

Analytical Study of Near-miss Cases at Tertiary Care Center

Preeti Frank Lewis¹, Bindu Gundaiah², Nitin Bhimrao Bavdekar³

Received on: 29 November 2022; Accepted on: 16 March 2023; Published on: 16 September 2023

ABSTRACT

Background: “Childbirth is a rebirth for the mother”—an ancient saying summarizes the unpredictable life-threatening conditions that might occur during pregnancy. Maternal deaths form only the tip of the iceberg, while a large part of it is the maternal comorbid conditions that remain largely undescribed.

Materials and methods: A retrospective observational study was conducted in the Department of Obstetrics and Gynaecology in collaboration with ICU, including the COVID-ICU in a Tertiary Care Hospital. The audit involves all women who are very ill, pregnant or recently delivered women who nearly died but survived a complication during pregnancy, and childbirth or within 42 days of termination of pregnancy, fulfilling the WHO criteria admitted at the tertiary center at the study period of 18 months.

Results: The audit revealed MNM incidence ratio of 34/1,000 live births and mortality ratio of 1,261/1,00,000 live births with maternal near-miss: maternal mortality ratio of 2.7:1 in 3,604 deliveries. The most common factor leading to near-miss is found to be hemorrhage followed by hypertensive disorders. Most of them were between 26 and 30 years, multigravida. Type-II delay is most commonly seen due to a lack of facilities at the peripheral centers.

Conclusion: Setting up “High-risk pregnancy clinics” at the taluka level for early recognition and referral of high-risk patients, upgrading the infrastructure of peripheral centers, and need of increase in tertiary care hospitals in every district for provision of quality care. Encouraging blood donation from a family member of every patient registering their pregnancy.

Keywords: Audit, Hemorrhage, High-risk pregnancy, Maternal near-miss.

Journal of South Asian Federation of Obstetrics and Gynaecology (2023): 10.5005/jp-journals-10006-2263

INTRODUCTION

Maternal health is considered to be one of the most sensitive indicators of the community health system. Measurement of such parameters is of paramount importance to know one’s country’s health status. Earlier maternal mortality ratio was used to measure maternal health, with improvement in the general health conditions and adoption of newer technologies, there was a plateau in the maternal deaths, which decreases the sensitivity of MMR, which led to the emergence of the concept of a maternal near-miss.

In 2008, WHO comes up with the organ dysfunction criteria to classify pregnant women under near-miss and defines MNM as “a woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy”.¹

Maternal near-miss has emerged as an adjunct to the investigation of maternal deaths as the two represent similar pathological and circumstantial factors leading to severe maternal outcomes. As near-miss cases are alive to directly inform on problems and obstacles that had to be overcome during the process of healthcare, they provide useful information on the quality of healthcare at all levels. Thus, there is a need for the application of the maternal near-miss concept for the assessment of maternal health and the quality of maternal care.

The primary aim of this audit is to study the series of events a near-miss case experiences, the management protocols, and the type of treatment/emergency interventions received by that case that caused the near-miss case to escape mortality. The secondary aim is to investigate the antenatal events, medical disease/high-risk factor, type of delay,² or the factors that caused the initiating morbidity in these cases.

^{1,2}Department of Obstetrics & Gynaecologist, GGMC and JJ Group of Hospitals, Mumbai, Maharashtra, India

³Department of Community Medicine, GGMC and JJ Group of Hospitals, Mumbai, Maharashtra, India

Corresponding Author: Bindu Gundaiah, Department of Obstetrics & Gynaecologist, GGMC and JJ Group of Hospitals, Mumbai, Maharashtra, India, Phone: +91 8088382834, e-mail: bindu.gundaiah@gmail.com

How to cite this article: Lewis PF, Gundaiah B, Bavdekar NB. Analytical Study of Near-miss Cases at Tertiary Care Center. *J South Asian Feder Obst Gynae* 2023;15(4):440–444.

Source of support: Nil

Conflict of interest: None

Patient consent statement: The author(s) have obtained written informed consent from the patients and the patient’s parents for publication of the article.

