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Original Research Article

Maternal Near Miss: An Analysis of Severe Maternal Morbidity and Its Determinants in a Tertiary Care Hospital

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Abstract:

Background and Objectives: Maternal near miss cases more often as compared to maternal deaths and have similar pathways which can provide valuable information about maternal mortality and hence these cases need to be reviewed which can indirectly play a major role in reducing maternal mortality ratio in India. This study was aimed to analyze the incidence, causes, and determinants of maternal near miss events in a tertiary care hospital.

Material and Methods: A retrospective analysis of health records of maternal near miss cases admitted to department of obst & gyne in tertiary care hospital from May 2024 to October 2024 was done. Patient characteristics like age, parity, gestational age, risk factors, mode of delivery, lifesaving intervention were studied.

Results: Total 2784 cases were admitted in obstetrics department for deliveries, out of them 284 maternal near miss cases from which 48 were maternal mortality The maternal near miss incidence ratio was 10.20/1000 live birth and maternal near miss to mortality ratio 5.92:1. Hypertension and PPH with severe anemia was the major cause of MNM. Women with multiparity, lack of awareness are at increased risk of near miss cases.

Conclusion: Hypertensive disorders in pregnancy and obstetric hemorrhage are leading cause for pregnancy specific obstetric disorder and anemia was found to be a leading cause for pre-existing condition aggravated during pregnancy. Improving timely access to quality antenatal care among pregnant mothers with quality critical care management can reduce maternal near miss cases.

Keywords: Maternal near miss, maternal death, Pregnancy-related complications, Pregnancy, Obstetric Hemorrhage, SMO.

Introduction

Maternal mortality is considered a key indicator of health services that offers by a government. It is often referred to as "just the tip of the iceberg," suggesting that there is a big base to the iceberg in the form of maternal illness, or maternal near misses, which have not received much attention. Around 99 percent of maternal deaths (MDs) worldwide occurred in underdeveloped nations during 2015[1]. MNM is gaining more importance as maternal mortality ratio (MMR) for 2014-2016 in India is reduced to 130/100,000 live births (LB)[2].

Due to variations in the criteria used to define maternal near misses and the diverse circumstances, there were significant disparities in the incidence of maternal near misses between nations. "A woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy" is the definition of a maternal near miss case given by the World Health Organization (WHO) in 2009 [3]. Women who escape life-threatening diseases, such as organ malfunction, are regarded as near-miss situations and every pregnant women have possibility to face this life threatening condition. Maternal near-miss incidents and maternal deaths that occur during pregnancy, labor, and postpartum are referred to as severe maternal outcomes, or SMOs [4]. Despite therapeutic advances in medical science and a growing perception of the safety of childbirth; morbidity and mortality continue to occur in obstetrics especially in the developing countries like India [5].

To identify remote and immediate factors that are associated with maternal morbidities and mortalities, it is very essential to know the factors that causes maternal near miss. As survivors of severe complications related to pregnancy share many characteristics with maternal deaths and can directly inform on barriers that have to be overcome after the onset of an acute complication [6]. Corrective actions for identified problems can be taken to reduce mortality and long term morbidity [7].

In Sustainable Development Goals (SDG), improving maternal health remains an important issue, which was planned to reduce the global Maternal Mortality Ratio (MMR) to less than 70 per 100,000 live births by the year 2030 [8]. Every day, a large number of obstetric patients from remote areas visit our hospital. Many of them are in a comatose state when they are admitted to the hospital. Only few patients die but the majority of them survive. The ultimate purpose of the near-miss approach is to improve clinical practice and reduce preventable morbidity and mortality through the use of best evidence-based practices. This study aims to analyze the incidence, causes, and determinants of maternal near miss events in a tertiary care hospital.

Material and Methods

This retrospective cross-sectional study was carried out in the department of Obstetrics & Gynecology, SN Medical College, and Agra from May 2024 to October 2024.

The near miss cases were pregnant and parturient women showing the presence of any one of the markers of life threatening conditions in all the three criteria (clinical, laboratory and management based) given by WHO criteria of near miss[3].

