

A Comparative Analysis of Maternal Near Miss and Maternal Mortality: A Prospective Observational Study in a Tertiary Care Hospital of Northern Bihar

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Abstract:

Background: Maternal mortality remains a critical indicator of a region's healthcare quality. However, the study of Maternal Near Miss (MNM) cases women who survived life-threatening pregnancy complications offers more robust data for improving obstetric care due to the larger volume of cases and the ability to interview survivors.

Objective: To compare the prevalence, nature of complications, and outcomes of MNM cases and maternal deaths (MD) to identify preventable factors and delays in care.

Methods: This prospective observational study was conducted at the Department of Obstetrics & Gynaecology, Darbhanga Medical College and Hospital (DMCH), Bihar, from March 2025 to September 2025. Following the WHO near-miss approach, 100 cases (96 MNM and 4 MD) were analyzed. Data on demographics, clinical presentation, and interventions were recorded.

Results: During the study period, the MNM to MD ratio was 24:1. Obstetric hemorrhage (38%) and hypertensive disorders of pregnancy (30%) were the leading causes of MNM, while sepsis and eclampsia dominated MD cases. A significant correlation was found between late referrals and mortality ($p < 0.05$). The Maternal Near Miss Incidence Ratio was 14.2 per 1,000 live births.

Conclusion: MNM cases significantly outnumber maternal deaths, providing a larger window for clinical audit. Strengthening peripheral referral systems and early management of hemorrhage and pre-eclampsia are vital to reducing both near-miss events and mortality.

Keywords: Maternal Near Miss, Maternal Mortality, Obstetric Hemorrhage, Eclampsia, WHO Criteria, Bihar, Tertiary Care.

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Introduction

The transition from maternal health to maternal death is often a continuum, punctuated by a critical phase known as "Maternal Near Miss" (MNM). A maternal near miss refers to a woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy. In the global pursuit of Sustainable Development Goal (SDG) 3.1 reducing the global maternal mortality ratio to less than 70 per 100,000 live births the analysis of near-miss cases has emerged as a cornerstone of obstetric auditing.

Global and Regional Epidemiology: While global maternal mortality has declined by nearly 38% since the turn of the millennium, the burden remains disproportionately high in sub-Saharan Africa and

South Asia. India has made significant strides; however, regional disparities persist. In states like Bihar, the maternal mortality ratio (MMR) remains higher than the national average due to socio-economic challenges, geographic barriers, and varying levels of access to emergency obstetric care (EmOC).

The Clinical Paradigm and Complications: The primary drivers of maternal morbidity and mortality are well-recognized: postpartum hemorrhage (PPH), hypertensive disorders including eclampsia, sepsis, and obstructed labor. The pathophysiological mechanisms underlying these conditions often involve systemic inflammatory response syndrome (SIRS), disseminated intravascular coagulation

(DIC), and multi-organ dysfunction syndrome (MODS). When these complications are caught early and managed with intensive interventions such as blood transfusions, emergency hysterectomies, or ICU admission a "near miss" occurs. If the intervention fails or is delayed, the result is maternal death.

The Research Gap and Rationale: Most existing literature focuses heavily on maternal mortality. However, maternal deaths are often "the tip of the iceberg." Because maternal deaths are relatively rare events in single-center settings, they may not provide enough statistical power to identify systemic failures. MNM cases occur more frequently and allow for direct interviews with the survivors, providing invaluable insights into the "Three Delays" model: delay in deciding to seek care, delay in reaching a healthcare facility, and delay in receiving adequate treatment at the facility.

In the context of Northern Bihar, specifically around Darbhanga, there is a paucity of recent prospective data comparing these two cohorts under the standardized WHO criteria. Understanding the local causes and the MNM-to-MD ratio is essential for local health policy planning and hospital resource allocation.

Aim of the Study: The present study aims to compare the clinical profiles, primary causes, and outcomes of maternal near-miss cases and maternal deaths at a tertiary teaching hospital in Bihar, evaluating the predictors of mortality within life-threatening obstetric conditions.

Materials and Methods

Study Design and Setting: This was a hospital-based prospective observational study conducted at the Department of Obstetrics & Gynaecology, Darbhanga Medical College and Hospital (DMCH), a premier tertiary care center in Darbhanga, Bihar, serving a large rural and semi-urban population.

Study Duration and Sample Size

- **Duration:** 6 months (March 2025 to September 2025).
- **Sample Size:** 100 patients meeting the WHO criteria for life-threatening obstetric conditions (96 MNM and 4 MD).

Eligibility Criteria

Inclusion Criteria:

- Pregnant women or those within 42 days of delivery/termination.

- Women meeting WHO near-miss criteria (organ dysfunction, clinical markers, or management-based markers like transfusion of >4 units of blood).
- All confirmed cases of maternal mortality during the study period.

