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Study on Maternal Near Miss Cases as an Indicator of Quality Obstetric Care in a Tertiary Care Hospital of Western Odisha

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ABSTRACT

Background: Maternal near miss (MNM) audits serve as a crucial measure for evaluating the quality of obstetric care, particularly in regions where maternal deaths are on the decline. This study aimed to explore the burden, characteristics, and outcomes of MNM cases at a tertiary referral center in Western Odisha.

Methods: In terms of methods, we conducted a retrospective observational study within the Department of Obstetrics and Gynaecology at Bhima Bhoi Medical College & Hospital in Bolangir. We included all women who met the World Health Organization's MNM criteria from January 1, 2021, to December 31, 2023, resulting in a total of 138 cases. We gathered data on sociodemographic factors, gestational age, clinical diagnoses, interventions, and outcomes. Descriptive statistics were used, presenting quantitative variables as means ± SD and qualitative variables as frequencies and percentages.

Results: Out of 28,340 live births, there were 138 MNM cases and 54 maternal deaths. MNM incidence was 4.86/1,000; mortality index 28.12%. Most cases occurred in women aged 25–35, multigravidae, and post-28 weeks—top causes: ruptured uterus, hypertension, and hemorrhage. Major interventions included transfusions and emergency surgeries.

Conclusion: In conclusion, uterine rupture, hypertensive crises, and hemorrhage are significant contributors to the MNM burden in Western Odisha. To mitigate maternal morbidity and mortality in similar resource-limited settings, it is vital to recognize cases early using WHO criteria, maintain vigilant monitoring, ensure timely referrals, and adopt a multidisciplinary approach.

Key-words: Maternal near miss; Severe maternal outcome; Obstetric emergencies; Uterine rupture; Hypertensive disorders; Western Odisha

INTRODUCTION

Maternal mortality is a crucial indicator of a health system's performance worldwide. Even with ongoing international efforts, around 800 women lose their lives every day due to complications from pregnancy or childbirth, highlighting a significant public health issue [1]. For every woman who dies, tens of thousands more face serious pregnancy-related health problems—over 50 million each year-many of which can lead to long-lasting physical, psychological, and social consequences [1,2].

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As nations build on the progress made during the Millennium Development Goal (MDG) era and move towards the Sustainable Development Goals (SDGs), it has become clear that traditional measures, such as the maternal mortality ratio (MMR), don't fully reflect the complexities and quality of obstetric care.

To address this shortcoming, the World Health Organization (WHO) introduced the idea of the MNM, which refers to "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of the end of pregnancy" [4–6]. Since near-miss events follow the same physiological pathways as maternal deaths, reviewing them provides a broader set of clinical data, sheds light on preventable factors in real-time, and helps identify shortcomings that might not be apparent when examining mortality statistics alone [3]. Notably, MNM audits are beneficial in areas where the

number of deaths is decreasing, making it more challenging to draw statistically significant insights from mortality reviews alone.

In India, initiatives like the Janani Suraksha Yojana and Janani Shishu Suraksha Karyakram have played a significant role in reducing MMR across the country. However, notable regional differences remain. For instance, Odisha, especially in its western districts, continues to experience higher-than-average maternal morbidity due to socioeconomic disparities, delays in referrals, and limited access to comprehensive emergency obstetric care. In these areas, tertiary care centers play a vital role in monitoring severe maternal outcomes and testing targeted interventions [7].

This study focuses on maternal near-miss cases treated at a tertiary referral hospital in Western Odisha, aiming to provide actionable insights into the quality of obstetric care in a resource-limited, high-burden environment. Our specific goals are to Identify and categorize the main clinical causes of maternal near-miss events observed in our facility, Evaluate the quality of obstetric care by examining the sequence of events and management protocols that distinguish survivors from those who do not make it, enhancing our understanding of the factors contributing to maternal deaths, Suggest context-appropriate interventions and monitoring strategies that could further lower maternal morbidity and mortality in the region [8].

By thoroughly reviewing near-miss cases, this study hopes to inform policy, improve clinical guidelines, and ultimately promote safer motherhood in Western Odisha and similar contexts.

