\*3 patients expired with fetus in uterus \*2 patients left against medical advice, \*\*20 postpartum patients did not require any surgical intervention, <sup>#</sup>One patient underwent suction evacuation

**Table 3: Obstetric indications for ICU admissions (n=99)**

S.No.	Obstetric indications	No. of patients	Percentage
1.	Hypertensive disorders of pregnancy	76	56.28
	• Preeclampsia	17	12.14
	• Eclampsia	59	42.14
2.	Obstetric hemorrhage		
	• Placenta previa and accreta	6	4.29
	• Rupture uterus	3	2.14
	• Uterine inversion	1	0.71
	• Ruptured ectopic	2	1.43
	• Postpartum hemorrhage	6	4.29
3.	Peripartum cardiomyopathy	4	2.86
4.	Septic abortion	1	0.71

ICU: Intensive care unit

**Table 4: Non-obstetric indications for ICU admission (n=41)**

S. No.	Non-obstetric indications	No. of patients	Percentage
1.	Heart diseases		
	a) Rheumatic heart disease	5	3.57
	b) Congenital heart diseases	5	3.57
	c) Dilated cardiomyopathy	1	0.71
2.	Severe anemia	11	7.86
3.	Pulmonary edema	5	3.57
4.	Acute fatty liver of pregnancy	4	2.86
5.	Acute kidney injury	3	2.14
6.	Non-obstetric infections	2	1.43
7.	Other hematological disorder	1	0.71
8.	Multiorgan dysfunction syndrome	1	0.71
9.	Epilepsy	1	0.71
10.	Scalp hemangioma	1	0.71
11.	Steven-Johnson syndrome	1	0.71

ICU: Intensive care unit

In the present study, the maximum number of patients (47.14%) was in the age group of 21–25 years. About 87.85% of the patients were  $\leq 30$  years of age. This age distribution correlate with other Indian studies, contrary to higher maternal age seen in developed countries.<sup>12-15</sup> Early age of marriage, poor access to antenatal services,

and suboptimal obstetric care in certain remote areas of the country may contribute to this age distribution.<sup>16</sup> In our study, the maximum number of admissions occurred during antepartum period (81.43%), mostly during the 3<sup>rd</sup> trimester of pregnancy (77.86%). This finding correlates with the study done by Bhadade et al.<sup>17</sup> However, other studies found a higher percentage of postpartum admissions.<sup>12,18</sup> This aspect of gestational age highlights the importance of close supervision of patients during antepartum (especially during 3<sup>rd</sup> trimester of pregnancy) as well as during postpartum period. The women from lower socio-economic status (78.57%) and rural area of residency (66.43%) comprised the risk factors for ICU admission. Previous studies have also reported that these groups may have more complications resulting in an increased need of an ICU care.<sup>2,19</sup> About 45.71% of the patients in our study underwent cesarean section. This suggests that operative deliveries are associated with higher chances of complications or cesarean delivery could be the consequence of underlying diseases for which the mother was admitted rather than the risk factor.<sup>20-22</sup> The hypertensive disorders of pregnancy were the most common (54.28%) while obstetric hemorrhage was the second most common (12.86%) diagnosis for

**Table 5: Distribution of patients according case fatality rate**

S. No.	Indication of admission	Total patients	Survivor	Non-survivor	Case fatality rate
1.	Hypertensive disorder of pregnancy	76	60	14	18.92
	• Preeclampsia	17	13	4	23.53
	• Eclampsia	59*	47	10	17.54
2.	Obstetric hemorrhage	18	11	7	38.89
	• Placenta previa and accreta	6	6	0	0
	• Rupture uterus	3	2	1	33.33
	• Uterine inversion	1	0	1	100
	• Ruptured ectopic	2	1	1	50
	• Post-partum hemorrhage	6	2	4	66.67
3.	Peripartum cardiomyopathy	4	4	0	0
4.	Septic abortion	1	1	0	0
5.	Heart diseases				
	a) Rheumatic heart disease	5	4	1	20
	b) Congenital heart diseases	5	0	5	100
	c) Dilated cardiomyopathy	1	0	1	100
6.	Pulmonary edema	5**	3	1	25
7.	Acute kidney injury	3	1	2	66.67
8.	Acute fatty liver of pregnancy	4	1	3	75
9.	Epilepsy	1	1	0	0
10.	Severe anemia	11**	3	6	66.67
11.	Other hematological disorder	1	1	0	0
12.	Multiple organ dysfunction syndrome	1	0	1	100
13.	Non-obstetric infections	2	0	2	100
14.	Scalp hemangioma	1	1	0	0
15.	Steven-Johnson syndrome	1#	-	-	-