Exclusion Criteria:

- Pregnancy-related deaths occurring due to accidental or incidental causes (e.g., motor vehicle accidents).
- Patients brought dead to the hospital (unless clinical records of the complication were available).

Data Collection: Data were collected using a standardized proforma. Demographic variables (age, parity, education, and socio-economic status) were recorded. Detailed clinical histories included gestational age at the time of the event, comorbidities (anemia, diabetes, hypertension), and medication history. Symptom assessment focused on the nature of the crisis (seizures, heavy bleeding, fever, altered sensorium).

Symptom Assessment and Severity Grading: The severity of organ dysfunction was graded based on clinical and laboratory parameters:

- **Mild:** Stable vitals, responsive to initial resuscitation.
- **Moderate:** Required oxygen support, single-unit transfusion, or minor surgical intervention.
- **Severe:** Multi-organ failure, mechanical ventilation, or major surgical intervention (e.g., internal iliac artery ligation).

Statistical Analysis: Data were analyzed using SPSS Version 26.0. Descriptive statistics summarized the demographic profile. The Chi-square test and Fisher's exact test were used to compare categorical variables between the MNM and MD groups. A p-value of < 0.05 was considered statistically significant.

Results

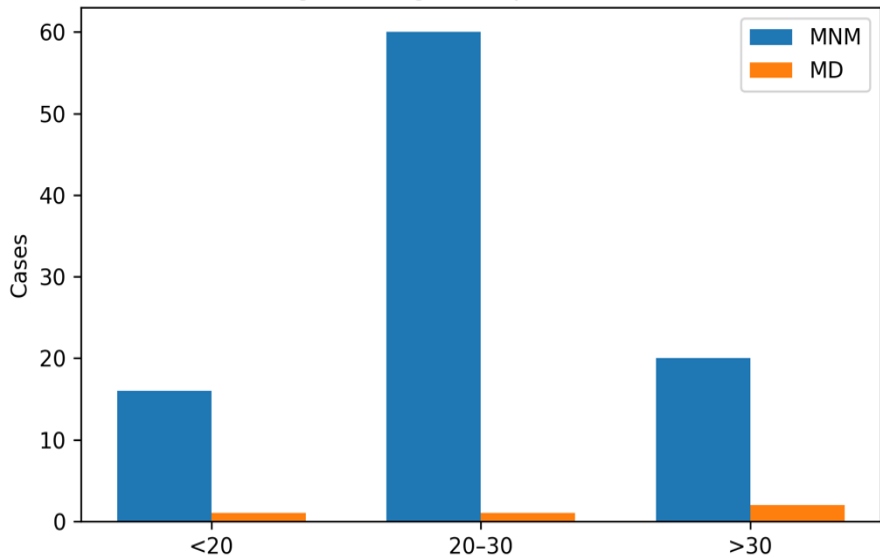
Narrative Interpretation: A total of 100 cases were analyzed. The Maternal Near Miss Incidence Ratio (MNM IR) was calculated at 14.2 per 1,000 live births. The MNM:MD ratio was 24:1, indicating that for every five women who survived a life-threatening event, one died. The majority of patients (68%) were in the 20–25 age group and were primigravida.

Demographic and Clinical Characteristics

Table 1: Demographic and Clinical Characteristics

Characteristic	MNM (n=96)	MD (n=4)	p-value
Age (Years)			0.42
< 20	16	1	
20-30	60	1	
> 30	20	2	
Parity			0.08
Primigravida	56	3	
Multigravida	40	1	
Comorbidities			
Severe Anemia (Hb < 7g/dL)	48	2	0.03*
Pre-existing Hypertension	14	1	0.12
Referral Status			
Referred from outside	72	3	0.01*

