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A prospective observational study of clinical and demographic profile of obstetric patients requiring intensive care unit admissions in a tertiary care hospital, Kashmir

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Abstract
Background: Obstetric critical care is a key indicator of maternal and perinatal health. Severe complications such as hypertensive disorders, hemorrhage, and sepsis frequently necessitate ICU admission, particularly in resource-limited and rural settings. Understanding demographic factors, antenatal care utilization, and clinical outcomes can guide preventive strategies.
Aim: To analyze the demographic profile, indications for ICU admission, antenatal care status, maternal and perinatal outcomes, and ICU stay duration among obstetric patients at a tertiary care hospital.
Methods: This prospective observational study included 300 obstetric patients admitted to the ICU at Lalla Ded Hospital, Srinagar, from September 2023 to February 2025. Data on demographics, obstetric history, indications for ICU admission, antenatal care, maternal and perinatal outcomes, and duration of ICU stay were collected and analyzed.
Results: The majority of patients were aged 26-30 years (39.7%) and from rural areas (74%), with over half having primary-level education. Multigravida and grand multigravida women constituted 92% of admissions. Hypertensive disorders (34.3%), hemorrhage (26.3%), and sepsis (14.3%) were the leading causes. Only 24.3% had regular antenatal care. Maternal outcomes showed 88.3% survival, 3.3% transfer to higher ICU, and 8.3% mortality. Perinatal outcomes included 82% live births, 14% intrauterine fetal deaths, and 4% early neonatal deaths. Most patients (64%) had ICU stays of 1-3 days, while 12% required ≥7 days.
Conclusion: High parity, rural residence, low education, and inadequate antenatal care are major risk factors for ICU admission. Hypertensive disorders, hemorrhage, and sepsis are primary causes. Strengthening antenatal care, improving rural referral systems, and timely management of obstetric emergencies can reduce maternal and perinatal morbidity and mortality.

Keywords: Obstetric ICU, maternal outcomes, perinatal outcomes, hypertensive disorders, hemorrhage, sepsis

Introduction
Pregnancy is a unique physiological state associated with significant changes in cardiovascular, respiratory, renal, metabolic, and neurohormonal systems. While these adaptations are essential for maternal well-being and fetal development, they can predispose women to complications requiring advanced monitoring and life-support interventions in intensive care units (ICUs) [1]. The provision of critical care during pregnancy and the postpartum period is vital for reducing maternal morbidity and mortality, especially in resource-limited settings.
Cardiovascular adaptations during pregnancy include a 30-50% rise in blood volume and cardiac output. While physiologically beneficial, these changes increase susceptibility to hypertensive disorders, venous thromboembolism (VTE), and peripartum cardiomyopathy, often necessitating ICU admission [1]. Similarly, respiratory adaptations such as reduced functional residual capacity and increased oxygen demand make women vulnerable to hypoxemia and respiratory distress in cases of sepsis, obstetric hemorrhage, or amniotic fluid embolism [2]. Renal hyperfiltration and metabolic changes like gestational insulin resistance can further aggravate pre-existing comorbidities, including diabetes and kidney disease, sometimes resulting in multi-organ dysfunction requiring ICU-level care [3].
The postpartum period remains particularly critical, as conditions such as postpartum hemorrhage (PPH), sepsis, and thromboembolic events are leading causes of maternal mortality

worldwide. PPH alone accounts for nearly one-quarter of global maternal deaths, often requiring resuscitation and advanced intensive care [4, 5]. Neurological and psychiatric complications, including eclampsia, cerebral hemorrhage, or severe mood disorders, also contribute to ICU admissions during pregnancy and puerperium [6]. Maternal mortality (MM) and severe maternal morbidity (SMM) are important indicators of healthcare quality. While the maternal mortality ratio (MMR) has declined globally, it remains high in low- and middle-income countries, including India, where disparities between rural and urban regions are prominent [6]. Severe maternal morbidity or "near-miss" events such as eclampsia, hemorrhage, and sepsis highlight the fragility of maternal healthcare systems and frequently lead to ICU admissions [7, 8]. Common obstetric conditions necessitating ICU care include hypertensive disorders (preeclampsia/eclampsia), obstetric hemorrhage, sepsis, cardiovascular collapse, and respiratory failure [9-13]. Multisystem involvement, delayed referrals, and limited healthcare resources further complicate management in developing regions [14]. In India, despite improvements in maternal healthcare services, ICU admissions continue to reflect the burden of preventable causes such as hemorrhage and hypertensive disorders, with significant rural-urban disparities in access to timely interventions [15, 16]. Given this context, evaluating the clinical and demographic characteristics of obstetric patients admitted to ICUs is crucial. Such data not only provide insights into patterns of maternal morbidity but also guide resource allocation, training, and policy-making to improve outcomes. The present study was undertaken at a tertiary care hospital in Kashmir to assess the clinical and demographic profile of obstetric patients requiring ICU admission, thereby contributing to regional data on maternal critical care.