\*Two patients of eclampsia left against medical advice (LAMA), \*One patient of pulmonary edema went LAMA, \*\*Two patients of severe anemia went LAMA, #1 patient of Steven Johnson syndrome went LAMA

ICU admission in our study. In other studies, the most common diagnosis of ICU admission has fluctuated between pregnancy induced hypertension and obstetric hemorrhage.<sup>23-26</sup> In the present study, pre-existing heart diseases and severe anemia were the most common (7.86% each) non-obstetric diseases leading to ICU admission. Ghike et al., also reported the similar finding.<sup>4</sup> Sepsis (obstetric and non-obstetric) as a cause of ICU admission has been variably reported with an incidence ranging from 1.6% to 27.15%.<sup>23,25</sup> In the present study, sepsis contributed to 2.14% of ICU admissions. Proper antiseptic precautions taken during delivery or surgical procedure on pregnant patients may lead to decreased incidence of sepsis. About 81.43% interventions (deliveries/surgical interventions) in the present study were performed at our hospital, a tertiary care hospital where standard protocols to prevent infection are followed, this may have contributed to lesser incidence of sepsis.

The maternal mortality depicts female access to the hospitals and responsiveness of the health care system to their needs. The maternal mortality in the ICU patients has been reported to be higher in developing countries than developed nations. Poor socio-economic status, inadequate antenatal care, poor rural health infrastructure, poor transport facilities, low hematocrit, and undernutrition of obstetric patients may be the possible causes for this difference.<sup>2,4,9</sup> The maternal

mortality in our study was 32.09%. This rate correlates with other Indian studies.<sup>23,27</sup>

We calculated CFR in our study. It is the proportion of the patients who have been diagnosed with a certain disease and end up dying due to it. CFR is a measure of disease lethality. The maternal mortality rate often confused with CFR – is a measure of the relative number of deaths (either in general, or due to a specific cause) within the entire population per unit of time. In the present study, non-obstetric causes of ICU admissions were found to have higher CFR (59.46%) than obstetric causes (21.65%). Among non-obstetric causes congenital heart diseases, non-obstetric sepsis, multiorgan dysfunction syndrome, and dilated cardiomyopathy had highest CFR (100%), followed by (AFLP-75%), severe anemia, and acute kidney injury (both had CFR of 66.67%). Tiwari et al., and Gombar et al., also reported that non-obstetric causes had higher case fatality than obstetric causes of ICU admissions.<sup>19,23</sup> To decrease the case fatality from non-obstetric causes specifically, cooperation is required among obstetrician, physician, interventionist, and anesthesiologist. Optimum care of the circulation and respiration at an early stage can clearly minimize the incidence of multiorgan failure and mortality in critically ill obstetric patients.<sup>20</sup> Among the obstetric causes of ICU admission, obstetric hemorrhage was found to have higher CFR (38.89%) than hypertensive disorders of pregnancy (18.92%). Similar results were



seen in other studies from the literature.<sup>2,28</sup> As obstetric hemorrhage causes a greater damage to the life of the affected patient, there is need of aggressive treatment in this group of patients. Although hypertensive disorders of pregnancy were the most common cause of admission, CFR was found to be lesser (18.982%), this could be due to the use of magnesium sulfate which is the anticonvulsant of choice for treating eclampsia. It reduces cerebral ischemia and results in significant reduction in the need of mechanical ventilation.<sup>20</sup>

### Limitations of the study

Our study was carried out at a tertiary care center, this limits its applicability to other settings. There may be difference in the clinical profile of the patients at other settings.

## CONCLUSION

The risk factors for admission to the ICU included young patients, rural background, antepartum patients (especially in third trimester), and lower socio-economic status. The most common etiology for ICU admissions was hypertensive disorders of pregnancy and obstetric hemorrhage. Non-obstetric causes of ICU admission were found to have higher CFR than obstetric causes. Reduction of maternal mortality due to obstetric and non-obstetric causes requires involvement of the patients and whole of the health care system from primary to tertiary level. Awareness should be created regarding the importance of adequate ANC and nutrition, detection of symptoms of various obstetric complications and contacting emergency department if dangerous features are noted. Health education and training of the health care professionals may improve obstetric care. A multidisciplinary team approach is essential to deliver comprehensive care to ultimately achieve improved maternal outcome.

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



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