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Original Research Article

## Obstetrics critical care: a 2 years retrospective study in a medical college hospital of western India

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### ABSTRACT

**Background:** This study highlights the possibilities of new contribution to the management of high risk pregnancies and those pregnancies with unpredictable outcomes. The objective was to study the incidence and the clinical profile of antenatal and postpartum women requiring admission to the ICU, the interventions required in these women and final outcome.

**Methods:** A retrospective cohort study of all obstetric critical care admissions during 2-year period from January 2016 to December 2017 was done at 1296 bedded tertiary care hospital. During the study total 349 obstetric patients were admitted to the ICU. The data were analysed by using percentage.

**Results:** Primigravida (54.73%) were more as compared to multigravida (45.27%). Only 15.76% patients were in antepartum period while majority of patients (84.24%) were admitted during postpartum period. The main obstetric indications for ICU admission were pregnancy-induced hypertension (14.32%) followed by obstetric hemorrhage (9.16%) and community acquired pneumonia (7.44%). Other indications were valvular heart disease (5.44%), ANC with severe anemia (1.72%), monitoring (6.30%). In the present study maternal mortality among the women admitted to ICU was 18.05%. The leading cause of maternal death was obstetric hemorrhage (28.57%) followed by pregnancy induced hypertension (25.40%). An ICU intervention during the stay of the patients in terms of mechanical ventilation was used in 250 (71.63%) cases.

**Conclusions:** A high quality multidisciplinary care is required in complicated pregnancies for safe motherhood. So, there is a need for dedicated ICU for obstetric patients.

**Keywords:** Critical care, Haemorrhage, Obstetric, Pregnancy-induced hypertension

### INTRODUCTION

Obstetric patients requiring ICU admission may reflect near miss maternal mortality and is now considered as maternal morbidity.<sup>1,2</sup> Maternal near miss case is defined as “a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy.” Hence

pregnant women health status is not reflected by mortality indicators alone.<sup>3</sup>

The incidence of pregnant women admitted in ICU in developed countries is 2-4 per 1000 deliveries as compared with 2-13.5 per 1000 deliveries in developing countries. India accounts for 19% of global maternal deaths. Admission of pregnant women to an ICU is

considered as an objective marker of severe maternal morbidity.<sup>4</sup>

Dedicated ICU for obstetric patients is not yet widely available. Present objectives are to study the incidence and the clinical profile of antenatal and postpartum women requiring admission to the ICU the interventions required in these women and final outcome.

**METHODS**

After institutional approval, this retrospective cohort study was conducted after collection of all obstetric critical care admissions data during 2-year period from January 2016 to December 2017. The tertiary care hospital is a 1296-bedded facility with a multidisciplinary 14-bedded surgical ICU managed by a team of two anesthesia consultants, three ICU residents and 25 bedded medical ICU managed by a team of two physicians and 6 residents. Obstetric patients were managed jointly by anesthesiologist, physician, obstetrician.

The medical records of all obstetric patients (pregnant or within 6 weeks postpartum) admitted to both the ICUs during the study were analyzed along with simultaneous analysis of ICU databases. The following data were recorded and analyzed for each patient: age, parity, primary diagnosis (obstetric or non-obstetric e.g. community-acquired pneumonia, rheumatic heart disease) responsible for the patient's critical illness, indication of ICU admission, obstetric interventions performed, critical care interventions performed during ICU stay (mechanical ventilation, central venous catheterization, invasive arterial pressure monitoring, hemodialysis), duration of mechanical ventilation, length of ICU stay and outcome of patient. This analytical data was compared with total number of ICU admissions, total number of deliveries in this period of time. The data were analysed statistically by using percentage.

**RESULTS**

During the study total 349 obstetric patients were admitted to the ICUs (3.96% of total ICU admissions). Out of 349, 164 women were admitted in Medical ICU and 185 women were admitted in surgical ICU. There were 25470 deliveries in this period, and the ICU admission rate was 13.70 per 1000 deliveries. The mean maternal age (in years) was 23.901±4.60 (mean±standard deviation) (Table 1).

Primigravida (54.73%) were more as compared to multigravida (45.27%). Only 15.76% patients were in antepartum period while majority of patients (84.24%) were admitted during postpartum period (Table 1). The main obstetric indications for ICU admission were pregnancy-induced hypertension (14.32%) followed by obstetric haemorrhage (9.16%) and community acquired pneumonia (7.44%) (Table 2). Other indications were

valvular heart disease (5.44%), ANC with severe anemia (1.72%), monitoring (6.30%).

