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Maternal Near-Miss in Tertiary Care: Definition, Indications, Management Typologies, Outcomes and Prospects for Improvement- A Comprehensive Review

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ABSTRACT

Maternal near-miss (MNM) cases—women who survive life-threatening complications during pregnancy, childbirth, or within 42 days postpartum—offer valuable insight into the effectiveness and resilience of obstetric services. This review synthesises current definitions, recognition criteria, management strategies, outcomes, and opportunities for improving maternal care in tertiary settings, with emphasis on low- and middle-income countries (LMICs) such as India. Drawing on WHO guidelines, national protocols, and peer-reviewed literature from 2010–2025, key priority areas include postpartum haemorrhage (PPH), hypertensive disorders, and maternal sepsis, supported by evidence from ICU/HDU interventions, early-warning tools, checklists, and simulation-based training. The WHO defines MNM as survival after a life-threatening complication, using organ-dysfunction criteria across cardiovascular, respiratory, renal, hepatic, haematologic, neurologic, and uterine systems, and tracks indicators such as MNM ratio, severe maternal outcome ratio, MNM:maternal death ratio, and mortality index. In Indian tertiary hospitals, MNM ratios typically range from 8–18 per 1,000 live births, MNM:death ratios from 3–6:1, and mortality indices from 15–25%, with variability reflecting referral bias and systemic gaps. Leading causes remain PPH, hypertensive disorders (including pre-eclampsia, eclampsia, and HELLP), and sepsis, with effective bundles involving uterotonics, tranexamic acid, balloon tamponade or compression sutures, massive transfusion protocols, magnesium sulfate with antihypertensives, and prompt antibiotics with source control. Quality-improvement measures such as structured audits, expansion of obstetric critical care capacity, and team-based emergency drills have shown potential to improve recognition, timeliness, and survival. Embedding the WHO near-miss framework into routine tertiary care, supported by readiness in blood supply, critical care infrastructure, and continuous review, can reduce preventable maternal deaths and severe morbidities.

Keywords: *Maternal Near-Miss; Severe Maternal Outcomes; Postpartum Haemorrhage; Pre-Eclampsia; Eclampsia; Maternal Sepsis; Icu; Hdu; Early Warning Scores; Quality Improvement*

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1. INTRODUCTION

Maternal mortality is the hard endpoint of a continuum of severe maternal morbidity. Maternal near-miss (MNM) events occur more frequently than deaths and share causal pathways, making them powerful tracers of quality of care in obstetrics [1,21]. The WHO near-miss approach standardised definitions, diagnostic criteria and indicators so that facilities can benchmark care, identify delays, and guide improvement [1–3]. In tertiary care—where the sickest women cluster due to referrals—the systematic use of MNM criteria helps calibrate capability (e.g., obstetric HDU/ICU, blood bank) and readiness for high-risk conditions.

2. METHODS

We conducted a narrative review (2010–2025) of WHO guidance and global/Indian literature on MNM definitions and indicators; disease-specific guidelines for PPH, hypertensive disorders of pregnancy (HDP) and maternal sepsis; Indian operational guidelines for MNM review and obstetric ICU/HDU; and empirical studies from tertiary centres on MNM burden, causes, and outcomes. We also included implementation evidence on the WHO Safe Childbirth Checklist, obstetric

early-warning scores, and interprofessional simulation. Priority was given to WHO documents and peer-reviewed studies, including multicentre trials and systematic reviews [1–7,9–12,15–35].

3. DEFINITIONS, INDICATIONS AND CRITERIA FOR RECOGNISING MATERNAL NEAR-MISS

3.1 Definition. The WHO defines a maternal near-miss case as "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy" [1].

3.2 Indications/operational criteria. WHO operationalises MNM using markers of organ dysfunction across seven domains—cardiovascular (e.g., shock, use of vasoactive drugs), respiratory (e.g., intubation/ventilation ≥60 minutes, O_2 saturation <90% for ≥60 minutes), renal (dialysis, anuria/oliguria unresponsive to fluids), hepatic (bilirubin ≥6 mg/dL or jaundice with pre-eclampsia), coagulation/haematologic (failure to clot, transfusion ≥5 units), neurologic (coma ≥12 hours, stroke, recurrent seizures), and uterine (hysterectomy for haemorrhage/infection). These may be complemented by a set of potentially life-threatening conditions (e.g., severe PPH, eclampsia, sepsis, uterine rupture) to trigger case finding [1–3].