The following statistics are studied:

- MNM ratio (MNMR) refers to the number of maternal near-miss cases per 1,000 live births (MNMR = MNM/LB).
- Maternal near-miss mortality ratio (MNM: MD) refers to the ratio between MNM cases and maternal deaths (MD).
- Women with life-threatening conditions (WLTC) refers to all women who either qualified as maternal near-miss cases or those who died. It is the sum of maternal near-miss and maternal deaths (WLTC = MNM + MD).
- Severe maternal outcome ratio (sMOR) refers to the number of women with life-threatening conditions (MNM + MD) per 1,000 live births (LB) {SMOR = (MNM + MD)/LB}.

Table 1: Near-miss indices

Indices	Numbers
Total no. of deliveries	3,604
Total no. of live births (LB)	3,488
Number of near-miss cases (MNM)	120
Number of maternal mortality cases (MM)	44
Maternal near-miss incidence ratio (MNM IR = MNM/LB)	34/1,000 live births
Maternal mortality ratio (MMR = MM/LB)	1,261/1,00,000 live births
Maternal near-miss: Maternal mortality ratio (MNM: MD)	2.7:1
Severe maternal outcome ratio (SMOR = MNM + MD/LB)	47/1,000 live births

MATERIALS AND METHODS

A retrospective observational study was conducted in the Department of Obstetrics and Gynaecology in collaboration with ICU, including the COVID-ICU in an urban Tertiary Care Hospital. The audit involves all women who are very ill, pregnant or recently delivered women who nearly died but survived a complication during pregnancy, and childbirth or within 42 days of termination of pregnancy, fulfilling the WHO criteria admitted at the tertiary center at the study period of 18 months.

RESULTS AND OBSERVATIONS

Prevalence Rate

In our study, 3,604 patients delivered during the study period, near-miss cases were found to be 120, MNM incidence ratio of 34/1000 live births, and mortality ratio of 1261/1,00,000 live births with maternal near-miss: maternal mortality ratio of 2.7:1 (Table 1).

Age

The study had 35% of the NMC falling in the age group between 26 and 30, and 31% between 21 and 25 years (Table 2).

REGISTRATIONS STATUS

About 87/120 cases were registered and 33/120 were unregistered.

Referral Status

About 78% of the cases were referred and 22% were unreferred, with type-I delay seen in 20%, type-II in 53%, and type-III delay in 18%.

This current study has hemorrhage as the most common determinant leading to a near-miss. Out of 44 (36%) near-miss cases due to hemorrhage, 12 (10%) of them presented with ruptured ectopic pregnancies, 10 (8.33%) were due to PPH, 10 (8.33%) placenta previa, 9 with abruption placenta, and 3 retained placenta/morbidly adherent placenta. Following hemorrhage, hypertensive disorders in pregnancy, including HELLP syndrome, account for 32.47%. The audit also involves COVID cases as they fall into respiratory organ dysfunction category by WHO, near-miss cases due to COVID pneumonitis apart from other respiratory causes that contribute 28 (23.324%) of the cases, and all of them have either required intubation/NIV/oxygen support under CCU care with saturation drop of <90% for >60 minutes.

Table 2: Distribution according to patient's characteristics

Patient characteristics	Near-miss Mean age (percentage)
Age (years)	
≤20	7 (5.833%)
21–25	38 (31.6%)
26–30	42 (35%)
31–35	21 (17.5%)
≥35 yrs	12 (10%)
Gravida	
Primigravida	31 (25.833)
Multigravida	89 (74.166)
Gestational weeks	
<12 weeks	2
12–28	11
>28	67
ANC/PNC status	
ANC	105 (87.5%)
PNC	15 (12.5%)
ANC status	
Booked with other practitioners	87 (72.5%)
Unbooked	33 (27.5%)
Admission status	
Unreferred	26 (21.66%)
Referred	94 (78.333%)
Type of delay	
Type-I (delay in the decision to seek care)	24 (20%)
Type-II (delay in reaching an adequate healthcare facility)	64 (53.33%)
Type-III (delay occurs in receiving adequate care at that facility)	22 (18.33%)
Admission status	
CCU/ICU admission	99 (82.5%)
Mean CCU admission	4.8166
Obstetric intervention	
Vaginal birth	41 (34.1666)
Cesarean section	37 (30.833%)
Home delivery	3 (2.5%)
Explorative laparotomy with ectopic excision	12 (10%)
LSCS f/b obstetric hysterectomy with vessel ligation	6 (5%)
Check curettage	1 (0.833%)
Duration of admission	
Mean duration of CCU/ICU admission	
<10 days	97
>10 days	2
Mean duration of ward admission	8.7
Blood/blood products	
Required blood/blood products	72 (60%)
Did not require blood/blood products	48 (40%)