MATERIALS AND METHODS

Study Design and Setting- This study was designed as a retrospective, record-based observational analysis to evaluate maternal near miss cases as a measure of the quality of obstetric care. It took place in the Department of Obstetrics and Gynaecology at Bhima Bhoi Medical College and Hospital (BBMCH) in Bolangir, a tertiary care teaching facility situated in Western Odisha. As a key referral center, BBMCH handles obstetric emergencies from around six neighbouring districts. The department is well-equipped, featuring two High Dependency Units (HDUs) and two beds in the Central Intensive Care Unit (CICU) specifically designated for obstetric and gynecological patients, enabling the management of critically ill women with severe pregnancy-related complications.

Study Duration and Population- The study spanned three years, from January 1, 2021, to December 31, 2023. The study population included all women diagnosed with maternal near miss according to the World Health Organization (WHO) criteria during this timeframe who received treatment at BBMCH, Bolangir. A total of 138 maternal near-miss cases were analyzed.

Data Collection Procedures- We gathered data by reviewing entries in the maternal near miss register maintained by our department, along with individual case records for each patient. To make sure we were consistent in identifying eligible cases, we used the WHO criteria for maternal near miss. The information we compiled included patient demographics, such as maternal age, parity, and gestational age at the time of the event, as well as details about the complications encountered, the interventions provided, and the outcomes of care.

We also considered other factors that might affect maternal outcomes, such as a lack of awareness about danger signs, poor transportation options, and delays in referrals from smaller centers. We carefully recorded information about lifesaving interventions—such as blood transfusions, surgical procedures, ICU admissions, and the use of vasopressors—to assess the timeliness and effectiveness of the responses.

Study Tools and Statistical Analysis- For data collection, we primarily relied on hospital registers and the case sheets of the patients we identified. We systematically compiled and organized all variables relevant to the clinical presentation and management of maternal near miss cases. Quantitative variables, such as age and parity, were summarized using descriptive statistics, including the mean and standard deviation. Meanwhile, qualitative variables—including the causes of near misses, types of interventions, and contributing social or systemic factors—were presented as frequencies and percentages to highlight their distribution and significance within the study population.

RESULTS

During the study period from January 2021 to December 2023 at BBMCH in Bolangir, a total of 138 MNM cases

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were identified. We took a close look at these cases, examining various factors such as demographic profiles, obstetric characteristics, clinical outcomes, causes, and the interventions that were provided. We also calculated the WHO maternal near-miss indicators to evaluate the quality of maternal healthcare provided at the institute.

Most maternal near miss cases were found in women aged 25 to 35 years, accounting for 50% of our study group. This age range showed a significantly higher risk of facing life-threatening obstetric complications compared to both younger and older women. Women aged 18 to 24 years accounted for 42.02%, while only 7.98% of the cases involved women over 35 years old.

When it comes to parity, multigravida women (58.69%) were more frequently affected by maternal near miss events than primigravida women (41.31%). The distribution of gestational age indicated that most cases occurred in the third trimester, specifically after 28 weeks of gestation, with a notable number also happening during the puerperal period. This highlights the importance of close monitoring during late pregnancy and the postpartum period (Table 1).

Table 1: Age, Parity, and Gestational Age Distribution of Maternal Near Miss Cases (n = 138)

Characteristics	Frequency (n)	Percentage (%)
Age Group (in years)		
18–24	58	42.02
25–35	69	50.00
>35	11	7.98
Parity		
Primigravida	57	41.31
Multigravida	81	58.69
Gestational Age (weeks)		
<12	5	3.62
12–28	18	13.04
>28	94	68.12
Puerperium	21	15.22

Let's delve into the findings on maternal health outcomes and the WHO's near-miss indicators. During the study, there were 31,429 obstetric admissions, with 28,340 resulting in live births. We recorded 138 cases of maternal near misses and 54 maternal deaths. This brings the total count of severe maternal outcomes (SMO) to 192. When we look at the severe maternal outcome ratio, it comes out to 6.77 per 1,000 live births. The maternal near miss ratio is 4.86 per 1,000 live births. Interestingly, the ratio of maternal near misses to mortality is 2.56:1, and the mortality index is at 28.12%. This indicates that nearly one-third of critically ill patients ended up progressing to maternal death (Table 2).