WHO criteria for maternal near miss [3]

Dysfunctional system	Clinical criteria	Laboratory markers	Management based proxies
Cardiovascular	( ) Shock ( ) Cardiac arrest	( ) Severe hypoperfusion (lactate>5 mmol/L or >45mg/dL) ( ) Severe Acidosis (pH<7.1)	( ) Use of continuous vasoactive drugs ( ) Cardio-pulmonary resuscitation
Respiratory	( ) Acute cyanosis ( ) Gasping ( ) Severe tachypnea (Respiratory rate >40 bpm) ( ) Severe bradypnea (Respiratory rate <6 bpm)	( ) Severe hypoxemia (Oxygen saturation < 90% for ≥ 60 minutes or PaO2/FiO2<200)	( ) Intubation and ventilation not related to anaesthesia
Renal	( ) Oliguria non responsive to fluids or diuretics	( ) Severe acute azotemia (Creatinine ≥300µmol/l or ≥3.5 mg/dL)	( ) Dialysis for acute renal failure
Haematologic/ Coagulation	( ) Failure to form clots	( ) Severe acute thrombocytopenia (<50,000 platelets/ml)	( ) Massive transfusion of blood / red cells (≥ 5 units)
Hepatic	( ) Jaundice in the presence of preeclampsia	( ) Severe acute hyperbilirubinemia (Bilirubin>100 µmol/l or >6.0 mg/dL)	
Neurologic	( ) Prolonged unconsciousness (lasting >12h) ( ) Stroke ( ) Uncontrollable fit / status epilepticus ( ) Global paralysis		
Alternative severity proxy			( ) Hysterectomy following infection or haemorrhage

Woman who survives a severe life threatening condition (either after receiving emergency medical or surgical intervention or otherwise) during pregnancy, abortion, childbirth or within 42 days of pregnancy termination were selected for the study.

Inclusion Criteria

Among women with pregnancy-related complications whose diagnosis met the WHO criteria were included in the study. They were classified by WHO:

1. Disease - specific criteria- Postpartum hemorrhage, severe pre-eclampsia, sepsis, rupture uterus, severe complications of abortion.
2. Organ system - based criteria -Cardiovascular dysfunction, Respiratory dysfunction, renal dysfunction.

3. Critical Interventions- ICU care, Laparotomy including Hysterectomy, Interventional radiology, Use of blood products, dialysis.

Exclusion Criteria

- Women who were admitted for normal vaginal delivery or who did not have any of the complications mentioned in the WHO near-miss criteria.

According to WHO Near Miss identification criteria, a Maternal Near Miss case must meet at least one of the clinical symptoms, investigations, interventions, or one of the criteria, such as cardiopulmonary collapse [9].

The data collected were patient characteristics-maternal age, gestational age, parity, mode of delivery, live saving intervention, causes of severe morbidity and duration of HDU/ICU stay. Other factor which may influence on study objective such has educational status, lack of awareness, lack of transport and delay in referring were also noted. Investigations were recorded for anaemia, septicaemia, and eclampsia and for organ system dysfunction/ failure. Data was collected for determining the nature of obstetric complication, presence of organ system dysfunction and timing of near miss events with respect to admission. The descriptive analysis of the collected data was done on statistical software- SPSS version 25.0 and the results were given in percentages. The incidence of near miss cases and maternal death to near miss ratio was calculated.

Results

A total of 2784 cases were admitted in obstetrics department for deliveries, out of them 284 maternal near miss cases were found during study period. The maternal near miss incidence ratio was 10.20/1000 live birth and maternal near miss to mortality ratio 5.92:1.

Table 1: Distribution of cases by age group

Age group	No. of cases	Percentage
<20	12	4.22
20-30	66	23.24
31-35	188	66.19
>35	18	6.33
Total	284	100

Out of 284 cases of maternal near miss, 67.61% were multiparas, 55.63% belongs to rural areas and 13.73% cases were from urban slum areas, this reflecting that they were far from city or delay in reaching tertiary care centre or either no proper knowledge about antenatal care. The majority of the cases were >28-40 wks of gestational age and 67.60% of total cases delivered by LSCS. The no. of ANC visits was the major contributing in maternal near miss events. In this study 189/284(66.55%) cases were those who had fewer or no ANC visits.

Table 2: Demographic parameters of maternal near miss cases

Parameters	No. of cases	Percentage
Parity		
Primipara	92	32.39
Multipara	192	67.61
Place of residence		
Urban	87	30.63
Semiurban	39	13.73
Rural	158	55.63
Gestational age (wks)		
<12	27	9.51
12-28	38	13.38
>28-40	198	69.72
Postpartum	21	7.39
Mode of delivery		
Vaginal	84	29.58
LSCS	192	67.60
Abortion	8	2.82
No. of ANC visits		
<4	189	66.55
>4	95	33.45

In this study most of the cases (85.91%) were not having any comborbidity, while heart disease in 12(4.22%) cases and renal disease and respiratory disease in 3.87% and 2.82% cases respectively. In 9 (3.17%) cases was associated with other combordity like DM, thyroid disorders.

