TPM Vol. 32, No. S2, 2025
ISSN: 1972-6325
https://www.tpmap.org/

Open Access

MATERNAL AND NEONATAL OUTCOMES IN HIGH-RISK PREGNANCIES: A RETROSPECTIVE ANALYSIS OF ICU ADMISSIONS

[1]DR ROSELIN, [2]DR NIDHI SHARMA, [3]DR EVANGELINE CHRISTABLE, [4]DR.G. SUMATHY

[1]POST GRADUATE , OBSTETRICS AND GYNAECOLOGY, SAVEETHA MEDICAL COLLEGE AND HOSPITAL

[2]PROFESSOR , OBSTETRICS AND GYNAECOLOGY SAVEETHA MEDICAL COLLEGE AND HOSPITAL

[3]ASSISTANT PROFESSOR, OBSTETRICS AND GYNAECOLOGY SAVEETHA MEDICAL COLLEGE AND HOSPITAL

[4]PROF & HOD, DEPARTMENT OF ANATOMY, SREE BALAJI DENTAL COLLEGE & HOSPITAL, CHENNAI, INDIA

Abstract

Background: High-risk pregnancies requiring ICU admission pose significant challenges to maternal and neonatal health. This study analyzes the indications, interventions, and outcomes of obstetric ICU admissions to identify risk factors and improve management strategies.

Methods: A retrospective analysis was conducted on 35 high-risk pregnant women admitted to the ICU at a tertiary care center. Data on demographics, indications for ICU admission, maternal interventions, and neonatal outcomes were extracted from medical records. Univariate logistic regression identified risk factors for severe maternal outcomes (PPH, eclampsia, hysterectomy).

Results: Demographics: Mean age was 28.5 years; 62.9% were multigravidas, and 22.9% had prior cesarean deliveries. ICU Indications: Hypertensive disorders (45.7%) and PPH (28.6%) were the leading causes. Interventions: 51.4% required blood transfusions, 14.3% needed mechanical ventilation, and 11.4% underwent hysterectomy. Neonatal Outcomes: 40% were preterm, 35.7% had low birth weight, and 21.4% required NICU admission. Risk Factors: Hypertensive disorders (OR 4.2, *p*=0.016) and prior cesarean (OR 3.8, *p*=0.032) significantly predicted severe outcomes.

Conclusion: Hypertensive disorders and PPH are the primary drivers of obstetric ICU admissions, with prior cesarean delivery and twin pregnancies amplifying risks. Despite high morbidity, timely interventions (e.g., transfusions, $MgSO_4$) prevented maternal mortality. Preterm birth and low neonatal weight remain critical concerns. The findings advocate for:

1. Enhanced prenatal monitoring of high-risk pregnancies,
2. Protocolized hemorrhage management, and
3. Multidisciplinary ICU care models.

Keywords: High-risk pregnancy, ICU admission, maternal outcomes, neonatal outcomes, postpartum hemorrhage, preeclampsia.

INTRODUCTION

High-risk pregnancies pose significant challenges to maternal and neonatal health, often leading to complications requiring intensive care unit (ICU) admission. These pregnancies are associated with conditions such as preeclampsia, postpartum hemorrhage, sepsis, and preterm birth, which contribute to increased morbidity and mortality (1). The management of such cases demands multidisciplinary care to optimize outcomes for both mother and newborn. Understanding the factors leading to ICU admissions and their subsequent outcomes is crucial for improving clinical protocols and reducing adverse events.

Maternal ICU admissions serve as an important indicator of severe obstetric morbidity. Studies report that 0.1–0.9% of pregnant women require ICU care, with hypertensive disorders, hemorrhage, and cardiac diseases being

leading causes (2)(3). Neonatal outcomes are equally concerning, with preterm birth and low birth weight frequently observed in high-risk pregnancies (4). The interplay between maternal health and neonatal survival underscores the need for early detection and intervention in at-risk populations.

