

The Incidence, Clinical Profile and Outcome of Prenatal and Postpartum Women Admitted to the ICU: Retrospective Study

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Abstract

Aim: The aim of the present study evaluates the incidence, clinical profile of antenatal and postpartum women requiring admission to the ICU the interventions required in these women and final outcome. **Methods:** This prospective observational study was done the Department of Anaesthesia and Critical Care, Patna Medical College and Hospital, Bihar, India, from July 2018 to June 2019. 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. **Results:** During the study total 200 obstetric patients were admitted to the ICUs (4.76% of total ICU admissions). Out of 200, 70 women were admitted in Medical ICU and 130 women were admitted in surgical ICU. There were 10000 deliveries in this period, and the ICU admission rate was 20 per 1000 deliveries. The mean maternal age (in years) was 24.26±4.78 (mean±standard deviation). Primigravida (55%) were more as compared to multigravida (45%). Only 16% patients were in antepartum period while majority of patients (84%) were admitted during postpartum period. The main obstetric indications for ICU admission were pregnancy-induced hypertension (15%) followed by obstetric haemorrhage (9%) and community acquired pneumonia (7%), other indications were valvular heart disease (5%) and monitoring (6.5%). In the present study maternal mortality among the women admitted to ICU was 16%. The leading cause of maternal death was obstetric haemorrhage (28.13%) followed by pregnancy induced hypertension (21.87%). An ICU intervention during the stay of the patients in terms of mechanical ventilation was used in 135 (67.5%) 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.

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Introduction

Maternal mortality rates remain relatively high in India although there is a declining trend in recent years[1]. The National Family Health Survey 4 from India (2015–2016) reported that institutional births increased from 38.7% to 78.9%, and child births by caesarean sections increased to 17.2% from 8.5%[1]. The maternal mortality rates (per 100,000 live births) have also shown a decline from 254 in 2004–2006 to 167 in 2011–2013[2]. Approximately 800 maternal deaths occur daily worldwide[3]. A study from the Netherlands reported a case fatality rate of 1:53 among pregnant women with severe maternal morbidity[4].

Despite the recent progress in the field of medicine, the developing countries lag far behind in providing good maternal care and obstetric intensive care facilities. The maternal mortality has steeply come down in the developed nations while developing nations are still struggling as they contribute 99% of the total global maternal deaths. The incidence of intensive care unit (ICU) admission of an obstetric patient in developed countries is 2-4/1000 deliveries, whereas in the developing nations it is as high as 2-13.5/1,000 deliveries[5]. Critically, ill-parturient poses a unique challenge to the obstetrician, Anesthesiologist as well as to the intensivists[6]. The systematic review in the current issue (September to December) of *Anesthesia, Essays and Research* has comprehensively described not only anesthetic management in parturients with severe co-morbidities, but also has raised a serious concern regarding the challenges faced during obstetrical critical care. These facts assume significant dimensions when considering maternal morbidity and mortality as these are objective markers and are considered to be an important quality assurance indicator[7]. The process of childbirth from conception to puerperium can be complicated anytime by severe maternal morbidity necessitating critical care support and admission into an ICU.

The medical management of the critically ill-obstetric patient requires a complete knowledge of the altered physiology of pregnancy as well as the superimposed acute pathological insult, demanding a cohesive coordinated care from an obstetrician as well as the Intensivists/Anesthesiologist. As per the statement of World Health Organization “there is a story behind every maternal death or life-threatening complications and understanding the lessons to be learnt can help to avoid such outcomes[8]”. The need for admission of a parturient to an ICU can arise because of obstetric complications (47-93%)⁹ as well as non-obstetric indications. Antepartum and postpartum hemorrhage, hypertensive disease of pregnancy and puerperal sepsis are the most frequent obstetric complications necessitating ICU admission. The common non-obstetric indications include maternal cardiac disease, trauma, anesthetic complications, cerebrovascular accidents and drug overdose. Presence of other co-morbidities such as diabetes, renal diseases, viral infections and others also contribute negatively in maternal outcome[10-12]. In these circumstances, a closed ICU is more suitable for imparting focused training to medical professionals and paramedics and can ensure a good teamwork as well[13]. Antenatal services have to be strengthened at grass root level and more specialists have to be recruited so as to identify parturients with co-morbid diseases so as to timely refer them to a tertiary care center.