Table 3: WHO's categorization according to organ dysfunction

<i>Organ dysfunction</i>	<i>Near-miss</i>
Cardiac dysfunction	23
Respiratory dysfunction	39
Coagulation dysfunction	21
Neurological dysfunction	7
Renal dysfunction	8
Hepatic dysfunction	7
Uterine dysfunction	9

Table 4: Distribution according to primary determinants of near-miss cases

	<i>Primary maternal causes</i>	<i>Near-miss</i>
1	Hemorrhagic	44 (36%)
	a) Ectopic pregnancy	12 (10%)
	b) Postpartum hemorrhage	10 (8.33%)
	c) Retained placenta/morbidly adherent placenta	3 (2.499%)
	d) Placenta previa	10 (8.33%)
	e) Abruptio placenta	9 (7.497%)
2	Hypertensive disorder	39 (32.4%)
	a) PIH and preeclampsia	23 (19.159%)
	b) Eclampsia	16 (13.328%)
3	COVID-19 pneumonitis	28 (23.324%)
4	Hematological dysfunction (including DIC)	29 (24.166%)
5	Cardiac disorders	15 (12.495%)
6	Shock	13 (10.829%)
7	Respiratory dysfunction (excluding COVID)	11 (9.166%)
8	Sepsis	10 (8.33%)
9	Renal dysfunction	8 (6.664%)
10	Hepatic dysfunction	7 (5.833%)
11	GDM with ketoacidosis	5 (4.165%)
12	Infectious causes	4 (3.332%)
13	Endocrine dysfunction	1 (0.833%)
14	Abortion (including septic abortion)	1 (0.833%)

The current audit has 28 (23.32%) COVID pneumonitis cases apart from other respiratory cases, they differ from each other in terms of severity, hospital stay, and the mode intervention. Most of the non-COVID cases had a shorter CCU duration of 4–5 days, with the highest survival rate following intubation as an emergency intervention. Whereas in COVID, mortality was seen in most of the intubated patients while only one survived, the rest 32% of the cases required NIV support, 57% revived on O₂ by mask, with a mean duration of CCU stay 6–7 days. The severity of the disease COVID had a direct association with the underlying morbidities like eclampsia, preeclampsia, and anemia.

Most of the patients had the affection of more than one organ system of which 24.16% of the cases had hematological dysfunction, including DIC and 10% shock, 12.49% cases had cardiovascular dysfunction, with 5.8% cases having hepatic dysfunction (Table 3). Renal and infectious causes were seen in 6% and 4% of the cases, respectively (Table 4).

Table 5: Critical lifesaving interventions done in near-miss cases

<i>Interventions</i>	<i>Near-miss cases</i>
ICU/CCU admission	99 (82.5%)
Resuscitative procedure/intubation	29 (24.16%)
Ventilation/NIV support	27 (22.5%)
Inotropic support	9 (7.497%)
Dialysis	5 (4.165%)
Management of ketoacidosis	5 (4.165%)
Obstetric hysterectomy	9 (7.497%)
Internal iliac artery ligation	4 (3.33%)
Repair of genital injury	1 (0.833%)
Reposition of uterine inversion	1 (0.833%)
Manual removal of placenta	1 (0.833%)
Check curettage	1 (0.833%)
Use of mannitol	3 (2.499%)
Blood/Blood product transfusion	72 (59.976%)
Termination of pregnancy	
Induction of labor	20 (16%)
Cesarean section	30 (25%)

About 82.5% of the cases required admission in the critical care unit with the mean duration of admission in CCU being 4–5 days. Immediate resuscitative measures like intubation were done in 25% of cases and about 22% required prolonged intubation/NIV support. This rate has been increased due to the inclusion of COVID cases under near-miss.

Emergency-operative interventions play a vital role in MNM, as most of the cases were of hemorrhagic cause, and immediate surgical intervention has saved many lives. About 9 cases have undergone obstetric hysterectomy with internal iliac artery ligation and 7 explorative laparotomies with ectopic excision.

