

Maternal near miss events &maternal deaths in a tertiary care hospital: A retrospective study

¹Ashwani Verma, Assistant Professor, Department of Obstetrics & Gynecology, National Institute of Medical Sciences, Jaipur, Rajasthan.

²Nidhi Chaturvedi, Professor, Department of Obstetrics & Gynecology, National Institute of Medical Sciences, Jaipur, Rajasthan.

³Sakshi Chaudhary, PG Resident, Department of Obstetrics & Gynecology, National Institute of Medical Sciences, Jaipur, Rajasthan.

³Pratiksha, PG Resident, Department of Obstetrics & Gynecology, National Institute of Medical Sciences, Jaipur, Rajasthan.

Corresponding Author: Pratiksha, PG Resident, Department of Obstetrics & Gynecology, National Institute of Medical Sciences, Jaipur, Rajasthan

Citation this Article: Ashwani Verma, Nidhi Chaturvedi, Sakshi Chaudhary, Pratiksha, “Maternal near miss events &maternal deaths in a tertiary care hospital: A retrospective study”, IJMSIR - February - 2024, Vol – 9, Issue - 1, P. No. 171 – 178.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Maternal mortality is an indicator of the quality of country’s maternal health services. Maternal near miss (MNM) can be a proxy for maternal death & it describes women who nearly died due to obstetric complications. Government of India (GoI) released operational guidelines for maternal near miss review (MNM-R) in 2014 for use by programme managers of public health system to assist them for conducting MNM-R.

Methods: A retrospective study was conducted from September 2022 to August 2023 at tertiary care unit in Jaipur. All eligible women were included according to MNM 2014 GoI guidelines.

Results: Out of 927 live birth 53 Near Miss Events (NME) occurred among which 9 expired. Thus, near miss rate (NMR) & Maternal mortality rate (MMR) of our

hospital was 47.4 per 1000 live birth and 970.87 per 100000 live births respectively. The ratio of maternal death to MNM (maternal mortality: near miss) was 1:4.8 and mortality index was 16.98. The leading cause of MNM was obstetric hemorrhage (43.18%). Sixty eight percent of women included in study were referred from lower facilities.

Conclusion: The leading cause of MNM was obstetric hemorrhage. MNM-R should be done at all referral & tertiary care centres in India so that detailed analysis of causes and incidence of MNM events can be done. As near miss analysis indicates the quality of health care it is worth presenting in national indices.

Keywords: Maternal mortality, near miss events, obstetrical hemorrhage.

Introduction

Maternal morbidity is a part of continuum from maternal good health to maternal mortality. Mothers suffering from acute complications share several common pathologies and circumstances related to their clinical condition. Some of these pregnant woman die while some survive these catastrophic events due to available health care. Hence Maternal mortality can largely be labelled as “tip of iceberg” with morbidity forming the base. The concept of Severe Acute Maternal Morbidity (SAMM) is thus apt for assessment of present health providing system[1,2].

Traditionally, maternal mortality has been used to define the expanse and effectiveness of health care programme in a country. Women who survive severe pregnancy complications have attracted the interest of researchers and public policy makers since, 1990s. This group which is known as maternal near miss (MNM) is formed by women who escape death after an acute and severe pregnancy complications. In 2009, WHO came up with clinical, laboratory and management criteria for identification of these cases [3].

MNM is defined as ‘a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy’ [4]. WHO recommended that MNM approach is considered in national plans to improve maternal health, because researchers agree that MNMs are frequently a preventable precursor of maternal mortality [5]. MNM reviews are proxy models of maternal death and are less threatening to service providers as the woman survives and she can be interviewed to understand the factors which saved her from this event [6].

MNM cases occurs more often as compared to maternal deaths and have similar pathways that can directly give information about strength and weakness of health

system that need to be overcome during the process of providing healthcare [7].