Table 3: Comorbidity in cases of maternal near is cases

Comorbidities	No. of cases	Percentage
Heart disease	12	4.22
Respiratory disease	8	2.82
Renal disease	11	3.87
Others	9	3.17
No underlying disease	244	85.91
Total	284	100

Modifiable factors that are contributed to maternal near miss in this study in the form of Women with lack of knowledge (69.01%) contributed to majority of maternal near miss followed by late referral and lack of transport 19.72% and 11.27% respectively.

Table 4: Factors contributing to maternal near miss

Factors	No. of cases	Percentage
Lack of transport	32	11.27
Lack of knowledge	196	69.01
Late referral (delay)	56	19.72
Total	284	100

In this study the cases of PIH/eclampsia (48.59%) were the most common cause for maternal near miss followed by ectopic pregnancy (16.90%). PPH with severe anemia (13.03%), deranged LFT (10.92%) and ICU admission (9.15%) were main cause for maternal near miss events. Sepsis, deranged KFT and hysterectomy cases were 3.52%, 1.76% and 4.93% respectively. Out of 284 cases, 48 (16.90%) cases underwent death and could not be saved.

Table 5: Causes of maternal near miss cases

Causes	No. of cases	Percentage
PIH / Preeclampsia	138	48.59
PPH with severe anemia	37	13.03
Sepsis	10	3.52
ICU	26	9.15
Deranged LFT	31	10.92
Deranged KFT	5	1.76
Ectopic pregnancy	48	16.90
Hysterectomy/ uterine rupture	14	4.93
Death	48	16.90

Discussion

This study investigated maternal near miss (MNM) events and their determinants in a tertiary care hospital. Near miss cases generally occur 6-10 times more frequently than maternal death and therefore a more reliable quantitative analysis which can provide more comprehensive profile of health system functioning.

Different studies from India and other developing and developed countries have reported prevalence of near miss of 14.1%, 10.1 % and 8.2 % respectively [4]. The incidence of maternal near miss in our study was 10.20/1000 which is below to the study by Sunanda N in 2023 who reported incidence ratio of 18.76/1000 live birth[10].

According to our study 66.19% risk of near miss were 31-35 yrs which is comparable to the study by Sunanda N 2023[10] in which maximum (48.10%) maternal near miss events occurs in 25-35 yrs of age group cases. A study by Teshome HN et al (2022) also showed 61.30% MNM cases of 25-34 yrs of age group [11].

This study reported 67.61% were multiparas which is correlates to the study by Sunanda N, 2023 [10] and Teshome HN et al, 2022[11] who reported 55.4% and 90.9% mutiparas respectively in their study. Increased parity in our study group were observed to have more complication which are comparable to Koski-Rahikkala et al study [12]. Majority of the cases (55.63%) belongs to rural areas and 13.73% cases were semi urban (slum) areas and the results also aligns with Sunanda N, 2023[10] and Teshome HN et al, 2022[11].

The no. of ANC visits was the major contributing in maternal near miss events. In this study

189/284(66.55%) cases were those who had fewer ANC visits i.e. <4 times. This is because during ANC visits an opportunity for early detection, monitoring, and management of potential risks during pregnancy. Women mostly from rural areas didn't ANC visits because either they were far from city or either no proper knowledge about antenatal care. Lack of knowledge was the main factor for contributing MNM in this study as 69.01% of total cases which is similar to the study by Sunanda N in 2023[10].

One possible explanation is that complicated cases are more likely to be referred, and lack of transportation or a long distance to travel to referral facilities (second delay), delayed referrals, and a lack of early detection of potentially life-threatening complications all contributing factors to maternal near-miss events.

In our study, PIH/eclampsia (48.59%) was the leading cause of maternal near misses, followed by ectopic pregnancy (16.90%). PPH with severe anemia (13.03%), altered LFT (10.92%), and ICU admission (9.15%) were the primary causes of maternal near miss events. The study reported cases of sepsis, altered KFT, and hysterectomy at 3.52%, 1.76%, and 4.93%, respectively. In study by Sunanda N reported most common cause for maternal near miss was hypertension and associated complications (33%), followed by obstetric hemorrhage (26.3%), anemia (10.3%), heart disorders (7.3%), and sepsis (6.9%)[10].

According to Gupta D et al. (2018), the leading causes of potentially life-threatening conditions and near misses were hemorrhage (40.5%), preeclampsia/eclampsia (24.3%), sepsis (13.5%), severe anemia (8.10%), ruptured uterus (6.75%), malaria (4.05%), hepatisis (1.35%), and shock due to diarrhea (1.35%) [13]. Our study results also aligns with Brazilian study which shows preeclampsia was the leading cause [14].