About 59.9% of the cases required blood transfusion of which 2 patients have received a massive blood transfusion. Most of the time, blood transfusion alone saves life and avoids severe morbidity (Table 5). Hence, obstetric hemorrhage should be picked up at the earliest, and blood loss should immediately be replaced to avoid severe morbidity. This can be observed in a current study where women with institutional delivery, when going into atonic PPH, immediate blood transfusion have reduced morbidity and are managed in the ward. In contrast, patients referred from peripheral centers end up in hemorrhagic shock or DIC, requiring prolonged CCU admission and even dialysis for AKI.

DISCUSSION

This study has hemorrhage as the most common determinant leading to a near-miss, similar to the studies from Australia and Indian.^{3–5} While the cause of maternal mortality still being the hypertensive disorder, indicating that when obstetric hemorrhage is picked up at the earliest at a tertiary care center or referred at the earliest from a peripheral center has got a better prognosis, and one can escape death with timely intervention and adequate blood transfusion.

Following hemorrhage, hypertensive disorders in pregnancy, including HELLP syndrome, account for 32.47%, unlike the study

from Sahijwani et al.⁶ which had preeclampsia as the most common cause. Earlier studies had higher proportions of eclampsia versus preeclampsia, but this study, including recent studies,^{7,8} has a higher proportion of preeclampsia over eclampsia probably because of the enrolment of the ANC cases at the possible nearby health centers and their prompt referral has reduced the incidence of eclampsia, hence reaffirming that timely initiation of treatment reduced the morbidity and mortality. Even though the number of women registering their pregnancy has increased, they fail to follow up regularly. Hence, these women land up with end-stage disease by the time they reach a tertiary care center, thus resulting in causing the highest mortality.

The audit also involves COVID cases contributing 23% of MNM, and it was found that pregnant with underlying morbidity had more severe diseases than others. This is similar to the meta-analysis of 117 studies with a total of 11,758 pregnant women included. The study concluded that pregnant women are at 20-times higher risk than nonpregnant women.⁹

It is known since the beginning of modern medicine that, “pregnancy is a pathophysiological state”, the termination of which can reverse many pathological conditions. Hence, judicious termination of pregnancy either by induction of labor or by cesarean section is one of the major emergency interventions that can combat mortality. This study had 30 indicated cesareans, most of them were done for placenta previa and abruptio placentae. About 20 indicated induction of labor done maximum for preeclampsia and eclampsia. None of the studies mentions termination of pregnancy as an intervention, which is a vital collaborative measure in the treatment of NMC.¹⁰⁻¹²

As the study was conducted during a COVID pandemic, comparison of the maternal near-miss ratio with previous studies might vary by a wide margin, as there was a peak surge in COVID cases alone during the study period. The comparison of individual data serves the purpose of recognizing gaps in the healthcare system. Certain gaps and technical factors contributing to maternal poor health are as follows:

- Failure of regular follow-ups at the registered center.
- Lack of knowledge regarding dangerous signs of pregnancy.
- Undiagnosed or late diagnosis of the underlying medical conditions.
- Poor infrastructure of peripheral hospitals and poor transport.
- Nonavailability of blood, nonavailability of OT, and poor manpower.
- Increased load on tertiary centers.

In our study, 78.33% of the cases were referred/transferred and most of the time reasons for referral are (a) nonavailability of ICU/CCU, (b) nonavailability of blood and blood products, (c) nonavailability of working operation theatre/nonavailability of NICU care, and (d) nonavailability of doctors.

This indicates (1) unmet needs of the referral care center. (2) Need of expert/skilled professionals at referral centers. (3) Need for more incentives for doctors to practice in the periphery. (4) Need for wider usage of telemedicine at peripheral centers. (5) Need for quick and well-equipped transport system. (6) Need for employing skilled/specialized doctors at peripheral centers.¹⁴

Multiple studies in developing countries show that most of the golden time is lost at the peripheral centers' due to poor facilities. Referral of all such cases overburdens tertiary centers, causing

problems in resource allocation and compromising the quality of care.

CONCLUSION AND RECOMMENDATION

At the most primary level, strengthening of peripheral centers with manpower and equipment and wider usage of telemedicine fills up most of the health gaps. This includes health education encouraging ANC registration and regular follow-up.

