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Maternal Near Miss: A Prospective Study in a Tertiary Care Centre

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KEYWORDS

Maternal Health, Maternal Near Miss, Obstetric Morbidity, Tertiary Care, WHO Criteria for Near Miss..

ABSTRACT:

Background: Maternal Near Miss (MNM) is a valuable indicator for assessing the quality of maternal health care and provides insights into severe obstetric complications where women survive life-threatening conditions. Evaluating MNM events offers an opportunity to identify gaps in health systems and improve maternal outcomes.

Methods: This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Mahatma Gandhi Medical College & Hospital, Jaipur, for a period of 18 months. All critically ill women during pregnancy, labor, postpartum, or within 42 days of termination of pregnancy fulfilling the World Health Organization (WHO) MNM criteria were included. Clinical history, interventions, intensive care unit (ICU) admissions, and maternal as well as fetal outcomes were recorded and analyzed.

Results: A total of 175 maternal near miss cases and 1 maternal death were identified. The MNM incidence ratio was 17.5 per 1000 live births, with a MNM to mortality ratio of 175:1. The maternal mortality ratio was 43.45 per 100,000 live births, while the mortality index was 0.56%. Hypertensive disorders of pregnancy and obstetric hemorrhage were the leading causes of MNM, followed by sepsis and severe anemia. Most MNM cases required ICU admission and interventions including blood transfusion and hysterectomy. Fetal outcomes included 103 live births, 04 stillbirths, along with frequent preterm deliveries.

Conclusion: MNM cases are considerably more common than maternal deaths and provide a practical tool for evaluating maternal health care quality. Regular MNM audits can help identify systemic deficiencies and guide strategies to reduce maternal morbidity and mortality.

INTRODUCTION

Maternal health has long been recognized as a cornerstone of public health, reflecting not only the quality of a healthcare system but also the broader social and economic development of a nation. [1] While maternal mortality remains a critical indicator, focusing exclusively on death statistics provides an incomplete picture of maternal health. Many women survive severe obstetric complications but endure significant short- and long-term physical, psychological, and social consequences. [2] To capture this wider spectrum of morbidity, the concept of Maternal Near Miss (MNM) has been introduced as a complement to maternal death audits.

According to the World Health Organization (WHO), a maternal near miss is defined as “a woman who nearly

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died but survived a complication that occurred during pregnancy, childbirth, or within six weeks of termination of pregnancy". [3] MNM cases represent the tip of the iceberg of maternal morbidity, occurring more frequently than maternal deaths and providing valuable opportunities to analyse gaps in healthcare delivery. Survivors can be interviewed, clinical pathways can be reconstructed, and systemic deficiencies can be identified, something not always possible with maternal death reviews. [4,5]

Globally, maternal morbidity and mortality remain pressing issues, particularly in low- and middle-income countries. Every year, nearly 300,000 women die due to pregnancy-related causes, the majority of which are preventable. [6] The United Nations Sustainable Development Goal (SDG) 3.1 aims to reduce the global maternal mortality ratio (MMR) to fewer than 70 per 100,000 live births by 2030. [7] India, home to one-sixth of the world's population, bears a significant share of the global burden, though steady progress has been made in recent decades. [8] Despite improvements, wide disparities exist between states and regions, with tertiary care hospitals continuing to witness high numbers of severe maternal complications. [9]

The most frequent life-threatening obstetric complications include severe hemorrhage, hypertensive disorders such as eclampsia and severe pre-eclampsia, sepsis, and obstructed or ruptured uterus. [10] These complications not only endanger maternal survival but also adversely affect fetal outcomes, leading to stillbirths, neonatal asphyxia, preterm births, and admission to intensive care units. [11] The dual impact on mother and child underscores the importance of early recognition, timely referral, and evidence-based interventions.