Assuming that most of these outcomes are preventable they may be explained by the “Three Delay Model”. First delay when the patient fails/ unable to seek health care. Second delay occurs due to lack of transport facility. Third delay occurs at the health facility when there is delay in initiation of care due to lack of care provider/ adequate facility [7].

In India, maternal mortality ratio (MMR) has been declining steadily [8] Maternal death review (MDR) as per the guidelines of Government of India (GoI) is being conducted at all the facility in India [9]. MNM is gaining more importance MMR for 2018-2020 in India is reduced to 97/100000 live births [10]. India is committed to achieve the UN target for Sustainable development goal (SDG) for MMR below 70/100000 by 2030 [6].

GoI released operational guidelines for MNM-R in December 2014. These guidelines will help to find the causes of MNM, health system response to maternal emergencies, to identify the gaps and thus, the remedies to be taken in health care system [9].

Most of the studies done in India and abroad have used WHO criteria for classification of MNM. We could find only one study on MNM using GoI criteria done in Maharashtra India in 2023[6]. Considering the wide variations in prevalence of MNM cases in different regions of India and great divide in the level of health facilities there is a need to study and review MNM cases to identify cases and especially the factors which added to the morbidity according to the delay model. With this background, we conducted this study in a tertiary care hospital in Rajasthan to find the causes, incidence, contributing factors and suggest measures for improvement.

Material and Methods

A retrospective study of women's medical records (927 cases) was done to complete proforma and summarize obstetric and perinatal events from September 2022 to August 2023 at National Institute of Medical Science, Jaipur, Rajasthan.

Near miss events were identified according to GoI guidelines. Cases of medical disorders and surgical disorders like hepatitis, pancreatitis, renal compromise and anaemia which lead to organ dysfunction were included. Data collected included demographic characteristics, obstetric complication in current pregnancy, time of occurrence of event, place where primary treatment taken, transport used, organ dysfunction involved, method of delivery, outcomes (maternal and perinatal), treatment including special interventions done up to hospital discharge.

Of these, women with life-threatening complications and maternal deaths were noted and women who survived were identified as MNM cases as per the criteria stated in the operational guidelines of GOI for classification of MNM cases.

Those meeting either minimum one criteria from each category – clinical findings (either symptoms or signs), investigations and interventions; or single criteria that signified cardiorespiratory collapse were included. The clinical findings, investigations and interventions were put under three broad categories – pregnancy-specific obstetric and medical disorders, pre-existing disorders aggravated during pregnancy and accidental/incidental disorders of pregnancy. These categories were further segregated under adverse events such as haemorrhage, sepsis, hypertension, etc.

Admitted pregnant/postpartum women not meeting criteria of MNM were excluded from the study.

Maternal near-miss (MNM) is defined as 'a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy'. Maternal death (MD) is defined according to the tenth revision of International Classification of Diseases (ICD-10) by the WHO.1 maternal mortality rate (MMR) is defined as the number of maternal deaths per 100,000 live births. Maternal near miss rate (NMR) was calculated as number of maternal near miss per 1,000 live births. It indicates prevalence of near miss. Severe maternal outcome ratio (SMOR) refers to the number of women with life-threatening complications per 1,000 live births (LB). $SMOR = (NM + MD)/LB$. It reflects the total morbidity. Mortality index is defined as the number of maternal deaths resulting from a particular obstetric condition divided by the sum of the near-miss morbidities and maternal deaths occurring from such obstetric condition, expressed as a percentage $(MD/MD + NM)$. Mortality index is calculated to appreciate the standard of care provided for each complication.

Result:

In our study there were a total of 950 deliveries. Out of this 23 were stillbirth/ IUFDs and 927 livebirths. Over a period of 1 year Near Miss Events in our hospital were 53, out of these 9 women died and 44 were categorized as MNM.

Out of 44 MNM maximum women were in age group of 25-30 years (56.81%). Women at extremes of age <20 years and >30 years were equal (4.6%) each and 34% were in age group of 20-24 years. Only one woman was unmarried who presented as ruptured ectopic and rest 97.7% women were married.