**Table 1: Year-wise distribution of total deliveries, total ICU admissions, parity, age.**

Total study period (2016-2017)	2016	2017
Total deliveries (n=25470)	12417	13053
Total ICU admissions (n=8808)	3768	5040
Total obstetric admissions to ICU (n= 349)	152	197
Obstetric admissions to ICU per 1000 deliveries (n=1000 deliveries=13.70)	12.24	15.09
Obstetric admissions to ICU as percentage of total ICU admissions (3.96)	4.03	3.90
Primigravida (n=191)	85	106
Multigravida (n=158)	67	91
Total ANC cases (n=55)	19	36
Total PNC cases (n=294)	133	161
Total cases delivered outside before admission (n=10)	4	6
Mean age of obstetric admissions to ICU in years (mean±SD)	23.901±4.60	
Age distribution, years (n=349)	<25 (258)	
	25-30 (61)	
	>30 (30)	

ICU: Intensive care unit; SD: Standard deviation

**Table 2: Total and year-wise distribution of causes of ICU admissions.**

Primary diagnosis	2016	2017	Percentage of total obstetric admissions to ICU in 2 years
PPH (n=32)	13	19	9.16
PIH (n=50)	20	30	14.32
Pneumonia (n=26)	10	16	7.44
Valvular heart disease (n=19)	7	12	5.44
Ruptured ectopic (n=3)	1	2	0.85
Ruptured uterus (n=2)	1	1	0.57
APH (n=7)	4	3	2.00
Cardiomyopathy (n=4)	0	4	1.14
Liver failure (n=0)	0	0	0
Acute kidney injury (n=6)	5	1	1.71
Eclampsia (n=10)	5	5	2.86
Septicemia (n=7)	3	4	2.00
Monitoring (n=22)	10	12	6.30

In the present study maternal mortality among the women admitted to ICU was 18.05%. The leading cause of maternal death was obstetric haemorrhage (28.57%)

followed by pregnancy induced hypertension (25.40%) (Table 3).

**Table 3: Total number of deaths related to primary diagnosis.**

Primary diagnosis	Deaths (n=63)		Percentage of total deaths
	2016	2017	
PIH (n=16)	10	6	25.40
PPH (n=18)	9	9	28.57
Septicemia with MODS (n=5)	1	4	7.94
Cardiomyopathy (n=2)	1	1	3.17
ANC with pneumonia (n=2)	1	1	3.17
ANC with severe anaemia (n=3)	2	1	4.76
ANC with dengue (n=1)	1	0	1.58
ANC with swine flu (n=3)	2	1	4.76
Others (n=13)	7	6	20.63

An ICU intervention during the stay of the patients in terms of mechanical ventilation was used in 250 (71.63%) cases (Table 4).

**Table 4: ICU intervention.**

Procedure	2016	2017	Total percentage
Invasive ventilation (n=250)	108	142	71.63
Dialysis (n=4)	1	3	1.15

As a tertiary care center, 10 women were referred to this institution immediately after delivery. Among preventable infectious diseases, 4 ANC admissions in medical ICU were for swine flu out of that 3 women died, 2 women admitted for pulmonary tuberculosis, 2 women for dengue out of that 1 died and 1 admitted for malaria. 2 patient had left the ICU against medical advice, both were unmarried adolescents (age 15 years and 16 years) out of that a 16week pregnant adolescent was admitted in surgical ICU for severe head injury and induced abortion was done as ICU intervention. Average stay in days of survivors was 4 and of non- survivors was 3 days.

## DISCUSSION

The mean age and the age distribution of the critically ill obstetric patients in the present study correlate with other contemporary Indian studies, but studies from abroad report a higher maternal age.<sup>5</sup> Although advanced maternal age has not been shown to be uniformly associated with ICU admissions and a median age of 30 years is consistent with birth age patterns in developed

countries.<sup>6</sup> The worth noticing point in Indian studies is the need of critical care in the patients under thirty. Socioeconomic factors, early marriages, less education and poor obstetric care in certain remote parts of the country may all contribute to this.

Other studies report a higher percentage of multiparous admissions. present study reports a higher percentage of primigravida. This probably correlates with a high percentage of patients being admitted with complications of PIH in present ICU, primiparity being a known risk factor of PIH.<sup>7</sup>

Present study had a high representation of postpartum patients, that is almost uniform among all studies from India and abroad.<sup>8</sup> Bhadate et al, reported a very high antepartum admission percentage of 66.39%, but their report is from an exclusively medical ICU, where most admissions were for indirect obstetric indications with hepatitis E in pregnancy being the most common (36.8%). Pollock et al, in their systematic review, showed that there was no difference in ICU admission per 1000 deliveries between developed (median 3 [IQR 0.7-8.8]) and developing (median 2.7 [IQR 1.3-3.5]) countries.<sup>9</sup>

The ICU utilization rate of 3.96 per 1000 deliveries in present study, albeit low, is more or less in keeping with the values from developing countries studied in the review and other recent Indian studies, which mostly reported a rate below 10 per 1000 deliveries. However, differences in case mix, obstetric and critical care protocols, facilities and bed strengths may be responsible for a very high ICU utilization rate of 28 and 54 per 1000 deliveries reported in two Indian studies.<sup>10</sup>