Studying MNM cases has several advantages: they occur more often than maternal deaths, survivors can provide first-hand accounts of delays and barriers, and their outcomes allow for real-time evaluation of the health system's capacity to manage obstetric emergencies. [12] Furthermore, MNM data serves as a useful surveillance tool for policymakers, helping to prioritize maternal health programs, allocate resources effectively, and monitor progress toward national and international targets. [13]

Given the high maternal mortality burden in India, systematic evaluation of MNM in tertiary care hospitals is particularly relevant. Mahatma Gandhi Hospital, Jaipur — being a referral center — provides comprehensive emergency obstetric care and thus serves as an ideal setting to study MNM. Investigating these cases offers insights into not only clinical causes and outcomes but also systemic issues such as referral patterns, availability of blood products, and critical care facilities. [14] This hospital-based study aims to highlight the determinants of maternal near miss, thereby contributing to efforts to reduce preventable maternal morbidity and mortality.

OBJECTIVES

The objective of the study was to observe the incidence of maternal near miss. We also aimed to evaluate causes of near miss as well as maternal and fetal outcomes in near miss.

METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, Mahatma Gandhi Medical College & Hospital, Jaipur, Rajasthan, for period of 18 months. Institutional Ethics Committee approval was obtained before initiation of the study, and informed written consent was obtained from all participants.

All critically ill women during pregnancy, labour, postpartum, or within 42 days of termination of pregnancy admitted to the obstetric ward or intensive care unit (ICU) were screened. Cases fulfilling the World Health Organization (WHO) 2009 criteria for maternal near miss (MNM) were included.

Inclusion criteria

Women with one or more of the following:

- Severe obstetric haemorrhage
- Hypertensive disorders of pregnancy (severe preeclampsia, eclampsia, HELLP syndrome)
- Severe anaemia (Hb < 5 g/dL or requiring ≥5 units blood transfusion)

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- Severe sepsis with multi-organ dysfunction
- Uterine infection or infection requiring hysterectomy
- Ruptured ectopic pregnancy or uterine rupture
- Cardiovascular dysfunction (shock, use of vasoactive drugs, cardiopulmonary resuscitation)
- Neurological dysfunction (coma, stroke, status epilepticus, total paralysis)
- Admission to ICU for organ support

Exclusion criteria

- Severe life-threatening conditions unrelated to pregnancy
- Patients or attendants unwilling to participate

On admission, a detailed history was obtained including age, parity, gestational age, antenatal booking status, and referral history. Clinical findings, investigations, and interventions were recorded. Outcomes such as mode of delivery, ICU admission and duration, surgical procedures performed, maternal outcome (survival/death), and foetal outcome (live birth, stillbirth, abortion, NICU admission) were documented.

Definitions and indicators

MNM cases were identified based on WHO 2009 near miss criteria (35). The following indicators were calculated:

- MNM incidence ratio (MNMIR): Number of MNM cases per 1000 live births
- MNM to mortality ratio (MNMR): Ratio of MNM cases to maternal deaths
- Maternal mortality ratio (MMR): Maternal deaths per 100,000 live births
- Mortality index (MI): Maternal deaths ÷ (MNM + maternal deaths) × 100
- Severe maternal outcome ratio (SMOR): (MNM + maternal deaths) per 1000 live births

Data was entered into Microsoft Excel and analysed using descriptive statistics. Results were expressed as frequencies, percentages, ratios, and proportions.

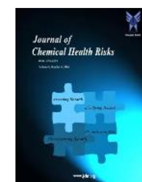
OBSERVATION AND RESULTS

Table 1. Incidence of Maternal Near Miss

Total No. of Admissions	9469
Total Case of Near Miss	175
Incidence	1.84%

Table 2. Demographic Profile of Maternal Near Miss Cases (n = 175)

Variable	Category	Number (n)	Percentage (%)
Age (years)	18-25	92	52.57
	26-30	57	32.57
	31-40	18	10.28
	>40	8	4.57
Parity	Primigravida	82	46.85
	Multigravida	93	53.14
Booking Status	Booked	63	36
	Unbooked	112	64



Referral Status	Referred	86	49.14
	Direct admission	89	50.85
Socioeconomic Status	Lower class	19	10.85
	Upper Lower	56	32
	Lower Middle	13	7.42
	Upper Middle	58	33.14
	Upper Class	29	16.57