Women belonging to rural background formed the majority group presenting as MNM (77.3%) and only 22.7% belongs to urban area. Sixty one percent had

received primary education and 38.6% women received more than primary education. Maximum women were homemaker (90.9%) while only 9.1% were working.

In our study, 68.18% were referred cases from other health facilities, 27% had received antenatal care in our hospital and 4.5% were unbooked cases.

Multigravidas were more commonly seen in MNM group (61.3%) while primigravidas were 38.6%. women with gestational age <12 weeks were 15.9%, while 59.1% were in 12-40 weeks of gestation and 25% were postnatal cases.

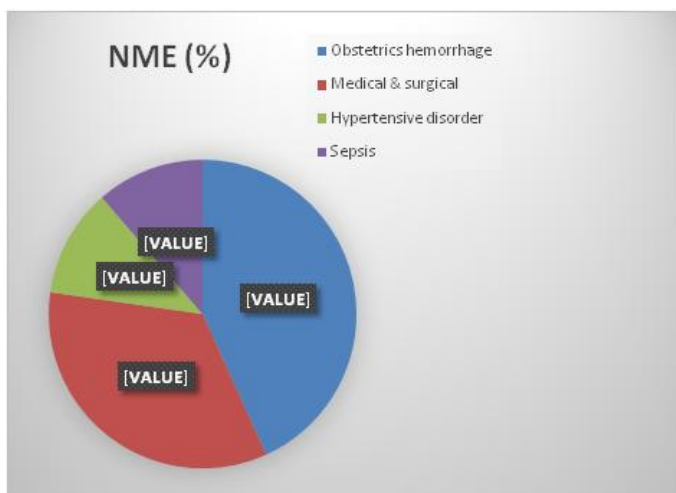
Table 1: Distribution according to demographic characteristics and reproductive attribute

Demographic characteristics and reproductive attribute	N= 44	%
Age (in yrs)		
<20	2	4.6 %
20-24	15	34 %
25-30	25	56.81%
>30	2	4.6 %
Marital Status		
Married	43	97.7%
Unmarried	1	2.3 %
Residence		
Urban	10	22.7%
Rural	34	77.3%
Education Status		
Primary	27	61 %
>Primary	17	38.6%
Booking Status		
Unbooked	2	4.5%
Booked	12	27%
Referred	30	68.18%
Parity		
Primi	17	38.6%
Multi	27	61.3%
Gestational Age		
<12 weeks	7	15.9%
12-40 weeks	26	59.1%
Postpartum	11	25%

Occupation		
Working	4	9.1%
Non-working	40	90.9%
Underlying Cause		
Hypertension	5	11.36%
Obstetric Hemorrhage	12	27.27%
Ectopic/ Abortion	7	15.9%
Infection	5	11.36%
Medical/ Surgical	15	34%
Length of ICU Stay		
<5 days	12	27.3%
>5 days	32	72.7%
Blood Products Use		
Yes	8	18.2%
No	36	81.8%

Obstetric hemorrhage including PPH, ectopic and abortion was the most common cause of MNM (43.18%) followed by medical and surgical causes (34%). Hypertensive disorder accounts 11.36% and sepsis was seen in 11.36% cases. (Fig. 1)

Fig. 1: Indication of Near miss



In our study, 27.3% women had ICU stay <5 days and 72.7% had much longer stay. Blood product was used in maximum number of cases (81.8%) when only 18.2% did not required transfusion.