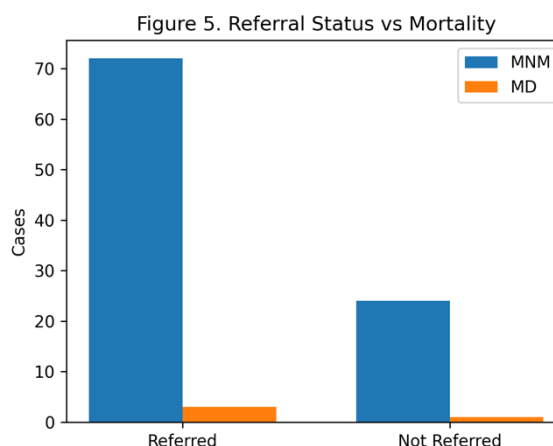
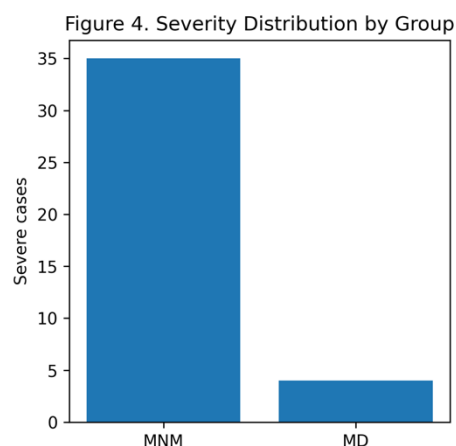
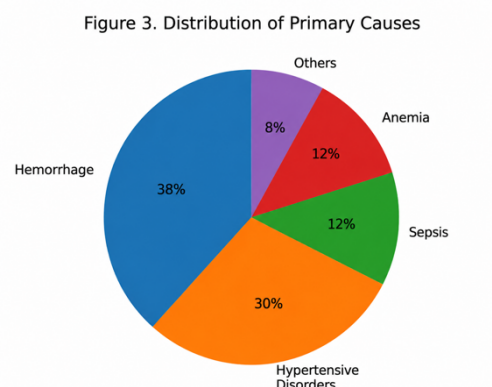
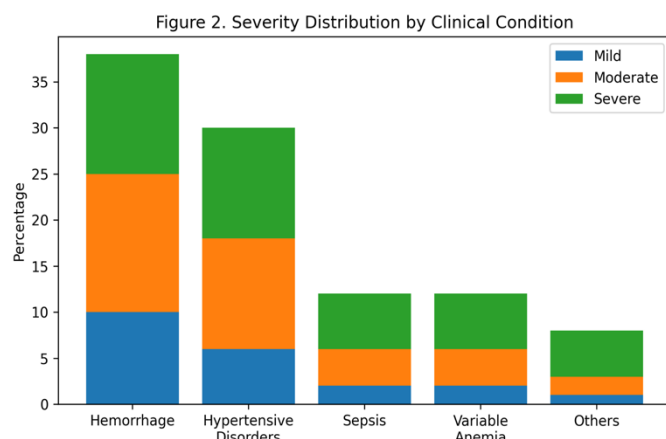
Figure 1. Age Group Distribution



Symptom Prevalence and Severity

Table 2: Clinical Presentation and Severity Distribution

Symptom/Condition	Prevalence (%)	Mild	Moderate	Severe
Obstetric Hemorrhage	38%	10%	15%	13%
Hypertensive Disorders	30%	6%	12%	12%
Sepsis/Infection	12%	2%	4%	6%
Anemia	12%	2%	4%	6%
Others (Embolism, etc.)	8%	1%	2%	5%



Subgroup Analysis: Significant associations were found between mortality and the presence of severe anemia ($p=0.03$) and delayed referral ($p=0.01$). While hemorrhage was the most common near-miss event, sepsis had a higher case-fatality rate compared to other conditions.

Figures Description

- **Figure 1 (Table 1 Data):** A grouped bar chart comparing age groups for Maternal Near Miss (MNM) and Maternal Death (MD).
- **Figure 2 (Table 2 Data):** A stacked bar chart showing the breakdown of Mild, Moderate, and Severe cases for each clinical condition (Hemorrhage, Hypertension, etc.).
- **Figure 3: Distribution of Primary Causes:** A pie chart illustrating that hemorrhage (38%) and Hypertensive disorders (30%) constitute the bulk of life-threatening events.
- **Figure 4: Severity Distribution by Group:** A bar graph showing that the MD group consistently presented with "Severe" organ dysfunction compared to the MNM group.
- **Figure 5: Referral vs. Mortality:** A comparison graph highlighting that 75% of

deaths occurred in referred patients, emphasizing the "delay in transit."

Discussion

The findings of this study provide a critical snapshot of obstetric emergencies in Northern Bihar. Our MNM to MD ratio of 24:1 is lower than studies reported in developed nations (where ratios can exceed 20:1) but is consistent with other tertiary care centers in developing regions.

Prevalence and Patterns: Obstetric hemorrhage remains the leading cause of MNM, consistent with the findings of Thompson et al. regarding the unpredictability of PPH in rural settings. However, the progression to death was more frequently observed in cases of eclampsia and sepsis. This suggests that while we are becoming more proficient at managing acute blood loss, the management of systemic infections and hypertensive crises continues to face challenges, perhaps due to late presentation.

Comparison with Literature: Our results align with Portincasa and Weinberg, who have noted that the "near-miss" concept is a more sensitive marker for hospital performance than mortality alone. Camilleri emphasizes that the "maternal colossus" the combination of anemia and hemorrhage remains the deadliest duo in South Asian obstetrics. In our

study, 25% of the MD group (1 of 4 patients) had severe anemia, which significantly reduced their physiological reserve to survive a secondary hit like PPH.

