

ANALYSIS OF OBSTETRIC ADMISSIONS AND NEAR MISS CASES IN THE HIGH DEPENDENCY UNIT AND THEIR OUTCOME IN A TERTIARY CARE CENTRE

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ABSTRACT

Background: High-risk obstetric cases contribute significantly to maternal morbidity and mortality, particularly in resource-limited settings. Early identification and critical care support through high-dependency units (HDU) and Intensive Care Units (ICU) are essential to improve outcomes. This study aimed to analyse the clinical profile, interventions, and outcomes of obstetric admissions to the HDU/ICU of a tertiary care hospital, with a special focus on maternal near-miss events and mortality. **Materials and Methods:** This prospective study included obstetric patients admitted to the HDU/ICU between January and December 2023. Data on demographic profiles, indications for admission, interventions, maternal and neonatal outcomes, and near-miss and mortality rates were collected and analysed. **Results:** Of the 9,338 labor ward admissions, 936 women (10.02%) required HDU/ICU care. Among them, 92.74% had pre-identified high-risk pregnancies. The most common indications for critical care were hypertensive disorders (27.6%), cardiac disease (11.6%), and antepartum haemorrhage (9.5%). Key interventions included blood transfusion (33%), mechanical ventilation (6.8%), and central line insertion (7.4%). The maternal near-miss rate was 10.0%, while the maternal mortality rate was 1.7% (n = 16), with hepatic failure, sepsis, and cardiogenic shock as the leading causes. Neonatal outcomes were favourable in 65.47% of cases, although 15.3% required NICU care. **Conclusion:** This study underscores the critical role of HDU/ICU in managing severe obstetric complications. Hypertensive disorders, cardiac issues, and haemorrhage remain the predominant causes of escalation. Timely intervention and multidisciplinary care significantly contribute to reducing maternal and perinatal morbidity and mortality rates.

INTRODUCTION

Managing critically ill pregnant women in the intensive care unit is challenging due to rare admissions and high maternal mortality rates. Limited knowledge and infrequent HDU encounters increase the risks of mortality and morbidity. The WHO stresses the importance of understanding the diseases affecting this group. The challenge is greater when both the mother and foetus are at risk.^[1] Pregnancy complications may require intensive care. Treating critically ill obstetric patients is complex for intensivists, anaesthesiologists, and obstetricians. Pregnancy-induced changes, such as increased cardiac output and altered immune responses, affect disease progression and treatment. Care must prioritise both

the mother and the foetus, often requiring a multidisciplinary approach for optimal outcomes.^[1,2] High Dependency Units (HDUs) manage patients requiring extensive monitoring, such as mechanical ventilation and multi-organ support, bridging obstetric wards and ICUs for timely interventions. Obstetric ICU/HDU admissions are rare (0.7%/7.2%) but indicate severe maternal morbidity and healthcare system efficiency.^[3] Maternal mortality in ICUs was 12.2%, influenced by resources, referral timeliness, staff, and equipment availability.^[4] The WHO states that each maternal death or complication is an opportunity to improve healthcare. Limited understanding of obstetric emergencies in HDUs often delays diagnosis and increases mortality. Obstetric patients face unique

challenges with distinct physiological characteristics that complicate their care.^[3,4]

The Millennium Development Goal 5 aimed to reduce maternal mortality by 75%. SDG3 targets a global maternal mortality ratio of under 70 per 100,000 live births. The Maternal Mortality Ratio (MMR) measures maternal health.^[5] A maternal near-miss refers to a woman who almost died but survived pregnancy-related complications. Critically ill pregnant women may face obstetric complications such as postpartum haemorrhage, hypertensive disorders, or non-obstetric issues worsened by pregnancy, such as heart disease.^[6,7] Management of these cases involves monitoring foetal health, addressing pregnancy-induced changes, and deciding on early delivery based on the conditions. Challenges arise from inconsistent HDU infrastructure and limited resources, especially in low- and middle-income countries such as India.^[6,7] Many tertiary care facilities lack specialised obstetric HDUs, and pregnant women are often treated in general ICUs where the staff may lack obstetric training. No consensus exists on HDU admission guidelines, leading to over- or under-triage.^[3,8] While international studies document obstetric ICU admissions, Indian data are sparse, often limited to small samples or single centres, and do not distinguish between ICU and HDU admissions. Many studies have focused only on maternal outcomes, ignoring foetal outcomes or system-level factors such as referral patterns or care delays.^[8,9] Research comparing HDU patient profiles is limited, although HDUs manage moderate risk cases.

