

Determinants of Maternal Near Miss at a Tertiary Care Hospital in Ahmedabad, Western India

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Abstract

Background: The aim is to study the various demographic characters, etiologies and outcomes of Maternal Near Miss (MNM) in antenatal and postnatal women coming to a Tertiary Care Hospital in Ahmedabad, Gujarat (Western India). **Material and Methods:** This is a retrospective observational study conducted between June 2021 and July 2022 at SVPIMSR, Ahmedabad. 78 pregnant women based on WHO near-miss criteria were included. Details were recorded by studying the case sheets of the patients and asking relevant focused questions to the patients themselves or their relatives regarding the patient's condition at the time of admission. Detailed history, clinical examination, treatment given, causes of referral in case the patient was referred from outside were noted. **Results:** In this study, Obstetric Haemorrhage (69.2%) and hypertensive disorders of pregnancy (30.7%) were the leading causes of MNM cases. Majority of the women (56.4%) belonged to the age group of 18-25 years, were multiparous (83.3%). 74.4% cases were emergency cases and 66.7% were referred cases. The maternal near-miss to maternal death ratio in our study is 8.9:1. 66.5% cases were referred due to various causes like lack of HDU facility, blood and blood products, NICU facilities etc from the peripheral centres. 18 near-miss cases (23.1%) were identified to have a delay; maximum was level 1 delay (12.8%). 31.5% of MNM cases required blood and blood product transfusion. 25% were admitted to the intensive care unit. **Conclusion:** Timely recognition, prompt treatment of MNM cases with availability of essential services like blood banks and obstetric ICUs at the primary level of treatment can help in preventing adverse outcomes. Reviewing near miss cases gives significant information about the three delays in health seeking so that appropriate action is taken. Delay in referral to tertiary care centres can be avoided by proper education to identify warning signs and symptoms and training to give primary treatment amongst primary care doctors.

Keywords: - Maternal Near Miss (MNM), Pregnancy, Obstetric Haemorrhage, Hypertensive disorder of pregnancy, Tertiary care

Introduction

Maternal morbidity and mortality still have an enormous impact on the lives of Indian women and their new-born. In health care literature "Near Miss" refers to a severe life-threatening condition that failed to cause death but had the potential to do so.

According to WHO, Maternal Near Miss case is defined as a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of

pregnancy¹. In a systematic review by Tuncalp using disease-specific criteria, near-miss rates are reported to be between 0.6% and 14.98%².