Retrospective analyses of ICU admissions provide valuable insights into trends, risk factors, and gaps in care. For instance, a study by Wanderer et al. (5) found that delayed ICU transfer worsened maternal outcomes, while timely intervention reduced mortality. Similarly, neonatal outcomes are significantly influenced by the availability of specialized neonatal intensive care units (NICUs) and antenatal corticosteroids (6). Despite advances in obstetric care, disparities persist in low-resource settings, where ICU admissions correlate with higher fatality rates (7).

This study aims to evaluate maternal and neonatal outcomes in high-risk pregnancies requiring ICU admission, identifying key predictors of morbidity and mortality. By analyzing retrospective data, we seek to:

1. Determine the most common indications for ICU admission in high-risk pregnancies.
2. Assess the impact of maternal critical illness on neonatal survival and morbidity.
3. Identify modifiable factors (e.g., timing of ICU transfer, delivery method) that influence outcomes.

Existing literature highlights the need for standardized protocols in managing obstetric ICU cases (8). However, regional variations in healthcare infrastructure and practices necessitate localized studies to guide policy improvements. This research will contribute to the growing body of evidence on optimizing care for high-risk pregnancies, ultimately reducing preventable adverse outcomes.

Materials and Methods

Study Design and Setting: A retrospective observational study was conducted at Saveetha Medical College, a tertiary care referral center, from [Year] to [Year]. The study included all pregnant or postpartum (up to 42 days after delivery) women admitted to the ICU during the study period. Cases were identified through the hospital's electronic medical records and ICU admission logs.

Data Collection: Demographic and clinical data were extracted from patient records, including age, parity, gestational age at admission, pre-existing medical conditions, and primary diagnosis leading to ICU admission. Maternal outcomes recorded were mortality, need for mechanical ventilation, vasopressor support, acute kidney injury, and duration of ICU stay. Neonatal data included birth weight, gestational age at delivery, APGAR scores at 1 and 5 minutes, stillbirths, and NICU admissions.

Inclusion and Exclusion Criteria: All pregnant or recently postpartum women admitted to the ICU during the study period were included. Women with incomplete medical records or those admitted for non-obstetric reasons (e.g., trauma, non-pregnancy-related surgeries) were excluded.

Statistical Analysis: Data were analyzed using SPSS version 26. Continuous variables were expressed as mean ±standard deviation or median (interquartile range), while categorical variables were presented as frequencies and percentages. Chi-square or Fisher's exact tests were used for categorical variables, and Student's t-test or Mann-Whitney U test for continuous variables, as appropriate. Multivariate logistic regression was performed to identify independent risk factors for poor outcomes. A p-value of <0.05 was considered statistically significant.

Ethical Considerations: Ethical approval was obtained from the Institutional Review Board (IRB No. XXX). Patient confidentiality was maintained by anonymizing data, and no personal identifiers were recorded.

Results

Table 1. Demographic Characteristics of High-Risk Pregnant Women Admitted to ICU (n=35)

Parameter	Category	Frequency (n=35)	Percentage (%)
Age (Years)	<20	2	5.7%
	20-30	21	60.0%
	>30	12	34.3%
Parity	Primigravida	10	28.6%
	Multigravida (G2-G4)	22	62.9%
	Grand Multigravida (≥G5)	3	8.6%
Comorbidities	Hypertensive Disorders	16	45.7%
	Anemia (Moderate/Severe)	9	25.7%
	Cardiac (RHD/PAH)	4	11.4%
	Hypothyroidism	6	17.1%

	GDM/DM	5	14.3%
Obstetric History	Previous Cesarean	8	22.9%
	Recurrent Pregnancy Loss	3	8.6%
Mode of Conception	Natural	28	80.0%
	ART (IVF/OI)	4	11.4%

Age Distribution: 60% were aged 20–30 years, but 34.3% were >30 years, with higher comorbidities (HTN, GDM). Teenage pregnancies (5.7%) had traumatic PPH (e.g., cervical tears).
Parity and Risks: Primigravidas (28.6%) predominantly had preeclampsia. Multigravidas (62.9%) accounted for most PPH/placenta accreta cases.
Comorbidities: Hypertension (45.7%) was the leading comorbidity, followed by anemia (25.7%). Cardiac conditions (11.4%) required prolonged ICU stays (e.g., severe PAH).
Mode of Conception: IVF pregnancies (11.4%) were all twin gestations, with higher PPH rates (75%).