Materials and Methods

Study Design and Duration

This prospective observational study was conducted over 18 months, from September 2023 to February 2025. Data collection was carried out during the initial 15 months, and the final three months were dedicated to statistical analysis and manuscript preparation.

Study Setting

The study was performed in the Department of Anesthesiology and Critical Care, Government Medical College Srinagar, at Lalla Ded Hospital, a tertiary maternity care and referral center in Kashmir that manages a high burden of critically ill obstetric patients.

Ethical Approval

Ethical clearance was obtained from the Institutional Ethical Committee (IEC) of Government Medical College Srinagar. Written informed consent was obtained from all participants before enrollment.

Study Population and Sampling

All obstetric patients requiring ICU admission during the study period were screened for eligibility. No fixed sample size was pre-determined; instead, all eligible patients were included consecutively. Based on admission trends, approximately 300 patients were enrolled.

Inclusion Criteria

- Obstetric patients admitted to the ICU.
- Women aged 20-45 years.
- Patients classified under ASA physical status II or III.

Exclusion Criteria

- Patients who declined participation.
- Patients undergoing gynecological surgeries unrelated to obstetric causes.

Data Collection

Eligible patients were enrolled after informed consent and interviewed using a pre-structured questionnaire. Information collected included:

- Demographic details (age, residence).
- Obstetric history (gravida, parity).
- Indication for ICU admission.
- Pre-existing comorbidities.
- Clinical course, interventions, and complications during ICU stay.

Participants were followed until final outcome, defined as discharge, death, and transfer to another ICU, or shift to ward. Data were documented in real-time and stored securely.

Outcome Measures

The primary outcomes were maternal mortality and duration of ICU stay. Secondary outcomes included development of organ dysfunction and need for invasive procedures (e.g., mechanical ventilation, dialysis).

Statistical Analysis

Data were entered in Microsoft Excel and analyzed using SPSS version 23.0. Descriptive statistics were expressed as frequencies and percentages for categorical variables, and as mean ± standard deviation or median (IQR) for continuous variables. Associations between categorical variables were tested using the Chi-square test. Continuous variables were compared using independent t-tests. A p-value ≤ 0.05 was considered statistically significant.

Results

The comprehensive demographic and obstetric profile is shown in Table 1. The majority of patients were in the age group of 26-30 years (39.7%), followed by 20-25 years (33.0%). A predominance of rural residence (74.0%) was noted. More than half of the patients (51.0%) had education only up to primary school level. Obstetric history revealed that nearly half of the women were multigravida (49.0%), while 43.0% were grand multigravida. A history of abortion was noted in nearly one-third of cases (32.0%).

Table 1: Demographic and obstetric profile of study population (n=300)

Variable	Category	Frequency	Percentage (%)
Age (years)	20-25	99	33.0
	26-30	119	39.7
	31-35	57	19.0
	36-40	19	6.3
	41-45	6	2.0
Residence	Urban	78	26.0
	Rural	222	74.0
Education	Primary (up to 5th)	153	51.0
	Middle (8th)	19	6.3
	Secondary (10th)	57	19.0
	Higher secondary (12th)	45	15.0
	Graduate & above	25	8.3
Gravida	Primi gravida	24	8.0
	Multi gravida (G2-G3)	147	49.0
	Grand multi gravida (≥G4)	129	43.0
Parity	P0	42	14.0
	P1-2	132	44.0
	P≥3	126	42.0
History of abortion	None	204	68.0
	1 abortion	58	19.3
	≥2 abortions	28	9.3
	Unknown	10	3.3

Hypertensive disorders of pregnancy were the most common indication for ICU admission (34.3%), followed by hemorrhage (26.3%) and sepsis (14.3%). Cardiac, respiratory, hepatic, renal, and neurological causes together contributed to the remaining admissions (Table 2).

Table 2: Indications for ICU admission

Indication	Frequency	Percentage (%)
Hypertensive disorders of pregnancy	103	34.3
Hemorrhage	79	26.3
Sepsis	43	14.3
Heart disease	21	7.0
Respiratory distress/ARDS	14	4.7
Anemia	9	3.0
Epilepsy/seizure disorder	8	2.7
Liver complications	6	2.0
Renal complications	5	1.7
Other causes	12	4.0

Antenatal care utilization was poor among these women. Only 24.3% had received regular antenatal check-ups, while the vast majority (75.7%) either had irregular or no antenatal care. This highlights the link between inadequate ANC and severe complications requiring ICU admission (Table 3).