In India, understanding patient flow and outcomes in ICUs and HDUs is vital for healthcare planning purposes. This study aimed to review obstetric patients and near miss cases admitted to the HDU, evaluating incidence, clinical characteristics, causes, interventions, utilization, and maternal and foetal outcomes.

MATERIALS AND METHODS

This prospective study was conducted in 936 obstetric patients admitted to the HDU and 94 near-miss cases at Government KAPV Medical College and Hospital between January 2024 and December 2024. Ethical committee approval was obtained, and informed consent from all patients was collected before the study.

Inclusion and exclusion criteria

This study included antenatal mothers with obstetric or non-obstetric causes, up to 6 weeks postpartum and post-abortion, belonging to all age groups

requiring HDU care and with more than 24 hours of HDU stay, and those requiring HDU interventions such as mechanical ventilation, haemodialysis, blood products, central lines, and tracheostomy. Patients with gynaecological conditions and those not admitted to the HDU were excluded from the study.

Materials

The materials used in the study included patient case records, HDU monitoring records, ICU and HDU admission registers, investigation reports including MRI, CT, and ECHO, and records of interventions such as mechanical ventilation, haemodialysis, tracheostomy, and blood product administration.

Methods

Nine hundred obstetric admissions to the HDU and 94 near-miss cases were randomly included. The case records were studied in detail, and parameters such as maternal age, parity, gestational age, diagnosis on admission, associated medical and surgical conditions, obstetric history, reason for ICU admission, antenatal or postnatal status, mode of delivery, and surgical procedures performed were recorded. The duration of ICU stays and interventions, including intubation, mechanical ventilation, tracheostomy, haemodialysis, plasmapheresis, and blood product transfusion, were noted. The need for investigations such as MRI, CT, and ECHO and the use of specific drug therapies, including antibiotics, antihypertensive drugs, anticonvulsants, inotropes, cardiac drugs, and insulin infusions were recorded. Maternal complications, such as DIC and ARDS, and maternal outcomes, including mortality, were noted. Neonatal outcomes were assessed based on neonatal intensive care unit admissions. Patients were followed up until discharge, and their condition at discharge was recorded. Data are presented as mean, standard deviation, frequency, and percentage.

RESULTS

Most patients were aged 21-25 years, 326 (36.67%), followed by 26-30 years, 302 (33.97%). Patients aged 31-35 years were 134 (15.07%), 80 (9.0%) were below 20, 38 (4.27%) were 36-40, and 9 (1.01%) were above 40. Multigravida patients predominated 680 (76.49%), while primigravida patients accounted for 209 (23.51%). Most were admitted at ≥ 28 weeks, 723 (81.33%), and 166 (18.67%) were < 28 weeks. The mean age was 26.83 ± 5.05 years, gestational age was 32.62 ± 9.56 weeks, and length of stay was 61.23 ± 67.61 hours. [Table 1]

Table 1: Baseline Characteristics of Patients

	N (%)	
Age group	<20 years	80 (9.0%)
	21–25 years	326 (36.67%)
	26–30 years	302 (33.97%)
	31–35 years	134 (15.07%)

	36–40 years	38 (4.27%)
	>40 years	9 (1.01%)
Parity	Primi	209 (23.51%)
	Multi	680 (76.49%)
Gestational age	<28 weeks	166 (18.67%)
	≥28 weeks	723 (81.33%)
Age (years) (Mean ± SD)		26.83 ± 5.05
Gestational age (weeks) (Mean ± SD)		32.62 ± 9.56
Duration of stay (hours) (Mean ± SD)		61.23 ± 67.61

Out of 9338 labor ward admissions, 936 (10.02%) (92.74%) were high-risk, and near-miss cases were required ICU/HDU admission, while 8402 (89.98%) 94 (10.0%). [Table 2] did not. Among ICU/HDU admissions, 868

Table 2: Distribution of ICU/HDU Admission Characteristics and Outcomes

	N (%)
Total labor ward admissions	9338
ICU/HDU admissions	936 (10.02%)
Non-ICU/HDU admissions	8402 (89.98%)
High-risk cases among ICU/HDU admissions	868 (92.74%)
Near miss cases	94 (10.0%)