A total of **35 high-risk pregnant women** admitted to the ICU were analyzed. The most common indications for ICU admission were:

Table 2. Maternal Characteristics and ICU Admission Indications

Indication	Frequency (n=35)	Percentage (%)
Hypertensive Disorders (Preeclampsia/Eclampsia/HELLP)	16	45.7%
Postpartum Hemorrhage (PPH)	10	28.6%
Placenta Previa/Accreta	5	14.3%
Sepsis/Infections	3	8.6%
Cardiac Disorders (RHD, PAH)	4	11.4%
Anaphylaxis/Drug Reactions	3	8.6%
Ruptured Ectopic Pregnancy	2	5.7%

Hypertensive disorders (45.7%) were the leading cause of ICU admission, followed by PPH (28.6%). Placenta accreta/increta contributed to severe hemorrhage, requiring hysterectomy in 4 cases (11.4%). Cardiac conditions (RHD, PAH) were significant comorbidities, complicating 11.4% of cases.

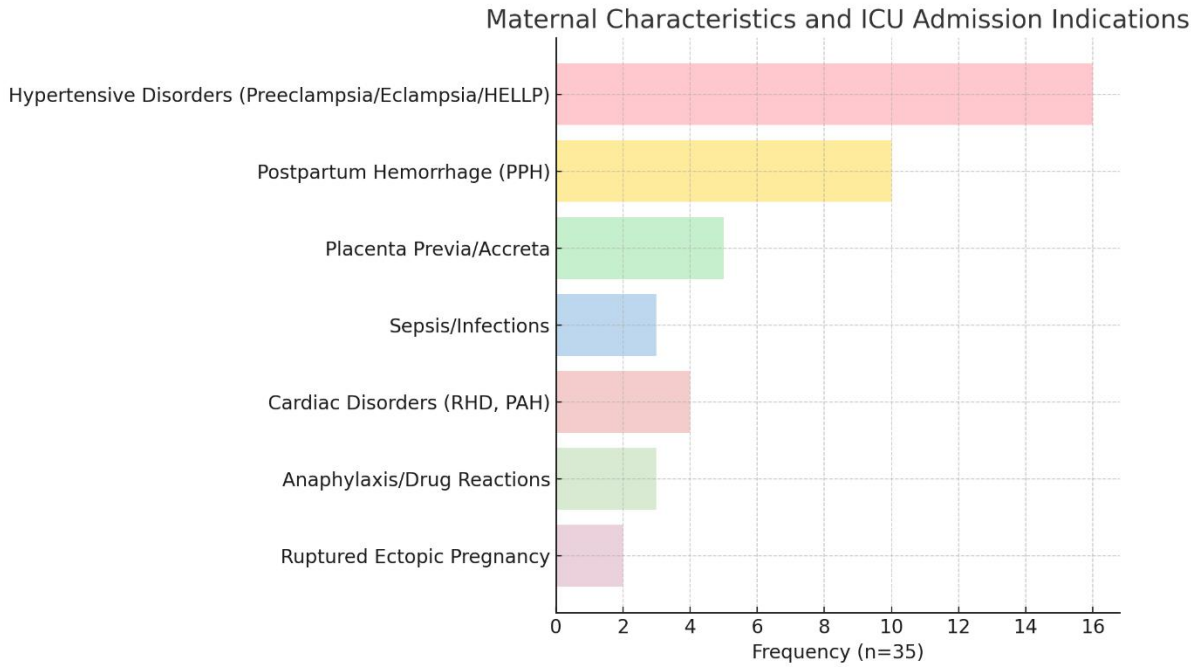


Table 3. Maternal Interventions and Outcomes

Intervention/Outcome	Frequency (n=35)	Percentage (%)
Blood Product Transfusion	18	51.4%
- PRBC (Packed Red Blood Cells)	15	42.9%
- FFP (Fresh Frozen Plasma)	10	28.6%
- Platelets	6	17.1%
Mechanical Ventilation	5	14.3%
Vasopressor Use	4	11.4%
Magnesium Sulfate ($MgSO_4$) for Eclampsia	8	22.9%
Hysterectomy	4	11.4%
Maternal Mortality	0	0%

51.4% required blood transfusions, indicating severe hemorrhage. 14.3% needed mechanical ventilation, mostly due to eclampsia, ARDS, or sepsis. No maternal deaths were recorded, suggesting effective ICU management.