Table 2: Near Miss Indicators

*Per 1,000 live births **Per 1, 00,000 live births

No. of live birth	927
Near Miss events	53
Maternal death	9
Near miss rate (NMR)*	47.4
Maternal mortality rate (MMR)**	970.87
Maternal mortality: near miss	1: 4.8
Mortality index	16.98

Table 3: Distribution of Maternal Near Miss Cases according to adverse events as per Maternal Near Miss Guidelines of the Government of India (N=44)

Pregnancy-specific obstetric and medical disorder (N=29)	
Haemorrhage	19 (43.18%)
Hypertension	6 (13.63%)
Sepsis	3 (6.81%)
Cardiac dysfunction	1 (2.27%)
Pre-existing disorders aggravated	

during pregnancy (N=15)	
Anaemia	8 (18.18%)
Liver dysfunction	2 (4.54%)
Cardiac dysfunction	3 (6.81%)
Incidental and accidental causes in pregnancy (N=2)	
Infections	2 (4.54%)

Discussion

Maternal mortality is a crucial indicator to assess the quality of services provided by healthcare system and there is a need to decrease MNM for achieving WHO sustainable goal of < 70 by 2030. In present study an attempt was made to collect data and statistics of MNM to review the existing national programme and to improve maternal health and decrease MNM. Our study is one of few studies done in which MNM woman were categorised according to Government of India (GOI) criteria. Only one more published study was found done in Maharashtra (2018-2020) to the best of our knowledge.

In present study incidence of MNM was 47.4/1000 live birth which is much more than the study done in Maharashtra by Kulkarni et al in 2018 which was 11/1000 live birth. Ratio of MNM to maternal death was 4.8:1 in our study this is in accordance to other Indian studies (2:1 – 21.8:1) [6]. In our study 27.3% cases were our booked patients and 72.7% were either referred or unbooked in our centre. However, out of these 41/44(93.18%) presented as MNM at time of admission and only 3/44(6.8%) became sick during hospital stay this is comparable to the study done by Kulkarni et al in Maharashtra were 81% were referred cases.

In our study the leading case of MNM was obstetrical hemorrhage (43.18%) comparable to study done by kulkarni et al were it was 36.4%. in other Indian studies too, obstetrical hemorrhage was the leading cause of

MNM 40.7%, 43.9% and 42.5% [11, 12, 13]. In a study done in north Himachal obstetrical hemorrhage was seen in 31% although it was not the leading cause of MNM in there study.

Various medical and surgical disorders complicating pregnancy form the second major cause of near miss events in our study (34%) this is in contrast to other Indian studies i.e. 3.4% in study one by shelly et al in north Himachal and 14% in study done in Maharashtra.

Hypertensive disorders of pregnancy were the cause of MNM in 13.63% of woman in our study which is much lower than the study done in Maharashtra (30.3%), north Himachal (39.7%) and other Indian studies (23.5%-33.1%) (13, 14, 15).

Medical/ surgical causes complicating pregnancy formed a large proportion of MNM group in our study this may be because these disorders are usually uncommon and need a multidisciplinary approach including detailed investigation to reach a diagnosis, extensive monitoring of both mother and fetus, risk of fetal harm which the lower/ primary centre are hesitant to take. Ours is a tertiary care centre but a private facility and probably the reason why we had less number of total deliveries and higher number of referral and high risk cases.

Result of all these studies show that major interventions are needed for strengthening the health system at various levels. Also community awareness and participation is the need of the hour for reducing the morbidity and mortality of women and children.

Correction of anaemia, safe abortion services, contraceptive awareness, availability and acceptance, better antenatal care with facility of early ultrasound examination for diagnosis of ectopic pregnancies, active management of third stage of labour and widen the availability of blood and blood products are some of the

measures which can help reducing the incidence of MNM.

Limitations

This was a retrospective study and in spite of extensive record searching reliable data on level of delay in MNM events could not be determined. Although not based on hard evidence yet in most cases level one delay was seen as patients made the visit to health centre only when things deteriorated.

Conclusion

Our study used GoI guidelines for classification of MNM but all other studies used WHO criteria. The leading cause of MNM was obstetrical hemorrhage in which Postpartum hemorrhage was more commonly seen than early pregnancy bleeding. Most cases were already sick at the time of admission to our facility and were referred from lower centres. Incidence of medical and surgical causes which are usually not considered the major cause of MNM was quite high in our tertiary care referral unit. MNM-R (review) should be done at all referral and tertiary care centers in India so that detailed analysis of causes and incidence of MNM events can be done. It is also important to identify the level of delay as given in GoI guidelines so that effective measures can be undertaken. MNM-R done in multiple centers all over India may also help in detecting the different resources in different regions as evident from MNM-R.