Considering the well-recognized differences in access to health-care facilities, severity of illness at the time of seeking medical help, and adequacy of ICU beds between developed and resource-limited countries, the similarity between present ICU admission rate and those from developed countries may appear paradoxical.<sup>11</sup>

However, this may be explained by the shortage of beds in present unit, compelling us to sometimes manage patients not needing very aggressive supports in other intensive care areas of the hospital on emergent basis (e.g., surgical ICU, trauma ICU) and in the absence of a dedicated obstetric ICU, even in the labor room recovery with coordinated efforts of obstetric, anesthesiology, and critical care teams. This subset of patients was not included in the analysis, and it might be a limitation of present study. The most common primary diagnosis leading to critical care admission is between obstetric hemorrhage and PIH in almost all the studies from India and abroad.<sup>12</sup>

The ICU patients had PIH as the most common primary diagnosis followed by obstetric hemorrhage. In the study by Togal et al, although the main primary diagnosis for

ICU admission was PIH, the main cause of death was hemorrhage.<sup>13</sup>

Sepsis is also being responsible for ICU admissions in obstetric patients worldwide. Even in studies from developed countries, significant percentages of obstetric critical care admissions 10%, 5%, 6.6%, 7.1% were due to sepsis.<sup>14</sup> Two Indian studies report a very low rate of sepsis 1.6%, 2.45% which is comparable to present study which is 2%. Gombar et al, even reports a sepsis admission rate as high as 27.15%. The ICU obstetric mortality rate of 18.05% in present study matches with the contemporary Indian studies. A low mortality rate of 6.5% reported by Harde et al, from a post anesthesia ICU may not be a representation of maternal mortality in a general ICU and a study by Bhadade et al, from the medical ICU of the same institute reports a high maternal mortality rate of 30.3%.<sup>15</sup>

Most common cause of referral to this institution was unavailability of blood and blood products followed by unavailability of speciality doctors team. A high rate of invasive ventilation (71.63%) in the present study reflects the severity of illness of patients admitted in present ICU. The tertiary referral centre status of present hospital (and women delivered before admission 2.86%) might have contributed to the high ventilation rate. Overall, the ventilation rate among obstetric patients is variable in studies from outside India with Zwart et al, reporting a rate of 34.8%, Crozier and Wallace 45%, Sriram and Robertson 61%, and the team of Togal et al, a rate as high as 85%. Present high ventilation rate nearly matches the Indian report by Ashraf et al. which is 85% but is higher than that reported in many other Indian studies.<sup>16</sup>

The low percentage of patients needing hemodialysis (1.15%) in present study is probably explained by the finding of cardiovascular and respiratory failures as the most common organ failures. In general, the Indian studies report a hemodialysis rate of <10%, with some reporting slightly higher percentages than ours (7.7%, 7.4% while Jain M et al, similar to present study (2.5%).<sup>17</sup> Only, Bhadade et al, reported an exceptionally high percentage of 38.88% from exclusively medical ICU. It has been recognized that the maternal mortality among critically ill obstetric patients in developing countries is higher than developed nations. Multiple socioeconomic and healthcare-related factors are responsible for this disparity. Studies by Sriram and Robertson and Crozier and Wallace did not report even a single maternal death, and the mortality rate was consistently below 5% in other reports from ICUs of developed countries.<sup>18</sup>

Like many studies from India and abroad obstetric hemorrhage with organ failure was the major cause of mortality in present study, being responsible for 36.50% of maternal deaths in ICU and PPH (28.57%) comprised most of these hemorrhage fatalities.<sup>19</sup> Other major causes

of mortality in present study were complicated PIH (25.40%) and sepsis with organ failure (7.94%).

Due to the quick reversibility of illness in most of the young obstetric patients, the average length of ICU stay is in general short in this patient group. The median length of ICU stay (in days) is 3 in the present study which nearly matches many other studies from around the world and India. However, an even shorter length of ICU stay of below 2 days has also been reported both from India and abroad. The length of ICU stay among non survivors in present study (in days) was 4 suggests fast rate of complications in these patients demanding more vigilant and quick decisions over treatment modalities in these patients. A general limitation of studies on obstetric critical care is the controversy regarding applicability of the most commonly used ICU severity scoring systems, for example, Acute Physiology and Chronic Health Evaluation or Simplified Acute Physiology Score among critically ill obstetric patients and hence, like a recently published study, authors also did not use any scoring system to assess severity of illness or predict mortality.<sup>20</sup>

However, the present study has some other limitations. Cases identified by retrospective audit of medical records might have been skewed toward direct obstetric diagnoses due to flagged predilection, thereby missing some cases admitted with indirect obstetric problems. Being a single centre study, present results cannot be extrapolated to a larger and diverse base of obstetric patients. Multicentre Indian studies on obstetric critical care may be helpful.<sup>21</sup>

## CONCLUSION

Finally, perinatal care involves well-coordinated functioning of various levels of health-care delivery systems. Present study, being a snapshot of obstetric patients managed in the ICU, is not representative of overall perinatal service delivery.

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