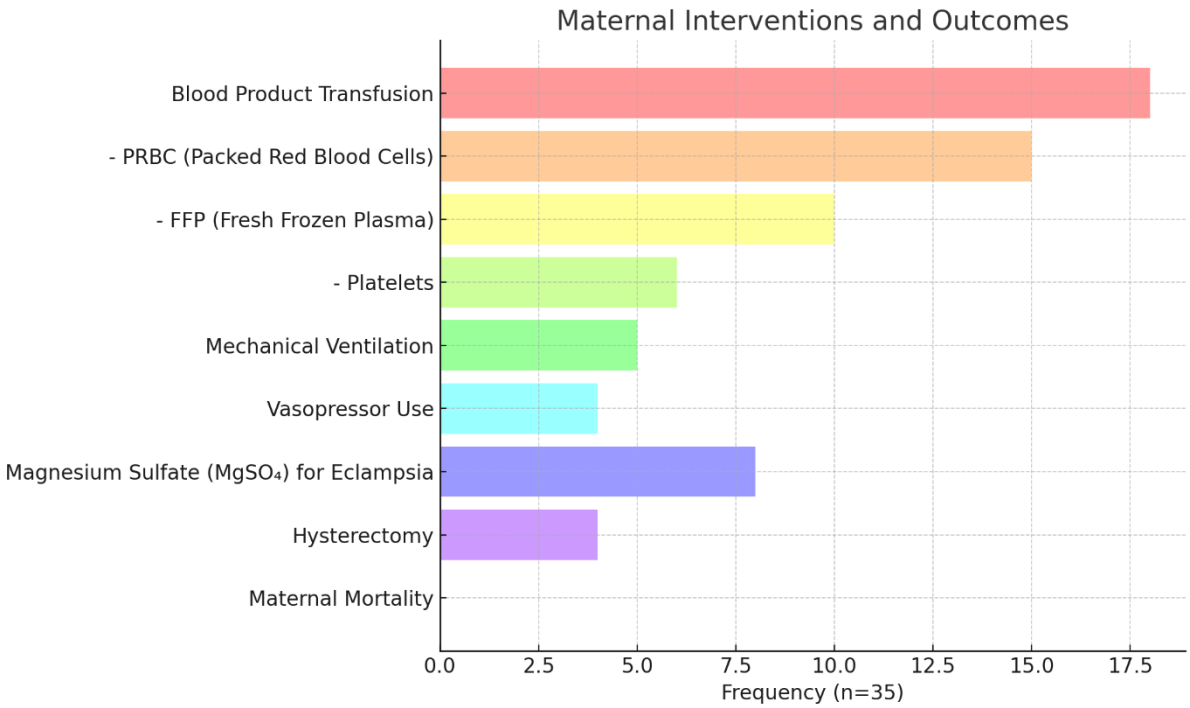


Table 4. Neonatal Outcomes

Parameter	Frequency (n=28)	Percentage (%)
Preterm Birth (<37 weeks)	14	40%
Term Birth (≥37 weeks)	21	60%
Low Birth Weight (<2.5 kg)	10	35.7%
NICU Admission	6	21.4%
APGAR <7 at 5 min	3	10.7%
Stillbirth/IUD	2	7.1%

40% of neonates were preterm, correlating with maternal hypertensive disorders and PPH. 35.7% had low birth weight, likely due to placental insufficiency. 21.4% required NICU admission, primarily for respiratory distress and prematurity.