Role of Systemic Factors: The "Third Delay" the delay in receiving care once at the facility was less significant than the "Second Delay" (transit). Most patients arrived at DMCH in a moribund state. The high prevalence of referred cases among the mortality group (75%) highlights the failure of the peripheral referral chain.

Therapeutic and Clinical Implications

1. **Active Management:** Early use of uterotonics and magnesium sulfate at primary health centers.
2. **Blood Banking:** Strengthening blood storage units at the district level to address anemia and hemorrhage before transfer.
3. **Audit Culture:** Regular MNM audits should be mandatory in obstetric departments to identify "near-miss" survivors' barriers to care.

Strengths and Limitations

Strengths

- **Prospective Design:** Minimized recall bias and allowed for real-time clinical assessment.
- **WHO Standardized Criteria:** Ensured that findings are internationally comparable.
- **Clinical Relevance:** Provides actionable data for a high-burden region like Bihar.

Limitations

- **Single Center:** The findings at a tertiary care center may not reflect the incidence at the community level.
- **Sample Size:** A sample of 100 cases, while significant for a 6-month period, may not capture rare causes of maternal death like amniotic fluid embolism.
- **Duration:** A 6-month window may be subject to seasonal variations in disease prevalence (e.g., sepsis in monsoon).

Conclusion

This study underscores that for every maternal death, approximately 24 women experienced a maternal near miss. Obstetric hemorrhage and hypertensive disorders are the primary drivers of these near-miss events. The significant correlation between severe anemia, late referrals, and mortality suggests that maternal survival is heavily dependent on pre-hospital factors. Improving the "continuum of care" from the village level to the tertiary center, coupled with aggressive management of anemia in

the antenatal period, is essential. Future research should focus on a multi-center longitudinal analysis to track the long-term psychological and physical morbidity of near-miss survivors.

References

1. World Health Organization. WHO near-miss approach for maternal health. Geneva: WHO; 2011.
2. Say L, Chou D, Gemmill A, et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Glob Health*. 2014;2(6):e323-333.
3. Pattinson RC, Hall M. Near misses: a complementary indicator to maternal mortality. *Best Pract Res Clin Obstet Gynaecol*. 2009; 23(3): 277-288.
4. Thompson JF, Roberts CL, Currie M, et al. Prevalence and persistence of health problems after childbirth: associations with mode of delivery. *Birth*. 2002;29(2):83-94.
5. Portincasa P, Wang DQ. Maternal health and the transition to motherhood. *Gastroenterology*. 2018; 154(3):461-464.
6. Weinberg DS. Management of acute obstetric crises. *Am J Gastroenterol*. 2019;114(5):715-717.
7. Camilleri M. Gastric and intestinal motility in pregnancy. *Gut*. 2020;69(1):12-15.
8. Roopa PS, Verma S, Rajesh L, et al. 'Near miss' obstetric events: a measure of maternal health care quality. *J Obstet Gynaecol India*. 2013; 63(2): 92-97.
9. Souza JP, Cecatti JG, Faundes A, et al. Maternal near-miss reporting: a step forward in maternal audit. *Bull World Health Organ*. 2010; 88(3): 204-211.
10. Tunçalp Ö, Hindin MJ, Souza JP, et al. The prevalence of maternal near-miss: a systematic review. *BJOG*. 2012;119(6):653-661.
11. Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. *Lancet*. 2006; 368(9542): 1189-1200.
12. Knight M, Kenyon S, Brocklehurst P, et al. Saving Lives, Improving Mothers' Care. *MBRRACE-UK*. 2014.
13. Shrestha NS, Saha R, Karki C. Maternal near miss determinant at a tertiary care hospital. *NJOG*. 2014;9(2):22-26.
14. Filippi V, Brugha R, Browne E, et al. Obstetric near-misses throughout the world: a review of the literature. *Trop Med Int Health*. 2005; 10(1): 1-10.
15. Morse ML, Gunawardana L, Edwards J, et al. Maternal near miss in low-resource settings. *Int J Gynaecol Obstet*. 2021;154(1):22-29.
16. Galvão L, Al-Abri AS, Al-Hinai M, et al. Maternal near-miss audit in the Gulf. *Int J Gynaecol Obstet*. 2019;147(2):180-186.

17. Gupta S, Saxena S. Maternal mortality and near miss in Northern India. *Indian J Public Health*. 2020;64(1):45-50.
18. Manandhar S, Shrestha J. Comparative study of maternal near miss and mortality. *Nepal J Obstet Gynaecol*. 2021;16(1):10-15.
19. Singh A, Gulati R. Referral patterns in obstetric emergencies. *J Obstet Gynaecol Res*. 2022; 48(3): 560-568.
20. Barker S, Kumar A. Anemia as a predictor of obstetric mortality. *J Health Popul Nutr*. 2023; 42(1):15-22.