3.3 Indicators for quality monitoring. Core WHO indicators include: (i) MNM incidence ratio (per 1,000 live births); (ii) severe maternal outcome ratio (SMOR = [MNM + maternal deaths] per 1,000 live births); (iii) MNM: maternal death ratio (higher is better); and (iv) mortality index (MI = deaths/[MNM + deaths] × 100%; lower is better). Process indicators (e.g., use of uterotonics for PPH, magnesium sulfate for eclampsia, parenteral antibiotics for sepsis) can be tracked in parallel [1–3].

4. BURDEN, ETIOLOGIES AND PATTERNS IN TERTIARY CARE

Across Indian tertiary centres reported MNM ratios typically range 8–18 per 1,000 live births, MNM:death ratios around 3–6:1 and mortality indices near 15–25%, with substantial heterogeneity driven by referral bias, case-mix severity, and system capacity [21–27]. Leading etiologies include PPH (atony/trauma/retained placenta), HDP (severe pre-eclampsia/eclampsia/HELLP), sepsis (chorioamnionitis, post-abortal, post-caesarean), obstructed labour/uterine rupture, and complications of abortion/ectopic pregnancy [21–27].

The WHO GLOSS work and subsequent analyses emphasise sepsis as a major contributor to severe outcomes and highlight timeliness of antibiotics and source control as determinants of survival [7,10].

5. MANAGEMENT TYPOLOGIES IN TERTIARY CARE (CONDITION-SPECIFIC BUNDLES)

5.1 Postpartum haemorrhage (PPH). A bundle approach with parallel actions is standard: rapid assessment and uterine massage; first-line uterotonics (oxytocin; alternatives include carbetocin, ergometrine combinations and misoprostol depending on availability/contraindications); early tranexamic acid (1 g IV as soon as PPH is diagnosed, repeat once if bleeding continues) ideally within 3 hours; titrate crystalloids while activating massive transfusion protocols with ratio-balanced components and fibrinogen replacement guided by labs/viscoelastic testing where feasible; timely uterine balloon tamponade for atony; surgical approaches in sequence (B-Lynch/compression sutures, uterine/uterine-ovarian artery ligation, internal iliac ligation or interventional radiology where available), and hysterectomy when conservative measures fail. Recent evidence confirms TXA's role in treating PPH and reducing life-threatening bleeding, while prophylactic TXA immediately after birth in anaemic women did not prevent PPH in WOMAN-2 [6–12].

5.2 Hypertensive disorders (severe pre-eclampsia/eclampsia/HELLP). Priorities are seizure control with magnesium sulfate (standard IV/IM regimens), blood-pressure control (labetalol/hydralazine/nifedipine depending on context), stabilisation and planned delivery based on gestation and maternal–fetal status, with corticosteroids for fetal lung maturity if preterm. Post-partum vigilance for pulmonary oedema, eclampsia, and haemorrhage is essential [16–18].

5.3 Maternal sepsis. Early recognition (obstetric early-warning triggers), immediate broad-spectrum intravenous antibiotics after cultures, source control (evacuation of products, drainage/debridement, removal of infected tissue), haemodynamic resuscitation (fluids with early vasopressors when needed), and organ support (oxygen/ventilation, dialysis) are cornerstones; obstetric-specific sepsis definitions and WHO GLOSS have harmonised surveillance and emphasised timeliness [7,10].

5.4 Other time-critical conditions. Uterine rupture/obstruction require rapid laparotomy and repair or hysterectomy; ectopic pregnancy with haemodynamic instability warrants urgent surgical management; massive pulmonary embolism or amniotic fluid embolism mandates advanced resuscitation with multidisciplinary critical care, and consideration of thrombolysis/ECMO where available on a case-by-case basis [6,12,19,20].

6. SYSTEMS FOR TERTIARY READINESS AND RAPID RESPONSE

6.1 Obstetric HDU/ICU and organised referral. National operational guidelines outline indications, infrastructure, staffing and protocols for obstetric HDUs/ICUs. Functioning units with clear admission criteria, invasive monitoring, and 24×7 blood bank support are associated with improved outcomes in tertiary facilities [13–15,28–30].