Table 3: Antenatal care status

Antenatal care	Frequency	Percentage (%)
Regular	73	24.3
Non-regular	227	75.7

Maternal outcomes are detailed in Table 4. A large majority (88.3%) recovered and were shifted to the ward, while 3.3% required transfer to another ICU for advanced support. Despite optimal efforts, maternal mortality was observed in 8.3% of cases.

Table 4: Maternal outcome of ICU admissions

Outcome	Frequency	Percentage (%)
Shifted to ward	265	88.3
Transferred to another ICU	10	3.3
Died	25	8.3

Perinatal outcomes were also assessed. Live births constituted 82.0% of cases, while intrauterine fetal deaths (IUFD) accounted for 14.0%. Early neonatal deaths occurred in 4.0%. These findings underline the significant perinatal morbidity and mortality associated with severe maternal complications requiring ICU care (Table 5).

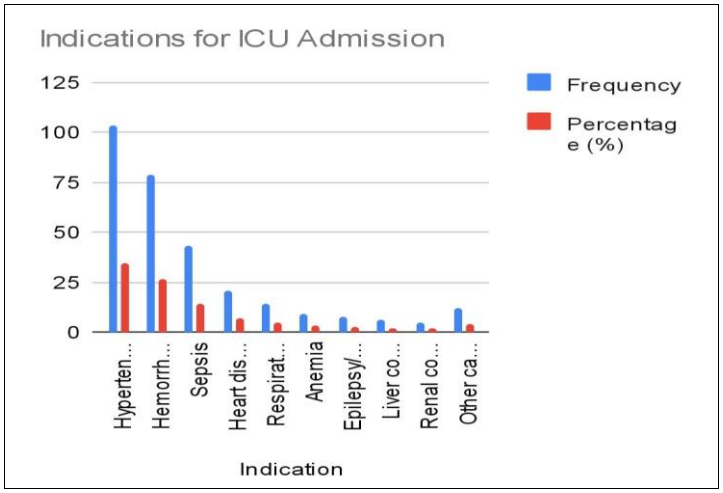
Table 5: Perinatal outcomes

Outcome	Frequency	Percentage (%)
Live birth	246	82.0
Intrauterine fetal death (IUFD)	42	14.0
Early neonatal death	12	4.0

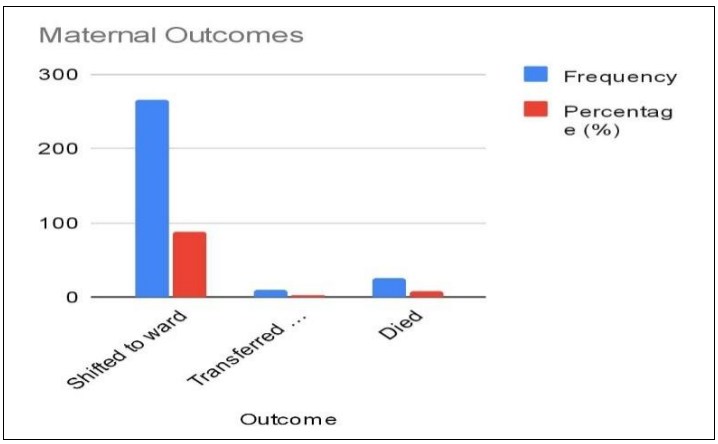
The duration of ICU stay is an important determinant of severity and resource utilization. Most patients (64.0%) required 1-3 days of ICU care, while 24.0% stayed for 4-6 days. A minority (12.0%) required more than a week of ICU stay, reflecting severe morbidity (Table 6).

Table 6: Duration of ICU stay

Duration of stay	Frequency	Percentage (%)
1-3 days	192	64.0
4-6 days	72	24.0
≥7 days	36	12.0



Graph 1: Indications for ICU Admission.



Graph 2: Maternal Outcomes.

Discussion

This prospective observational study involving 300 obstetric patients admitted to the ICU at Lalla Ded Hospital, Srinagar, provides important insights into the demographic determinants, indications for admission, antenatal care utilization, maternal and perinatal outcomes, and duration of ICU stay in a high-volume tertiary referral center.

The majority of women requiring ICU care were in the 26-30 year age group (39.7%), followed by 20-25 years (33%). This reflects the peak reproductive age in India and is consistent with findings from other studies, where the mean maternal ICU admission age ranged between 25 and 30 years [17]. Advanced maternal age (> 35 years), though less frequent, carried a disproportionately higher risk of morbidity due to preeclampsia, placenta previa, and hemorrhage, as previously reported [18].