Table 2: Maternal Outcome Indicators Based on WHO Criteria

Indicator	Formula	Value
Maternal Near Miss (MNM)	—	138
Maternal Death (MD)	—	54
Live Births (LB)	—	28,340
Severe Maternal Outcome (SMO)	MNM + MD	192
Severe Maternal Outcome Ratio	SMO / LB × 1000	6.77
Maternal Near Miss Ratio	MNM / LB × 1000	4.86
Maternal Near Miss to Mortality	MNM: MD	2.56: 1
Mortality Index	MD / (MNM + MD) × 100	28.12%

When it comes to maternal near miss cases, a variety of serious complications can arise, such as severe bleeding, high blood pressure issues, infections, and organ failure. The most frequently performed interventions include blood transfusions and emergency surgeries like peripartum hysterectomy and laparotomy, along with mechanical ventilation and inotropic support. Moreover, a significant number of patients ended up needing hemodialysis, highlighting just how critical their organ function had become (Fig. 1).

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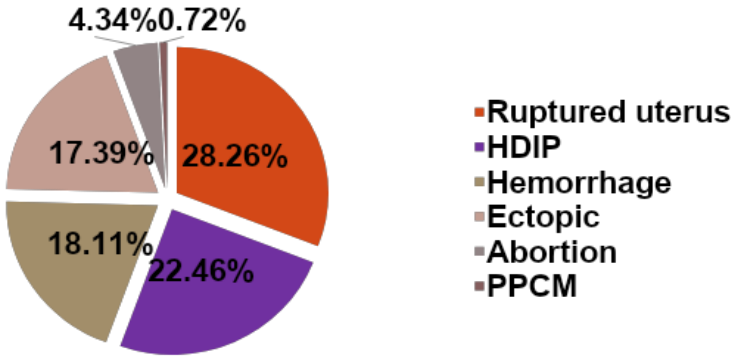

Fig. 1: Distribution of Causes of Maternal Near Miss at BBMCH (n = 138)

A closer look at the non-clinical factors shows that a lack of awareness about the warning signs of pregnancy was the most prevalent issue, affecting 63.76% of cases. Additionally, delays in getting appropriate care were significantly impacted by late referrals and the unavailability of timely transportation. These findings highlight the complex interplay between clinical severity and health system barriers in determining maternal outcomes (Fig. 2).

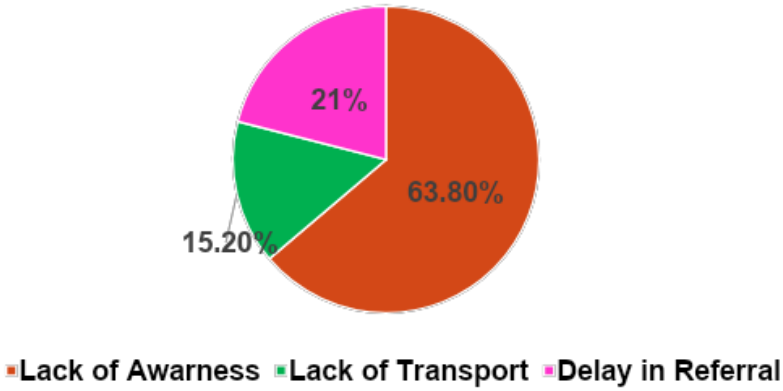

Fig. 2: Common Interventions Administered to Near Miss Cases (n=138)

DISCUSSION

The current analysis reveals that serious, life-threatening obstetric complications are still quite prevalent in Western Odisha, even in a tertiary-level facility. However, the patterns and frequency of near-miss events show significant differences compared to those reported in other regions of India and similar low- and middle-income areas. In our hospital, the maternal near-miss incidence ratio was 4.86 per 1,000 live births, which is notably lower than the 15–40 per 1,000 range reported in the multicountry WHO survey of referral hospitals in low-resource settings. A lower ratio could indicate genuinely improved preventive care, or, more likely in our situation, an incomplete record of early third-level referrals that unfortunately pass away before reaching the facility. Supporting this latter view, our near-miss-to-mortality ratio was 2.56:1, which is less favorable than the 7:1 ratio observed by Kumar et al. in an eastern Indian intensive care cohort and the 5.6:1 reported by Roopa et al. from South India. A low ratio suggests that once women enter critical illness, a significant number still do not survive—highlighting gaps in critical-care capacity, delays in recognition, and late arrivals from peripheral centers [9,10].