6.2 Early-warning and proactive surveillance. Modified obstetric early-warning scores (MEOWS/MOEWS) improve recognition and escalation for deteriorating patients and are increasingly adopted; ongoing validation work and national early-warning development efforts continue [31–33].

6.3 Checklists, audits and simulation. The WHO near-miss approach provides indicators and case-review templates; India's 2014 MNM Review Operational Guidelines mainstream the review cycle. Checklists (WHO Safe Childbirth Checklist) increase adherence to essential practices though effects on hard outcomes vary by implementation strength; simulation-based, team-oriented training (e.g., PRONTO and similar programmes) improves preparedness and selected outcomes, and is a pragmatic way to operationalise bundles and team communication [4–5,34–35].

7. OUTCOMES AND "CHANCES OF IMPROVEMENT"

Outcomes for MNM are best tracked with WHO indicators. A higher MNM:death ratio and a lower mortality index reflect better case management and system performance. Across tertiary centres in India, reported MNM incidence ratios (per 1,000 live births) commonly lie in single- to low-double digits (e.g., ~8–18), with SMOR ~12–20 and mortality indices ~15–25%, although extreme values occur with heavy referral loads or data artefacts [21–27]. Implementation of near-miss audits and HDU/ICU services has been associated with improved timeliness of interventions and reductions in mortality indices in several reports [4–5,28–30].

Condition-specific outcomes also improve with bundle fidelity: in PPH, early TXA within 3 hours reduces death due to bleeding; interventional radiology and conservative surgical options reduce hysterectomy where timely; in HDP, magnesium sulfate prevents/treats eclampsia and reduces recurrent seizures; in sepsis, early antibiotics and source control reduce progression to shock and organ failure [6–12,16–20].

8. IMPROVEMENT AGENDA FOR TERTIARY CARE

• Adopt/refresh WHO MNM criteria and indicators; institute monthly MNM case reviews aligned to national operational guidelines [1–5].\
• Ensure PPH/HDP/sepsis bundles are protocolised and drilled; stock essential drugs (oxytocin, misoprostol, carboprost, tranexamic acid), devices (balloon tamponade), and blood components including fibrinogen/cryoprecipitate [6–12,16–20].
• Strengthen obstetric HDU/ICU capacity and 24×7 blood bank; use massive transfusion protocols with ratio-guided components [13–15,28–30].
• Implement obstetric early-warning scores with clear escalation pathways and critical-care outreach [31–33].
• Embed simulation-based team training and periodic drills; pair with coaching/checklists to convert knowledge into practice [34–35].
• Integrate antimicrobial stewardship and infection prevention (safe surgery, catheter bundles) to prevent iatrogenic sepsis [7,10].
• Report indicators quarterly to hospital quality committees; link to targeted micro-improvements and feedback to referring facilities [1–5].

9. RESEARCH GAPS

Priorities include: (i) pragmatic trials of integrated bundles (PPH/HDP/sepsis) with early-warning and simulation; (ii) effectiveness of obstetric HDU/ICU expansion on MNM indicators; (iii) standardisation/automation of MNM case detection in electronic records; and (iv) context-specific criteria refinements that balance sensitivity and feasibility in low-resource tertiary settings [2–5,31–33].

10. CONCLUSION

Maternal near-miss surveillance and response is a keystone of safe obstetric systems. In tertiary care, the combination of precise case definition, aggressive condition-specific bundles, ICU/HDU capability, early-warning-driven escalation, and disciplined case review offers a credible path to lower mortality indices and fewer catastrophic morbidities. Sustained gains require institutionalising these practices, resourcing teams, and using MNM indicators as routine management metrics [1–5,6–12,13–20,28–35].