A predominance of rural residence (74%) was observed in our study. Rural women are particularly vulnerable due to poor transportation facilities, delayed referrals, and inadequate access to skilled obstetric care. This "rural disadvantage" in maternal critical illness has been reported in multiple Indian and African studies [19].

Educational status was notably poor, with over 50% of patients having only primary-level education. Low literacy is strongly associated with poor recognition of warning signs, delayed health-seeking behavior, and irregular antenatal visits [20]. In line with our findings, Rathi *et al*. Also demonstrated that maternal education significantly reduces the risk of ICU admission through improved preparedness and health literacy [20]. Multigravida and grand multigravida women constituted over 90% of ICU admissions, emphasizing the role of high parity as a risk factor for life-threatening complications such as hemorrhage and uterine rupture [21]. A history of abortion was present in nearly one-third of cases, suggesting cumulative risk from previous uterine interventions and underlying comorbidities.

Hypertensive disorders of pregnancy (34.3%), hemorrhage (26.3%), and sepsis (14.3%) were the leading causes of ICU admissions in our cohort. These three conditions accounted for more than 75% of admissions, mirroring the "obstetric triad" of maternal morbidity globally [22]. Hypertensive disorders, especially eclampsia, often require ventilatory support, antihypertensive infusions, and seizure control. Several studies confirm that eclampsia remains the single most important cause of ICU admission in obstetric populations [23, 24]. Hemorrhage, the second most common cause, highlights ongoing gaps in timely access to blood products and surgical intervention [22]. Sepsis, accounting for 14.3% of admissions, continues to rise in significance, driven by unsafe abortion practices and puerperal infections [25]. Only 24.3% of women had received regular antenatal care (ANC), while 75.7% had irregular or no follow-up. This highlights a critical gap, as consistent ANC can identify anemia, hypertensive disorders, and gestational diabetes before complications arise. Our findings are consistent with Kumar *et al*., who found that inadequate ANC is one of the strongest predictors of ICU admission [26]. Bako *et al*. Similarly reported that improved ANC coverage significantly reduces obstetric ICU morbidity and mortality in African populations [27].

The majority of patients (88.3%) recovered and were shifted to the ward, while 8.3% succumbed despite optimal management.

This mortality rate falls within the 5-12% range reported in similar Indian tertiary centers [28]. A small fraction (3.3%) required transfer to another ICU, reflecting the need for highly specialized support.

Mortality was more frequent among women undergoing emergency cesarean sections, a finding also documented by Wanderer *et al*., who emphasized the increased risk of adverse outcomes with emergency surgical interventions under unstable conditions [29]. Complications such as acute kidney injury, pulmonary edema, and disseminated intravascular coagulation (DIC) were major contributors to mortality, similar to reports by Bibi *et al*. [30].

Perinatal compromise was evident, with intrauterine fetal deaths (14%) and early neonatal deaths (4%) recorded. Although 82% of pregnancies resulted in live births, these figures underline the close relationship between maternal critical illness and adverse perinatal outcomes. Previous studies have similarly shown that maternal ICU admission strongly predicts perinatal morbidity and mortality [31].

Most patients required short ICU stays (1-3 days, 64%), while 12% had prolonged stays of ≥7 days. Longer ICU admissions were significantly associated with severe complications, multi-organ dysfunction, and poor outcomes. Mishra *et al*. Reported that prolonged ICU stay is a surrogate marker for severity of illness and strongly correlates with increased maternal mortality [32].

This study underscores several key areas for intervention: strengthening antenatal care coverage, enhancing rural referral systems, improving blood bank facilities, and ensuring timely management of hypertensive and hemorrhagic emergencies. Preventing the cascade from obstetric complications to multi-organ dysfunction remains central to reducing ICU admissions and mortality.

Conclusion

The main causes of ICU admission were hypertensive disorders, obstetric hemorrhage, and sepsis. Poor antenatal care was common, with nearly three-quarters of patients having irregular or no follow-up, emphasizing the need for early detection and timely referral.

Maternal survival was high at 88.3%, but the mortality rate of 8.3% reflects ongoing challenges, especially in emergency cesarean cases and those with multi-organ complications. Perinatal outcomes were affected, with 14% intrauterine fetal deaths and 4% early neonatal deaths. Prolonged ICU stays were associated with severe illness and higher mortality.

Improving maternal outcomes requires strengthening antenatal care, rural referral systems, timely management of obstetric emergencies, and adequate ICU preparedness. Addressing these gaps can reduce preventable ICU admissions and improve both maternal and perinatal outcomes.

Conflict of interest: Nil

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