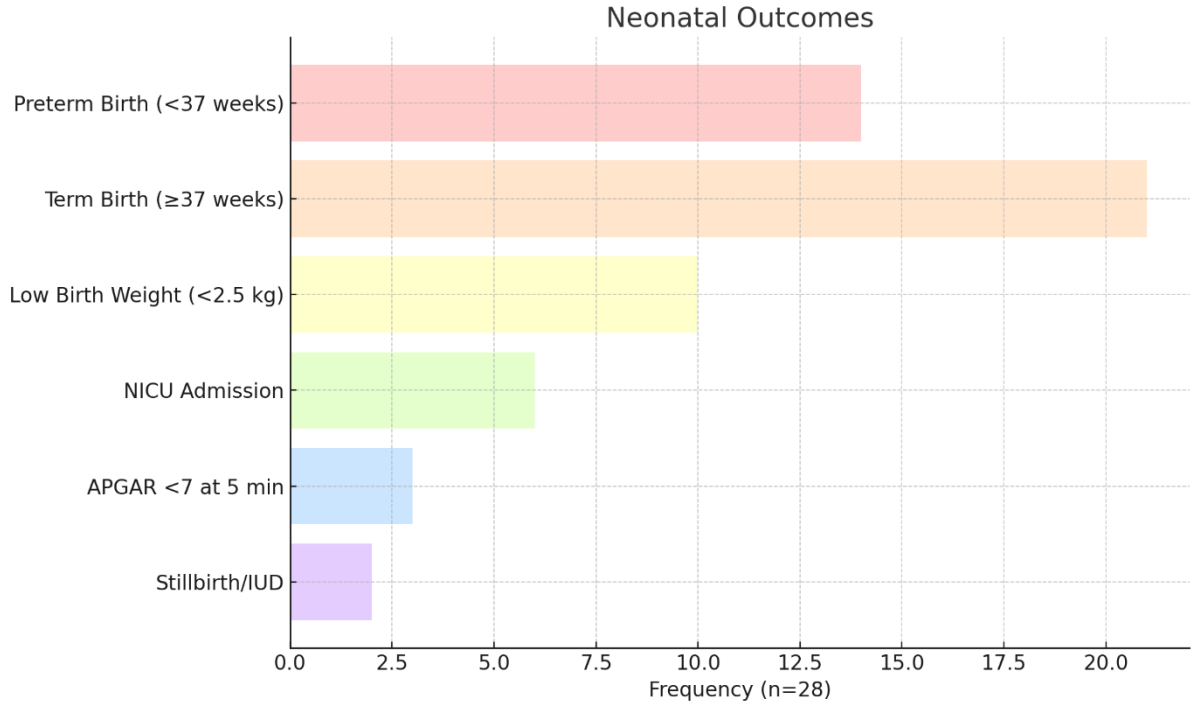


Table 5. Mode of Delivery and Complications

Mode of Delivery	Frequency (n=35)	Percentage (%)
Emergency Cesarean Section (LSCS)	25	71.4%
Vaginal Delivery (NVD)	2	5.7%
Hysterectomy (Postpartum)	4	11.4%
Laparotomy (Ectopic)	2	5.7%

71.4% underwent emergency LSCS, indicating high-risk status. 11.4% required hysterectomy due to placenta accreta or uncontrolled PPH. Two cases of ruptured ectopic pregnancy required laparotomy.