LSCS was the most common pregnancy outcome in 414 (53.43%) patients, followed by normal vaginal delivery in 199 (22.38%). Abortions occurred in 59 (6.64%) patients and ectopic pregnancies in 46 (5.17%) patients. The number of undelivered patients in the analysis was 48 (5.40%). Surgical interventions included laparotomy in 45 (1.57%), hysterectomy in 25 (2.81%), and outlet forceps delivery in 25 (2.81%) cases. Hysterotomy was

performed in 15 (1.12%) patients. Spontaneous expulsion occurred in 7 (0.79%) women, while VBAC and vacuum delivery were the least common, occurring in 4 (0.45%) and 2 (0.22%) women, respectively. Hypertensive disorders were the leading cause of HDU admission in 258 (27.5%) patients, followed by obstetric haemorrhage in 165 (17.6%) and heart disease in 109 (11.6%). [Table 3]

Table 3: Pregnancy Outcomes and Causes of HDU Admission

	N (%)
Outcome of pregnancy	LSCS
	414 (53.43%)
	Normal delivery
	199 (22.38%)
	Abortion
	59 (6.64%)
	Ectopic pregnancy
	46 (5.17%)
	Not delivered
	48 (5.40%)
	Laparotomy
	45 (1.57%)
Cause	Hysterectomy
	25 (2.81%)
	Outlet forceps
	25 (2.81%)
	Hysterotomy
	15 (1.12%)
	Spontaneous expulsion
	7 (0.79%)
	VBAC
	4 (0.45%)
	Vacuum
	2 (0.22%)
	Hypertensive disorders of pregnancy
	258 (27.5%)
	Obstetric haemorrhage
	165 (17.6%)
	Heart disease complicating pregnancy
	109 (11.6%)

Central vein catheterisation was the most common intervention in 69 (7.37%) patients, followed by mechanical ventilation in 64 (6.84%) patients. Massive transfusions were required in 18 (1.92%) patients. Dialysis was performed in 8 (0.85%) patients, while tracheostomy and plasmapheresis were the least common, performed in 4 (0.43%) and 2 (0.21%) patients, respectively. Over half of the patients, 524 (55.98%) received blood transfusions, whereas 412 (44.02%) did not. Antihypertensives

were the most commonly used drug therapy in 234 (25.00%) patients, followed by anticonvulsants in 207 (22.12%) and magnesium sulphate in 172 (18.38%). Cardiac drugs were used in 107 (11.43%) patients, inotropes in 64 (6.84%), and anti-oedema drugs in 46 (4.91%). Anticoagulants and insulin infusion were used in 25 (2.67%) and 11 (1.18%) patients, respectively. Nitroglycerin was used, in 4 (0.43%).

Table 4: Distribution of Interventions, Blood Transfusion, and Drug Therapy

	N (%)
Intervention	Central vein catheterization
	69 (7.37%)
	Mechanical ventilation
	64 (6.84%)
	Dialysis
	8 (0.85%)
	Tracheostomy
	4 (0.43%)

	Plasmapheresis	2 (0.21%)
	Massive transfusion	18 (1.92%)
Blood Transfusion	Transfused	524 (55.98%)
	Not transfused	412 (44.02%)
Drug therapy	Antihypertensives	234 (25.00%)
	Anticonvulsants	207 (22.12%)
	Magnesium sulphate	172 (18.38%)
	Cardiac drugs	107 (11.43%)
	Inotropes	64 (6.84%)
	Anti-edema drugs	46 (4.91%)
	Anticoagulants	25 (2.67%)
	Insulin infusion	11 (1.18%)
	Nitroglycerin	4 (0.43%)

Among the maternal outcomes, 915 (97.76%) patients were discharged stably. Maternal death occurred in 16 (1.71%) patients. Discharges against medical advice and referrals each comprised 2 (0.21%), and 1 (0.11%) patient was discharged with a disability. Regarding neonatal outcomes, most babies were healthy (582 [65.47 %]). NICU admission was required in 136 (15.30%) cases.