Table 3. Obstetric Profile of Maternal Near Miss Cases (n = 175)

Variable	Category	Number (n)	Percentage (%)
Gestational age at admission	upto 12 weeks	11	6.28
	13 – 28 weeks	10	5.71
	> 28 weeks	107	61.14
	Postnatal	47	26.85
Mode of delivery	Vaginal delivery	50	28.5
	Caesarean section (LSCS)	57	32.5

Table 4. Distribution of Patient According to Causes of Maternal Near Miss

Cause	Number (n)	Percentage (%)
APH	15	8.57
PPH	37	21.14
Severe Preeclampsia	28	16
Eclampsia	17	9.71
Rupture Ectopic	8	4.57
Severe Anemia	13	7.42
Rupture Uterus	1	0.57
Sepsis	3	1.71
Heart Disease	8	4.57
COVID-19 Infection	31	17.71

HELLP Syndrome	4	2.28
Thrombocytopenia	8	4.57
Dengue	7	4
Diabetes	4	2.28
AKI	3	1.71
Previous Caesarean	10	5.71
Molar Pregnancy	2	1.14
Retained Placenta	2	1.14
IUFD with DIC	4	2.28
Vaginal Haematoma	4	2.28

Table 5. Distribution of Patients According to Interventions Done in Cases of Maternal Near Miss (n = 175)

Intervention	Number (n)	Percentage (%)
ICU admission	112	64.3
Blood transfusion	112	64.2
Mechanical ventilation	34	19.4
Surgical interventions (hysterectomy, laparotomy, bladder repair, etc.)	42	24

Table 6. Distribution of Patient According to Neonatal Outcome and Neonatal Complication

Variable	Outcome	Number (n)	Percentage (%)
Neonatal Outcome	Live Birth	103	96.26
	Still Birth	04	03.73
Neonatal Complications	Meconium Aspirations Syndrome	12	11.65
	Respiratory Distress Syndrome	12	11.65
	Seizures	04	03.88
	Jaundice	06	05.82
	Neonatal Hypoglycemia	04	03.88
	No Complications	65	63.10

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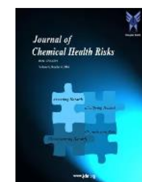


Table No. 7 – Distribution of Patient According to Final Maternal Outcome

Variable	No. of Patients	Percentage (%)
Discharged with Good Health	160	91.43
LAMA	15	8.57
Total	175	100

During the study period, a total of 175 maternal near miss (MNM) cases and 1 maternal death were identified. The calculated indices were:

- MNM incidence ratio (MNMIR): 17.5 per 1000 live births
- MNM to mortality ratio (MNMR): 175:1
- Maternal mortality ratio (MMR): 43.45 per 100,000 live births
- Severe maternal outcome ratio (SMOR): 76.5 per 1000 live births
- Mortality index (MI): 0.56%

Observation and results

Table No. 1 shows that among 9,469 obstetric admissions, 175 fulfilled maternal near miss (MNM) criteria, yielding an incidence of 1.84%.

Table No. 2 shows that most MNM cases were aged 18–25 years (52.57%), followed by 26–30 years (32.57%). Multigravidae constituted 53.14%, and 64% were unbooked. Nearly half were referrals (49.14%). By socioeconomic status, upper–middle (33.14%) and upper–lower (32%) classes predominated.

At admission, 61.14% were >28 weeks, 26.85% were postnatal, while early gestations (<12 weeks) comprised 6.28%. Caesarean delivery occurred in 32.5%; vaginal delivery in 28.5%. Which is depicted in table no. 3.

The leading contributors of MNM was postpartum hemorrhage (21.14%) as evident in table no. 4, followed by COVID-19 infection (17.71%), and severe preeclampsia (16%), followed by eclampsia (9.71%). Other causes included severe anemia (7.42%), previous caesarean-related complications (5.71%), thrombocytopenia and heart disease (each 4.57%), and a spectrum of less frequent etiologies (≤4%).