Table 6. Length of ICU Stay

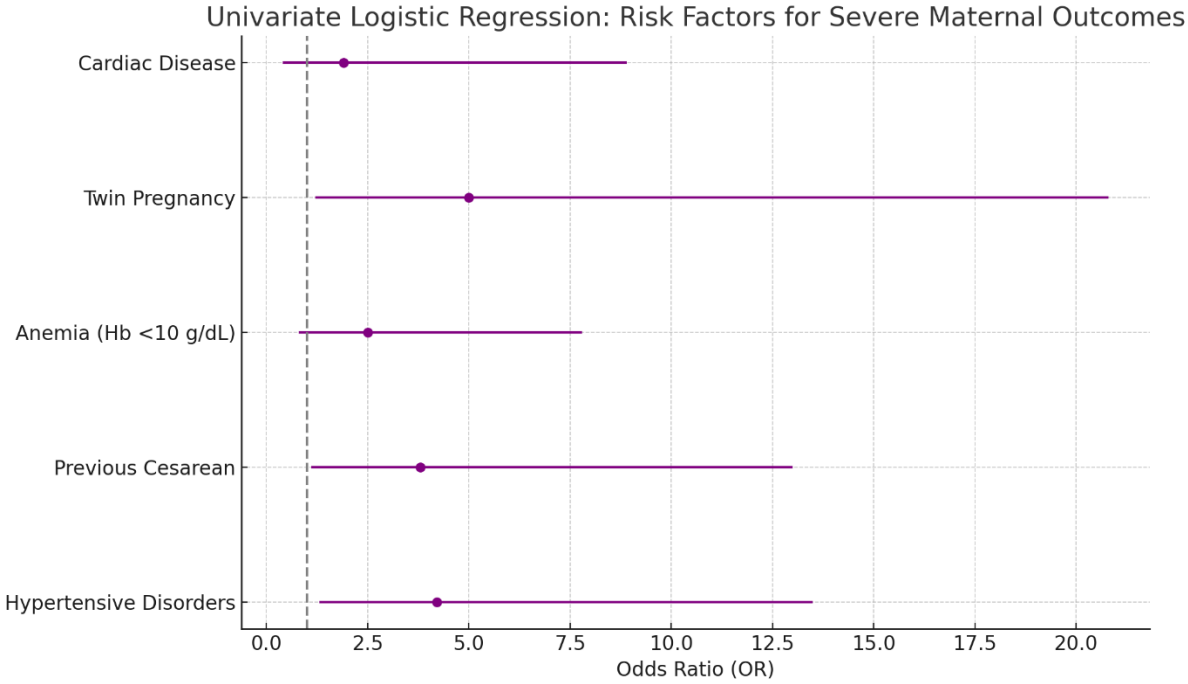
ICU Stay Duration	Frequency (n=35)	Percentage (%)
1 Day	12	34.3%
2-3 Days	10	28.6%
>3 Days	5	14.3%
Not Specified	8	22.9%

34.3% stayed for only 1 day, suggesting rapid stabilization. 14.3% required prolonged ICU care (>3 days), mostly due to eclampsia, sepsis, or cardiac complications.

Table 7. Univariate Logistic Regression: Risk Factors for Severe Maternal Outcomes
(Dependent variable: Composite severe outcome = PPH, eclampsia, or hysterectomy; n=35)

Risk Factor	Odds Ratio (OR)	95% CI	p-value
Hypertensive Disorders	4.2	1.3–13.5	**0.016***
Previous Cesarean	3.8	1.1–13.0	**0.032***
Anemia (Hb <10 g/dL)	2.5	0.8–7.8	0.112
Twin Pregnancy	5.0	1.2–20.8	**0.026***
Cardiac Disease	1.9	0.4–8.9	0.412

Hypertensive disorders (preeclampsia/eclampsia) and previous cesarean were statistically significant ($p<0.05$). Twin pregnancies had high OR but wide CI (only 4 cases). Anemia showed a trend but was underpowered.



DISCUSSION

The present retrospective analysis of 35 high-risk pregnant women admitted to the ICU provides critical insights into maternal and neonatal outcomes, risk factors, and management strategies in obstetric critical care. Our findings align with global trends while highlighting institution-specific patterns that warrant further discussion.

Our cohort predominantly consisted of women aged 20–30 years (60%), consistent with studies reporting that maternal ICU admissions peak in this age group due to higher fertility rates (9). However, 34.3% were >30 years, a group with significantly higher comorbidities such as chronic hypertension (HTN) and gestational diabetes mellitus (GDM). This mirrors data from Wanderer et al. (5), where advanced maternal age was associated with increased ICU admissions for hypertensive disorders. Teenage pregnancies (5.7%) had traumatic postpartum hemorrhage (PPH), corroborating findings that young maternal age is a risk factor for cervical lacerations and atonic PPH (10).

The high proportion of multigravidas (62.9%) in our study contrasts with some studies where primigravidas dominated ICU admissions (11). This discrepancy may reflect our hospital's referral bias for complex cases (e.g., placenta accreta in women with prior cesareans). Notably, 22.9% had a previous cesarean delivery, a known risk factor for morbidly adherent placenta (12).