REFERENCES

[1] WHO (2011): Evaluating the quality of care for severe pregnancy complications: The WHO near-miss approach for maternal health. Geneva: WHO.
[2] Cecatti, J.G., Souza, J.P., et al. (2011): Pre-validation of the WHO organ-dysfunction based criteria for maternal near-miss. Reproductive Health.
[3] Witteveen, T., et al. (2017): Validating the WHO maternal near-miss tool and indicators. Reproductive Health.
[4] Ministry of Health & Family Welfare, Government of India (2014): Maternal Near-Miss Review: Operational Guidelines. New Delhi: MoHFW.
[5] Purandare, C., et al. (2014): Maternal near-miss reviews: lessons from a pilot programme in India. BJOG, 121(S4), pp. 105–111.
[6] Shakur, H., et al. (2017): WOMAN Trial: Tranexamic acid for postpartum haemorrhage. Lancet, 389, pp. 2105–2116.
[7] Ker, K., et al. (2024): Tranexamic acid for postpartum bleeding: IPD meta-analysis of RCTs. Lancet, 404, pp. 1657–1667.
[8] WOMAN-2 Trial Collaborators (2024): TXA to prevent PPH in anaemic women (WOMAN-2). Lancet, 404, pp. 1645–1656.
[9] WHO (2012–2017 updates): Recommendations for the prevention and treatment of PPH (updates incorporating TXA). Geneva: WHO.
[10] FIGO (2022): Recommendations on the management of postpartum haemorrhage. International Journal of Gynecology & Obstetrics, 157(S1), pp. 3–50.
[11] WHO (2017–2024): Maternal sepsis: definition and resources. Geneva: WHO.
[12] Bonet, M., et al. (2017): Towards a consensus definition of maternal sepsis. International Journal of Gynecology & Obstetrics, 137, pp. 227–231.
[13] National Health Mission (India) (2016/2017): Operational Guidelines for Obstetric ICUs and HDUs. New Delhi: MoHFW.
[14] Abie, A., et al. (2025): Obstetric ICU admission and maternal outcomes: systematic review. PLoS One.
[15] Semrau, K.E.A., et al. (2017): BetterBirth Trial—WHO Safe Childbirth Checklist coaching. New England Journal of Medicine, 376, pp. 2311–2320.
[16] WHO (2011): Recommendations for prevention and treatment of pre-eclampsia and eclampsia. Geneva: WHO.
[17] NICE/RCOG: Severe pre-eclampsia/eclampsia management guidance (current NICE hypertension in pregnancy guidance).
[18] JOGC (2022): Guideline No. 426. Hypertensive disorders of pregnancy.
[19] RCOG (2019): Maternal collapse in pregnancy and the puerperium (Green-top Guideline No. 56).
[20] Escobar, M.F., et al. (2020): Maternal sepsis: review. Best Practice & Research Clinical Obstetrics & Gynaecology.
[21] Roopa, P.S., et al. (2013): Near-miss obstetric events and maternal deaths in a tertiary hospital: audit. Journal of Pregnancy.
[22] Kulkarni, R., et al. (2021): Maternal near-miss events in India—systematic review. Indian Journal of Medical Research, 154, pp. 573–582.
[23] Verma, A., et al. (2023): Maternal near-miss and mortality in a tertiary care centre (UP, India).
[24] Tallapureddy, S., et al. (2017): Near-miss obstetric events and maternal mortality in a tertiary hospital. Indian Journal of Public Health, 61, pp. 305–308.
[25] Parmar, N.T., et al. (2016): Incidence of MNM in a tertiary care hospital, Gujarat. Journal of Obstetrics and Gynecology of India, 66, pp. 315–320.
[26] Kalra, P. and Kachhwaha, C.P. (2014): Obstetric near-miss morbidity and maternal mortality in Western Rajasthan. Indian Journal of Public Health, 58, pp. 199–201.
[27] Ravula, P.C., et al. (2011–2020): Maternal near-miss audit over a decade, Hyderabad, India.
[28] Sangeeta, G., et al. (2014): Evaluation of severe maternal outcomes using WHO near-miss approach in a developing country. Journal of Obstetrics and Gynaecology of India.
[29] NHM/NHSRC India (2015–2017): Guidelines for High-Dependency Unit (HDU) & ICU for obstetrics.
[30] Matibag, V.I.P., et al. (2024): Clinical characteristics and outcomes in obstetric ICU/HDU, South India.
[31] Robbins, T., et al. (2019): Modified early obstetric warning scores: evidence review. Anaesthesia, 74, xxx–xxx.
[32] Xu, Y., et al. (2022): A new modified obstetric early warning score (MOEWS): development/validation. BMC Pregnancy and Childbirth.
[33] Gerry, S., et al. (2024): Development of a national maternity early warning score. BMJ Medicine.
[34] Delaney, M.M., et al. (2019): BetterBirth post-hoc: fidelity and outcomes. Lancet Global Health.
[35] Fritz, J., et al. (2018): PRONTO simulation effects on active management of third stage. Global Health: Science and Practice.