ICU admission and blood transfusion were required in ~64% each. Mechanical ventilation was instituted in 19.4%, and major surgical procedures (e.g., hysterectomy, laparotomy, bladder repair) in 24%. Which has been shown in table no. 5.

Table no. 6 depicts neonatal outcomes, among recorded births, 96.26% were liveborn; 3.73% were stillborn. Complications included meconium aspiration (11.65%) and respiratory distress syndrome (11.65%); 63.10% had no complications.

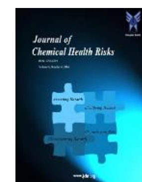
Table no. 7 shows maternal outcomes among which Overall, 91.43% were discharged in good health; 8.57% left against medical advice (LAMA).

DISCUSSION

The MNM incidence of 1.84% in this tertiary-care cohort reflects a substantial burden of life-threatening obstetric morbidity. While case-mix and referral bias influence absolute rates, the magnitude underscores the need for robust prevention, early recognition, and timely escalation protocols.

The predominance of young women (18–30 years), the high proportion of unbooked cases (64%), and nearly half being referrals (49.14%) suggest missed opportunities for antenatal risk stratification and delayed access to definitive care. Strengthening community-level screening, transport/communication pathways, and continuity between peripheral facilities and tertiary centers are likely leverage points.

Hemorrhage, hypertensive disorders, and infection remain central contributors to MNM. Postpartum hemorrhage (21.14%) was the single most common cause, closely followed by severe



preeclampsia/eclampsia (25.71% combined) and COVID-19 (17.71%) during the study period. Targeted bundles for PPH prevention/management, early treatment of hypertension, and resilient infection-control/respiratory care capacity are critical.

High rates of ICU admission and blood transfusion (~64% each) highlight the intensity of resource utilization and the importance of well-functioning blood banks, trained rapid-response teams, and ICU interfaces. The 24% rate of surgical interventions indicates the need for around-the-clock surgical and anesthesia coverage with streamlined decision-to-incision timelines.

Despite severe maternal morbidity, livebirths predominated (96.26%), and nearly two-thirds of neonates had no complications. Nonetheless, respiratory complications were frequent, emphasizing antenatal corticosteroid coverage where gestationally appropriate and vigilant intrapartum/newborn care to mitigate asphyxia-related risks.

Discharge in good health for 91.43% of mothers is encouraging; however, 8.57% LAMA points to socio-economic and psychosocial barriers that may interrupt definitive treatment and follow-up. Implementing structured MNM reviews, near-miss audits, and post-event debriefs can illuminate preventable factors and inform rapid-cycle quality improvement.

This single-center observational dataset, influenced by referral patterns, may not generalize to non-tertiary settings. Cause attribution relied on clinical documentation; misclassification is possible. Future work should incorporate time-to-intervention metrics and standardized WHO MNM criteria auditing for benchmarking.

Programmatically, prioritizing PPH and hypertensive disorder bundles, tightening referral/transport systems, ensuring blood product availability, and reinforcing ICU capacity are actionable. At the patient level, expanding ANC coverage and risk communication could reduce late presentations and improve outcomes.

CONCLUSION

This study highlights the significant burden of maternal near miss in a tertiary-care setting, with an incidence of 1.84%. Hemorrhage, hypertensive disorders, and COVID-19 emerged as leading contributors, underscoring the persistent challenges in obstetric care. The predominance of young, unbooked, and referred women reflects systemic gaps in antenatal surveillance and referral pathways. While most women were discharged in good health and perinatal outcomes were largely favorable, the high rates of ICU admission, transfusion, and surgical interventions emphasize the critical resource demands of MNM cases. Strengthening antenatal coverage, timely risk identification, rapid referral mechanisms, and access to comprehensive emergency obstetric and critical care services are essential. Near miss audits and structured quality improvement programs should be integrated into routine practice to further reduce preventable maternal morbidity and move closer to achieving maternal health targets.

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