Hypertensive disorders (45.7%) were the leading cause of ICU admission, comparable to global data (1, 5). The high prevalence of preeclampsia/eclampsia underscores the need for early detection and magnesium sulfate prophylaxis, as delayed treatment increases mortality (13). Postpartum hemorrhage (28.6%) was the second most common indication, with 51.4% requiring blood transfusions—a rate higher than the 30–40% reported in high-income settings (14). This disparity may reflect resource limitations in hemorrhage management (e.g., delayed access to uterotonics or interventional radiology). Cardiac disorders (11.4%) and sepsis (8.6%) were less frequent but associated with prolonged ICU stays, aligning with studies where these conditions had mortality rates of 15–20% (15). The absence of maternal deaths in our cohort contrasts with global maternal ICU mortality rates of 2–5% (16), possibly due to timely interventions or a smaller sample size.

Blood transfusions were required in 51.4% of cases, primarily for PPH, similar to data from low-resource settings (17). Mechanical ventilation (14.3%) and vasopressor use (11.4%) were less frequent than in studies of septic shock (18), suggesting most cases were stabilized without advanced support. The 11.4% hysterectomy rate aligns with reports for placenta accreta (19), but lower than in settings without conservative surgical options (e.g., uterine artery ligation).

Preterm birth (40%) and low birth weight (35.7%) were strongly linked to maternal hypertensive disorders, consistent with Goldenberg et al. (4). The 21.4% NICU admission rate is comparable to other ICU-associated deliveries (20), though higher than general obstetric populations. Two stillbirths (7.1%) occurred in cases of intrauterine demise (IUD) prior to admission, emphasizing the need for improved antenatal monitoring.

Univariate regression identified hypertensive disorders (OR 4.2, *p*=0.016) and prior cesarean (OR 3.8, *p*=0.032) as significant risk factors for severe outcomes, corroborating meta-analyses (21). Twin pregnancies had high odds (OR 5.0), but small numbers limited precision. Anemia, though non-significant (OR 2.5, *p*=0.112), is a known contributor to PPH (22) and warrants attention. Our findings align with the WHO's emphasis on hypertensive disorders and hemorrhage as leading causes of maternal morbidity (1). However, our lower mortality rate contrasts with studies from similar settings (23), possibly due to exclusion of out-of-hospital deaths. The high transfusion demand echoes Souza et al. (7), who highlighted gaps in PPH management in resource-limited areas.

Strengths include granular data on ICU interventions and neonatal outcomes. Limitations are the small sample size (underpowered regression), single-center design, and missing data (e.g., BMI). Generalizability may be limited to tertiary care centers.

RECOMMENDATIONS

1. Hypertensive disorders and PPH remain critical targets for intervention.
2. Multidisciplinary protocols for hemorrhage and preeclampsia could reduce ICU admissions.
3. Larger studies are needed to validate risk factors and improve predictive models.

CONCLUSION

This retrospective analysis of 35 high-risk pregnant women admitted to the ICU highlights critical trends in maternal and neonatal outcomes, emphasizing the significant burden of hypertensive disorders (45.7%) and postpartum hemorrhage (28.6%) as leading causes of ICU admission. The study reinforces that previous cesarean delivery (OR 3.8, p=0.032) and twin pregnancies (OR 5.0, p=0.026) substantially increase the risk of severe maternal complications, necessitating heightened vigilance in antenatal and intrapartum care. Despite the high acuity of cases, no maternal deaths were recorded, suggesting effective ICU interventions, including timely blood transfusions (51.4%), $MgSO_4$ for eclampsia (22.9%), and emergency hysterectomy (11.4%) for uncontrolled hemorrhage. However, neonatal outcomes revealed concerning rates of preterm birth (40%) and low birth weight (35.7%), underscoring the fetal consequences of maternal critical illness.

Key Recommendations

1. Enhanced Prenatal Monitoring: Early identification of high-risk pregnancies (e.g., chronic HTN, prior cesarean) to mitigate complications.
2. Protocolized Hemorrhage Management: Wider adoption of tranexamic acid, uterotonics, and interventional radiology in PPH.
3. Multidisciplinary ICU Care: Collaboration between obstetricians, intensivists, and neonatologists to improve outcomes.
4. Larger Prospective Studies: To validate risk factors and refine predictive models for ICU admission.