Our study results also supported by study of Vandana et al [15] and Souza et al [16] which showed preeclampsia as the major determinant of near miss. [14,18] In study by Roopa et al[17] found that sepsis was the major cause.

Morbidity is primarily caused by a lack of awareness and a delay in referral by peripheral centers. Maternal morbidities in our study could have been caused by delayed diagnosis, inappropriate transfer, or inadequate utilization of resources. Along with improved awareness of one's own health, health education has the potential to significantly improve the quality of obstetric treatment.

Conclusion

Hypertension and its complication and obstetric haemorrhage are the pregnancy specific leading causes and anemia is the pre-existing condition that aggravated during pregnancy for maternal near miss cases. Maternal morbidity and death can be decreased through early detection of near-miss incidents using WHO criteria, careful observation, health education, early referral, and prompt multidisciplinary intervention. We recommend a longitudinal multicentre study to generate a more stable and more comprehensive national illustration of the maternal near miss.

1a National Institution for Transforming India, Government of India Niti Aayog Available from: http://niti.gov.in/content/maternal-mortality-ratio-mmr-100000-live-births accessed on November 25, 2024

References

1. Maternal Health. World Health Organization; 2011. Available from: http//www.who.int/ reproductivehealth%0Ahttp://apps.who.int/iris/ bitstream/10665/44692/1/9789241502221_eng.pdf. [Last accessed on 2024 Nov 15].
2. National Institution for Transforming India, Government of India Niti Aayog Available from:http://niti.gov.in/content/maternal-mortality-ratio-mmr-100000-live-births accessed d on November 25, 2024
3. Report on the World Health Organization Working Group on the classification of Maternal Deaths and Severe Maternal Morbidities. Geneva: World Health Organization, 2009
4. Chhabra P. Maternal Near Miss: An Indicator for Maternal Health and Maternal Care. Indian J Community Med. 2014; 39(3): 132-7.
5. Souza JP, Cecatti JG, Parpinelli MA, Serruya SJ, Amaral E. Appropriate criteria for identification of near-miss maternal morbidity in tertiary care facilities: a cross sectional study. BMC Pregnancy and Childbirth. 2007; 7(20): 1-8.
6. Lotufo FA, Parpinelli MA, Haddad SM, Surita FG, Cecatti JG. Applying the new concept of maternal near-miss in an intensive care unit. Clinics (Sao Paulo). 2012; 67(3):225-30.
7. World Health Organization. Evaluating the quality of care for severe pregnancy complications -The WHO near- miss approach for maternal health. Geneva: World Health Organization; 2011.
8. Department Department of Economic and Social Affairs, United Nations. Transforming our world: The 2030 agenda for sustainable development. New York, NY: UN. (2015).
9. Bharati panda, Smita Kumari Panda, Durga Madhab Satapathy, Rudra Prasanna Mishra. Maternal near miss-an indicator of maternal health in a tertiary care hospital of odisha.jemds.2018:7(2):1443-1446.
10. Sunanda N, Sudha R, Impana M. Analysis of maternal near miss cases in a tertiary care hos-

pital. Int J Reprod Contracept Obstet Gynecol 2023; 12:1248-52.
11. Teshome HN, Ayele ET, Hailemeskel S, Yimer O, Mulu GB, Tadese M. Determinants of maternal near-miss among women admitted to public hospitals in North Shewa Zone, Ethiopia: A case-control study. Frontiers in Public Health. 2022 Aug 25; 10:996885.
12. Koski-Rahikkala H, Pouta A, Pietiläinen K, Hartikainen AL. Does parity affect mortality among parous women? J Epidemiol Community Health. 2006; 60(11):968-73.
13. Gupta D, Nandi A, Noor N, Joshi T, Bhargava M. Incidence of maternal near miss and mortality cases in central India tertiary care centre and evaluation of various causes. The New Indian Journal of OBGYN. 2018; 4(2): 112-6.
14. Pattinson RC, Hall M. Near misses: a useful adjunct to maternal death enquiries. Br Med Bull. 2003; 67: 231-43.
15. Vandana, Krishnaswamy P. A prospective study of severe acute maternal morbidity and maternal near miss in a tertiary care hospital. J Obstet Gynecol India. 2022; 72(1):19-25.
16. Souza JP, Cecatti JG, Parpinelli MA, Serruya SJ, Amaral E. Appropriate criteria for identification of near-miss maternal morbidity in tertiary care facilities: a cross sectional study. BMC Pregnancy Childbirth. 2007; 7(1):1-8.
17. Ps R, Verma S, Rai L, Kumar P, Pai MV, Shetty J. "Near miss" obstetric events and maternal deaths in a tertiary care hospital: an audit. J Pregnancy. 2013; 2013:393758.