Material and methods

This prospective observational study was done in the Department of Anaesthesia and Critical Care, Patna Medical College and Hospital, Bihar, India from July 2018 to June 2019, after taking the approval of the protocol review committee and institutional ethics committee. 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 200 obstetric patients were admitted to the ICUs (4.76% of total ICU admissions). Out of 200, 70 women were admitted in Medical ICU and 130 women were admitted in surgical ICU. There were 10000 deliveries in this period, and the ICU admission rate was 20 per 1000 deliveries. The mean maternal age (in years) was 24.26 ± 4.78 (mean \pm standard

deviation) (Table 1). Primigravida (55%) were more as compared to multigravida (45%). Only 16% patients were in antepartum period while majority of patients (84%) were admitted during postpartum period (Table 1). The main obstetric indications for ICU admission were pregnancy-induced hypertension (15%) followed by obstetric haemorrhage (9%) and community acquired pneumonia (7%) (Table 2). Other indications were valvular heart disease (5%) and monitoring (6.5%). In the present study maternal mortality among the women admitted to ICU was 16%. The leading cause of maternal death was obstetric haemorrhage (28.13%) followed by pregnancy induced hypertension (21.87%) (Table 3). An ICU intervention during the stay of the patients in terms of mechanical ventilation was used in 140 (70%) cases (Table 4). Among preventable infectious diseases, 5 ANC admissions in medical ICU were for swine flu out of that 1 woman died, 1 women admitted for pulmonary tuberculosis, 3 women for dengue out of that 1 died and 1 admitted for malaria. Average stay in days of survivors was 5 and of non- survivors was 4 days.

Table 1: Distribution of deliveries, total ICU admissions, parity, age

Parameter	Numbers	Percentage
Deliveries	10000	
ICU admissions	4200	
Obstetric admissions to ICU	200	
Obstetric admissions to ICU per 1000 deliveries		20.0
Obstetric admissions to ICU as percentage of total ICU admissions		4.76
Primigravida	110	55
Multigravida	90	45
ANC cases	32	16
PNC cases	168	84
cases delivered outside before admission	4	2
Mean age of obstetric admissions to ICU in years (mean \pm SD)	24.26 \pm 4.78	
Age distribution, years (n=200)	Below 25 years (140)	
	25-30 (35)	
	Above 30 years (25)	

Table 2: Distribution of causes of ICU admissions

Primary diagnosis	Number	Percentage
PPH	18	9
PIH	30	15
Pneumonia	14	7
Valvular heart disease	10	5
Ruptured ectopic	2	1
Ruptured uterus	1	0.5
APH	6	3
Cardiomyopathy	1	1
Acute kidney injury	3	1.5
Eclampsia	6	3
Septicemia	5	2.5
Monitoring	13	6.5

Table 3: Number of deaths related to primary diagnosis

Primary diagnosis	Number of deaths=32	Percentage
PIH	7	21.87
PPH	9	28.13
Septicemia with MODS	3	9.37
Cardiomyopathy	1	3.13
ANC with pneumonia	2	6.25
ANC with severe anaemia	3	9.37
ANC with dengue	1	3.13
ANC with swine flu	1	3.13
Others	5	15.63

Table 4: ICU intervention

Procedure	Number of patients	percentage
Invasive ventilation	140	70
Dialysis	3	1.5

Discussion

Critical illness may complicate any pregnancy. Early warning scores can predict clinical deterioration. Blood gas analysis is often a very good tool to risk categorise a sick parturient. Obstetricians must be familiar with the issues pertaining to care of pregnant women with multiple organ failures. Many obstetric disorders may mimic medical disorders. Constitute a multidisciplinary team and lynchpin the correct diagnosis even while resuscitation measures are on. The team must decide whether delivery will alter the natural history of the disease process and improve maternal survival.

In the present study the mean maternal age (in years) was 24.26 ± 4.78 and 70 percent patients from below 25 years age this finding was correlate with other contemporary Indian studies, but studies from abroad report a higher maternal age[14]. 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[15]. 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 Primigravida (55%) were more as compared to multigravida (45%). 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[16].

In our study only 16% patients were in antepartum period while majority of patients (84%) were admitted during postpartum period, that is almost uniform among all studies from India and abroad[17]. 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[18].

The ICU utilization rate of 20 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[19].

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[20].

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, anaesthesiology, 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[21].

The ICU patients had PIH as the most common primary diagnosis followed by obstetric hemorrhage. In the study by Togonal et al, although the main primary diagnosis for ICU admission was PIH, the main cause of death was hemorrhage[22].

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[23]. Two Indian studies report a very low rate of sepsis 1.6%, 2.45% which is comparable to present study which is 2.5%. 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%[24].

Most common cause of referral to this institution was unavailability of blood and blood products followed by unavailability of speciality doctor's team. A high rate of invasive ventilation (70%) in the present study reflects the severity of illness of patients admitted in present ICU. 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 Togonal 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[25].

The low percentage of patients needing hemodialysis (1.5%) 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%).²⁶ 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[27].

Like many studies from India and abroad obstetric hemorrhage with organ failure was the major cause of mortality in present study, PPH (28.13%) comprised most of these hemorrhage fatalities[28]. Other major causes of mortality in present study were complicated PIH (21.87%) and sepsis with organ failure (9.37%).

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) was 4 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 5 suggests fast rate of complications in these patients demanding more vigilant and quick decisions over treatment modalities in these patients.

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.

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