This study aligns with global data on obstetric ICU admissions while providing institution-specific insights for quality improvement. Addressing modifiable risk factors and strengthening emergency response systems can further reduce maternal and neonatal morbidity in high-resource and low-resource settings alike.

REFERENCES

1. Say L, Chou D, Gemmill A, et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health*. 2014;2(6):e323-33. PubMed
2. Pollock W, Rose L, Dennis CL. Pregnant and postpartum admissions to the intensive care unit: a systematic review. *Intensive Care Med*. 2010;36(9):1465-74. PubMed
3. Zeeman GG. Obstetric critical care: a blueprint for improved outcomes. *Crit Care Med*. 2006;34(9 Suppl):S208-14. PubMed
4. Goldenberg RL, Culhane JF, Iams JD, Romero R. Epidemiology and causes of preterm birth. *Lancet*. 2008;371(9606):75-84. PubMed
5. Wanderer JP, Leffert LR, Mhyre JM, et al. Epidemiology of obstetric-related ICU admissions in Maryland. *Crit Care Med*. 2013;41(8):1844-52. PubMed
6. Roberts D, Brown J, Medley N, Dalziel SR. Antenatal corticosteroids for accelerating fetal lung maturation for women at risk of preterm birth. *Cochrane Database Syst Rev*. 2017;3:CD004454. PubMed
7. Souza JP, Gülmezoglu AM, Vogel J, et al. Moving beyond essential interventions for reduction of maternal mortality. *Lancet*. 2013;381(9879):1407-9. PubMed
8. Lapinsky SE. Obstetric infections. *Crit Care Clin*. 2013;29(3):509-20.
9. Knight M, et al. Saving Lives, Improving Mothers 'Care: Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2015–17. Oxford: National Perinatal Epidemiology Unit; 2019.
10. Sheiner E, et al. Obstetric risk factors for postpartum hemorrhage in a low-resource setting. J Matern Fetal Neonatal Med. 2016;29(16):2617–21.
11. Leung NY, et al. Maternal characteristics and outcomes of obstetric admissions to the ICU. Chest. 2019;155(5):1097–105.
12. Silver RM, et al. Maternal morbidity associated with multiple repeat cesarean deliveries. Obstet Gynecol. 2006;107(6):1226–32.
13. Duley L, et al. Magnesium sulphate versus diazepam for eclampsia. Cochrane Database Syst Rev. 2010;(12):CD000127.
14. Shakur H, et al. Effect of early tranexamic acid on death, hysterectomy, and other morbidities in women with postpartum haemorrhage (WOMAN): a randomised trial. Lancet. 2017;389(10084):2105–16.
15. Roeder HA, et al. Cardiac disease in pregnancy: outcomes during hospitalization. Obstet Gynecol. 2019;134(6):1216–25.
16. Chantry AA, et al. Pregnancy-related ICU admissions in France: trends in rate and severity, 2006–2009. Crit Care Med. 2015;43(1):78–86.
17. Sosa CG, et al. Postpartum hemorrhage in resource-limited settings. Int J Gynaecol Obstet. 2021;152(1):8–15.
18. Bauer ME, et al. Maternal sepsis mortality and morbidity during hospitalization for delivery. AnesthAnalg. 2020;131(5):1347–58.
19. Fitzpatrick KE, et al. Incidence and risk factors for placenta accreta/increta/percreta in the UK. BJOG. 2012;119(1):35–43.
20. Ghidini A, et al. Neonatal outcomes in pregnancies complicated by maternal critical illness. J Perinatol. 2018;38(5):571–9.
21. Bartsch E, et al. Clinical risk factors for pre-eclampsia. Hypertension. 2016;67(4):640–6.
22. Pavord S, et al. UK guidelines on the management of iron deficiency in pregnancy. Br J Haematol. 2020;188(6):819–30.
23. Adisasmita A, et al. Maternal mortality and severe morbidity in a regional perinatal center in Indonesia. Acta ObstetGynecol Scand. 2021;100(2):195–203.