The patterns of age and parity we observed align closely with national trends, but they also reveal some intriguing insights. A significant portion of near-miss cases—about half—occurred in women aged 25 to 35, which is the peak fertility age in India. Additionally, 42% of these cases involved women aged 18 to 24. While we know that severe complications tend to spike at the extremes of reproductive age—this has been confirmed by data from Canada showing nearly a three-fold increase after age 35—the overall numbers in our study were largely influenced by the age groups where most pregnancies happen. Interestingly, women who have had multiple

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pregnancies made up almost 59% of the cases. Previous research has indicated that having a high number of pregnancies can offer some long-term survival benefits. Still, it also puts women at risk for acute emergencies during labor, like uterine rupture and postpartum hemorrhage. Our findings reinforce this distinction and highlight the importance of providing personalized counseling, even for mothers who are considered 'experienced' [11].

The distribution of gestational age mirrored patterns seen in other Indian tertiary hospitals: nearly 70% of cases occurred after 28 weeks, and 15% during the postpartum period. This late clustering reflects physiological risks for hypertensive crises and hemorrhage but also points to missed opportunities for early antenatal detection and timely referral. The cause profile has shifted from the classic triad of hemorrhage, hypertensive disorders, and sepsis, as per Heitkamp et al.'s global review. In our setting, ruptured uterus was the leading cause (28.26%), followed by hypertensive disorders (22.46%), major hemorrhage (17.39%), and ectopic gestation and sickle-cell crisis (15.21% each). The high rate of uterine rupture implies delayed arrival of obstructed labor cases despite functioning first-referral units. Transport audits revealed median travel times over two hours. Combined with widespread anemia, this delay contributes to rapid deterioration. Improving blood loss estimation during labor—with tools like calibrated drapes—can help detect hidden hemorrhage early and trigger faster resuscitation [12].

Critical-care needs reflected case severity: over two-thirds required massive transfusions, one in five underwent emergency laparotomy or hysterectomy, and 14% needed both ventilation and vasopressors. Although our HDU enabled timely organ support, dialysis was often unavailable, and corticosteroid use for preterm births was inconsistent. These gaps highlight the urgent need for standardized protocols, stock management, and better coordination with transfusion and critical care services to improve outcomes [9].

To address system-level delays like late referrals and poor danger sign recognition, we've implemented targeted strategies. Monthly reviews of near-miss and mortality cases are conducted by a senior obstetrician who also audits data quality. A district-wide WhatsApp group, "Fight MMR Balangir," enables real-time coordination among clinicians and ambulance teams, reducing inter-facility transfer time by 20 minutes. ASHA worker counseling and direct phone lines with peripheral nurses aim to cut first-contact delays. We've also formalized referral links with VIMSAR to ensure critical cases receive timely tertiary care support [13].

The strengths of this investigation lie in its comprehensive three-year coverage and adherence to WHO criteria, which allows for comparisons across different settings [6,8]. However, the retrospective design means we had to rely on secondary documentation; missing hemodynamic data, under-recorded organ support details, and a lack of long-term functional outcomes have limited our ability to conduct a detailed analysis. Plus, since this is a single-center study from a high-volume referral hospital, its applicability to primary or secondary facilities is somewhat limited.

While our maternal-near-miss incidence ratio is significantly lower than international standards [7], the troubling mortality rate and the prevalence of preventable issues like uterine rupture highlight persistent gaps in our ability to recognize and refer cases promptly. To build on the progress made in maternal survival, it's crucial to enhance community awareness, standardize emergency transport routes, and boost critical care capabilities—particularly in areas such as blood supply, dialysis, and anesthesia support—in Western Odisha and other resource-limited regions [14].

CONCLUSIONS

In conclusion, this study shines a light on the fact that ruptured uterus, hypertensive disorders, and obstetric hemorrhage are still the main pregnancy-related causes of maternal near miss events in our area. These findings highlight the importance of identifying life-threatening complications early on, using the near-miss criteria established by the WHO. We need to focus on improving clinical monitoring, boosting health education in our communities, ensuring timely and effective referrals, and taking a coordinated, multidisciplinary approach. These strategies are essential for cutting down on maternal morbidity and mortality. By implementing these measures, especially in resource-limited settings like ours, we can significantly improve the quality of obstetric care and strive for safer motherhood outcomes..

CONTRIBUTION OF AUTHORS

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