References

1. W. Stones, W. Lim, F. Al-Azzawi, and M. Kelly, "An investigation of maternal morbidity with identification of life-threatening "near miss" episodes," *Health Trends*, vol. 23, no. 1, pp. 13-15, 1991.
2. N. Sivalingam and K. W. Looi, "Clinical experience with management of "near-miss" cases in obstetrics,"

Medical Journal of Malaysia, vol. 54, no. 4, pp. 496-503, 1999.

3. L. Say, J. P. Souza, and R. C. Pattinson, "Maternal near miss- towards a standard tool for monitoring quality of maternal health care," *Best Practice and Research*, vol. 23, no. 3, pp. 287- 296, 2009.
4. World Health Organization. Evaluating the quality of care for severe pregnancy complications the WHO near-miss approach for maternal health.
5. Hirshberg A, Srinivas SK *Epidemiology of maternal morbidity and mortality. Semin Perinatol.* 2017;41:1-6.
6. Kulkarni R, Chauhan S, Fidvi J, Nayak A, Humane A, Mayekar R, Begum S, Patil A, Mayadeo N. Incidence & factors influencing maternal near miss events in tertiary hospitals of Maharashtra, India. *Indian J Med Res.* 2023 Jan;158(1):66-74. doi: 10.4103/ijmr.ijmr_2932_21. PMID: 37602588; PMCID: PMC10550065.
7. Kulkarni R, Kshirsagar H, Begum S, Patil A, Chauhan S. Maternal near miss events in India. *Indian J Med Res.* 2021 Apr;154(4):573-582. doi: 10.4103/ijmr.IJMR_928_19. PMID: 35435342; PMCID: PMC9205009.
8. Office of the Registrar General & Census Commissioner, India. Ministry of Home Affairs, Government of India. Special bulletin on maternal mortality in India 2016- 18, sample registration system Available from: <https://censusindia.gov.in/census.Website/data/SRSMMB>.
9. Ministry of Health and Family Welfare, Government of India. Operational Guidelines for Maternal Near Miss Review. Available from: http://www.nrhmorissa.gov.in/writereaddata/Upload/Documents/Maternal_Near_Miss_Operational_Guidelines.pdf.

10. Ministry of Health and Family Welfare, Government of India. Operational Guidelines for Maternal Near Miss Review. Available from: [http://www.nrhmorissa.gov.in/writereaddata/ Upload/ Documents/Maternal_Near_Miss_Operational_Guidelines.pdf](http://www.nrhmorissa.gov.in/writereaddata/Upload/Documents/Maternal_Near_Miss_Operational_Guidelines.pdf).
11. Sangeeta G. Leena W. Taru G, Sushma K, Nupur G, Amrita P. Evaluation of severe maternal outcomes to assess quality of maternal health care at a tertiary center. *J ObstetGynaecol India* 2015; 65: 23-7.
12. Patankar A, Uikey P, Rawlani N. Severe acute maternal morbidity (near miss) in a tertiary care center in Maharashtra: A prospective study. *Int J Sci Stud* 2016; 4: 134-40.
13. Kamal S. Roy P. Singh S. Minz J. A study of maternal near miss cases at tertiary medical college of Jharkhand India. *Int J Reprod Contracept ObstetGynecol* 2017; 6:2375-80
14. Sangeeta G, Leena W. Taru G, Sushma K, Nupur G, Amrita P. Evaluation of severe maternal outcomes to assess quality of maternal health care at a tertiary center. *J Obstet Gynaecol India* 2015; 65: 23-7.
15. Patankar A, Uikey P, Rawlani N. Severe acute maternal morbidity (near miss) in a tertiary care center in Maharashtra: A prospective study. *Int J Sci Stud* 2016; 4: 134-40.