Abortions accounted for 67 (7.54%), and 53 (5.96%) were not delivered during assessment. Ectopic pregnancies occurred in 40 (4.50%) cases. There were 10 (1.12%) stillbirths and 1 (0.11 %) case of intrauterine demise. High-risk cases comprised 868 (92.74%) patients. Near-miss cases were observed in 94 (10.0%) patients. [Table 5]

Table 5: Distribution of Maternal, Neonatal, and Other Outcomes

			N (%)
Outcome	Maternal outcome	Discharged well	915 (97.76%)
		Maternal death	16 (1.71%)
		Discharged AMA	2 (0.21%)
		Referred	2 (0.21%)
		Disability	1 (0.11%)
	Neonatal outcome	Baby well	582 (65.47%)
		NICU admission	136 (15.30%)
		Abortion	67 (7.54%)
		Not delivered	53 (5.96%)
		Ectopic	40 (4.50%)
		Stillbirth	10 (1.12%)
		IUD	1 (0.11%)
	Other outcomes	High-risk cases	868 (92.74%)
		Near miss cases	94 (10.0%)

DISCUSSION

In our study, most patients were young, in their early to mid-twenties, with few at the age extremes. Multigravida patients outnumbered primigravida patients. Admissions occurred later in gestation, indicating more complications in advanced pregnancies. The duration of stay varied, reflecting severity differences. A significant portion of labor ward admissions required ICU/HDU care, indicating a critical care burden. Most ICU/HDU patients were high-risk, with many near-miss cases, underscoring early recognition and timely referral importance. A 2025 HDU series reported most women were 20-29 years old; a 2021 near-miss study found maximum cases in the 20-24 age group and third trimester; a 2024 ICU study found 86.7% were early postpartum after cesarean.^[10,11] Severe maternal morbidity tends to cluster in late pregnancy and the postpartum period rather than early gestation.

In our study, caesarean section was the most common mode of delivery, followed by vaginal delivery. Hypertensive disorders caused HDU admissions, followed by obstetric haemorrhage and cardiac disease, major contributors to severe

maternal morbidity. Central venous catheterisation and mechanical ventilation were common, reflecting the need for advanced monitoring and respiratory support. Our causation profile aligns with recent literature. A 2025 HDU series found eclampsia as the most common admission reason; a 2022 near-miss HDU study identified hypertensive disorders and obstetric haemorrhage as main direct causes, with cardiac disease as the main indirect cause.^[10,12] In our study, many patients required blood transfusions, indicating a high prevalence of anaemia and haemorrhagic complications. Antihypertensives, anticonvulsants, and magnesium sulphate were often used in hypertensive disorders. Most patients were discharged in stable condition, indicating effective HDU/ICU management. Recent reports mention close monitoring, antihypertensives, magnesium sulphate, blood transfusion, inotropes, anticonvulsants, and mechanical ventilation. In a study by Vanitha et al., 33% received 3-5 blood transfusions, 21% more than 5, 70% medical intervention with “antihypertensives /anticonvulsants /anticoagulants /diuretics and Digoxin,” and 5% moved to ICU, all needing ventilatory support.^[13] A study by Kaveri et al.

aligns, noting interventions like “anticonvulsants, blood transfusions, and mechanical ventilation”.^[14] The intervention burden supports true severe maternal morbidity rather than routine HDU observation.

In our study, the maternal mortality rate was low, with few adverse outcomes. Most neonates were healthy, but many required NICU admissions, reflecting the impact of maternal complications. High-risk and near-miss cases were key HDU admission components, highlighting HDU care's role in preventing maternal mortality and improving outcomes. A 2026 OHDU study by Rathwa et al., reported 95.5% discharge to the postnatal ward and 0.5% mortality; a 2024 ICU patient by Rocha et al., reported 1.3% mortality and 46.4% NICU admission.^[15,11] Our low maternal mortality fits best with effective HDU-level care, while neonatal compromise remains an important residual burden.

CONCLUSION

This study highlighted the role of the ICU/HDU in managing high-risk pregnancies to enhance the survival chances of mothers and offspring. Conditions requiring HDU include high blood pressure, cardiovascular diseases, and massive haemorrhage, making antenatal visits and early management crucial. Most patients were discharged in good health, indicating the success of ICU/HDU treatment in secondary care hospitals. Improving antenatal care, early identification of high-risk pregnancies, and timely referrals from smaller hospitals are vital for reducing maternal complications and mortality. Analysing 'near-miss' cases during and after delivery will enhance patient care and treatment. Identifying high-risk pregnancies, using low-dose aspirin, taking calcium supplements, and attending follow-up visits are essential. Pregnancy-related heart disease causes many complications but can be prevented through early health education and cardiovascular screening before conception. Massive haemorrhage can lead to maternal complications and death. HDU care bridges routine and ICU care, aiding in the early treatment of serious cases and reducing maternal complications and deaths.

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