Setting up “High-Risk Pregnancy Clinics (HRPCs)” at the subdistrict level, with visits from doctors specializing in obstetrics and gynecology, will establish this multidisciplinary approach and timely referral mechanism. The high-risk individuals can be identified at the HRPCs and referred to centers in the nearby area at a stipulated time providing good-quality antenatal coverage and referral linkage through these HRPCs. At the district level, every district must have one tertiary care hospital to the nearby peripheral centers for the better decentralization of patient's load rather than overburdening the tertiary center at metropolitan cities and to avoid delays in starting appropriate definitive management.

As this current study has more than 50% of the patients requiring blood and its product transfusion, making it obvious that obstetric hemorrhages are unavoidable and early blood replacement can prevent severe morbidity, the government should encourage blood donation camps every 3 months once and make it a point that all women who register pregnancy should have a relative having donated blood at the registered center providing that woman with a universal pass of blood availability at the time of need. This will not only increase the blood availability but also decrease the referrals due to blood nonavailability.

Audit of near-miss cases will allow the analyses of care received by critically ill women, deficiencies and gaps in healthcare, and comparison between and within the institutes and countries can be carried. This will help us to improvise the quality of obstetric care and further reduce maternal morbidity.

REFERENCES

1. https://en.wikipedia.org/wiki/Near_miss WHO definition of maternal near-miss
2. Yunus S, Kauser S, Ali S, et al. Three ‘delays’ as a framework for critical analysis of maternal near miss and maternal mortality. *J South Asian Feder Obstet Gynaecol* 2013;5(2):57–59. DOI: 10.5005/JP-JOURNALS-10006-1224.
3. Jayaratnam S, Burton A, Connan KF, et al. Maternal ‘near miss’ at royal Darwin hospital: An analysis of severe maternal morbidity at an Australian regional tertiary maternity unit. *Aust N Z J Obstet Gynaecol* 2016;56(4):381–386. DOI: 10.1111/ajo.12436.
4. Kamal S, Roy P, Singh S, et al. A study of maternal near miss cases at tertiary medical college of Jharkhand, India. *Int J Reprod Contracept Obstet Gynecol* 2017;6(6):2375–2380. DOI: 10.18203/2320-1770.ijrcog20172316.
5. Rathod AD, Chavan RP, Thool P. Analysis of near-miss and maternal mortality at tertiary referral centre of rural India. *J Obstet Gynecol India* 2016;66(S1):295–300. DOI: 10.1007/s13224-016-0902-2.
6. Sahijwani DV, Desai A, Kansara V. Analysis of near miss cases as a reflection of emergency obstetric services and need of obstetric ICCU. *J South Asian Feder Obstet Gynaecol* 2013;5(3):99–101. DOI: 10.5005/jp-journals-10006-1237.
7. Samant PY, Dhanawat J. Maternal near miss: An Indian tertiary care centre audit. *Int J Reprod Contracept Obstet Gynecol* 2019;8(5): 1874–1879. DOI: 10.18203/2320-1770.ijrcog20191935.

8. Kumari S, Kapoor G, Sharma M, et al. Study of maternal near miss and maternal mortality in a tertiary care hospital. *J Clin Diagn Res* 2020;14(4). DOI: 10.7860/JCDR/2020/42710.13634.
9. Karimi L, Makvandi S, Vahedian-Azimi A, et al. Effect of COVID-19 on mortality of pregnant and postpartum women: A systematic review and meta-analysis. *J Pregnancy* 2021;2021:8870129. DOI: 10.1155/2021/8870129.
10. MOHFW, Govt. of India guidelines for maternal near-miss. *Maternal_Near_Miss_Operational_Guidelines.pdf*.
11. Herklots T, van Acht L, Khamis RS, et al. Validity of WHO's near-miss approach in a high maternal mortality setting. *PLoS One* 2019;14(5):e0217135. DOI: 10.1371/journal.pone.0217135.
12. Tunçalp Ö, Souza JP. Maternal near-miss audits to improve quality of care. *BJOG* 2014;121(Suppl 4):102–104. DOI: 10.1111/1471-0528.12868.
13. Sharma C, Yadav A, Mehrotra M, et al. Maternal near miss: Unraveling our experience in the tertiary care hospital of Andaman and Nicobar Islands. *Indian J Community Med* 2021;46(1):35–39. DOI: 10.4103/ijcm.IJCM_145_20.