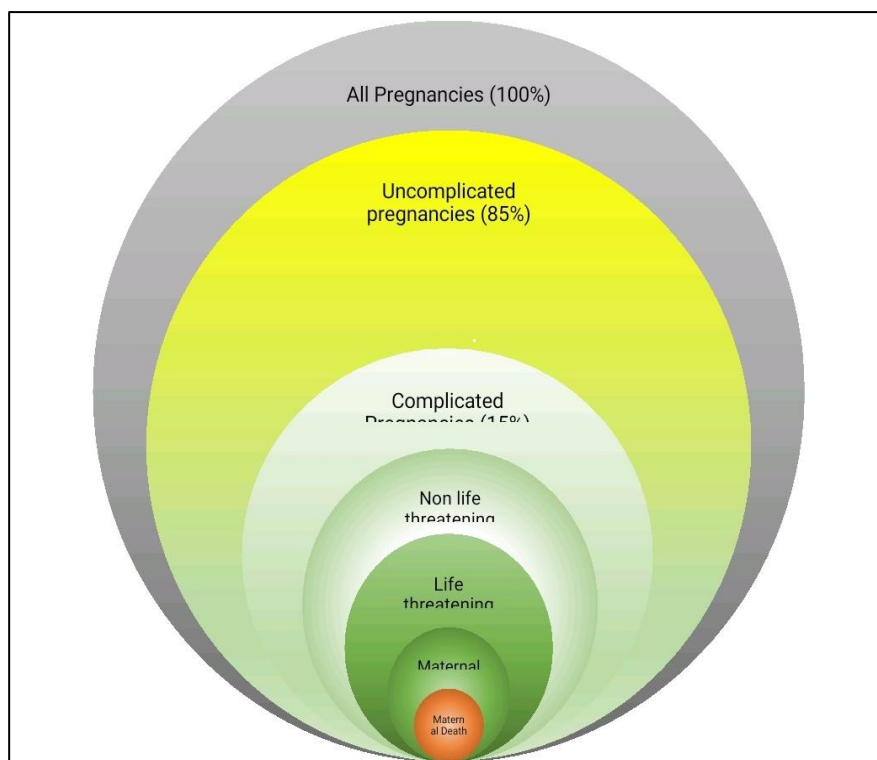
Improving maternal health is one of the eight Millennium Development Goals (MDG) adopted at the 2000 Millennium Summit. The two targets for assessing progress in improving maternal health (MDG5) are reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015, and achieving universal access to reproductive health by 2015³. Since 1990, though maternal deaths world-wide have dropped by 47%, the number of maternal deaths in developing countries remains high. The MMR in 2008 was highest in developing regions (290) in stark contrast to developed regions (14) and countries of the Commonwealth of Independent States³. Despite a significant decline in the number of maternal deaths, the rate of decline is less than half of what is needed to achieve the MDG target. Maternal mortality rate in India has declined from 301 in 2001-2003 to 113 per 100000 live births in 2016-2017 and 97 per 100000 live births in 2018-2020^{4,5}. The investigation of near-miss provides knowledge about illness burden and indicates the quality of care in mothers. Maternal near-miss cases have similar causes as maternal deaths. So, study of near miss cases can even broaden understanding of factors that contribute to both maternal morbidity and mortality and bring forth various necessary action plans which may be taken at the community, district or state level for a reduction in maternal morbidity and mortality and eliminate programme gaps.

In 2011, WHO came up with clinical, laboratory and management-based criteria for the identification of these cases¹. The WHO criteria for identifying maternal near-miss cases are based on dysfunction or failure of any vital organ (circulatory, respiratory, cardiac, renal, hepatic, central nervous, metabolic and haematological dysfunctions) and the ensuing complications.

- Clinical
 1. Loss of consciousness
 2. Shock
 3. Clotting failure
 4. Gaspings
 5. Respiratory rate < 6/min or >40/min
 6. Oliguria
 7. Jaundice in presence of preeclampsia
- Laboratory
 1. Oxygen saturation <90% for >60 minutes
 2. Acute thrombocytopenia (platelet count <50,000)
 3. Serum bilirubin >6 mg/dl
 4. Serum creatinine >3.5mg/dl
 5. pH <7.1
- Management
 1. Massive blood transfusion (> 5 units)
 2. Intubation or ventilation not related to anaesthesia
 3. Use of cardiotoxic/ vasopressor drugs
 4. Dialysis in case of renal failure
 5. Hysterectomy following infection or haemorrhage
 6. Cardiopulmonary Resuscitation

Aims

To study the incidence, various demographic characteristics, etiological factors and outcomes of Maternal Near Miss (MNM) in pregnant women coming to a Tertiary Care Hospital in Ahmedabad, Gujarat (Western India) and also to identify levels of delay in seeking timely medical care and to suggest recommendations to decrease maternal morbidity and mortality.



Material and Methods

This is a retrospective observational study conducted after receiving approval from institutional review board and ethics committee in the Department of Obstetrics and Gynaecology, at Sardar Vallabhbhai Patel Institute of Medical Sciences and research (SVPIMSR) in Ahmedabad, Western India between June 2021 to July 2022.

According to the WHO near-miss criteria¹, 78 women were included in the study. Details were recorded by studying the case sheets of the patients and asking relevant focused questions to the patients themselves or their relatives regarding the patient's condition at the time of admission to the hospital. Detailed history, demographic characters, clinical examination, treatment given, causes of referral in case the patient was referred from outside were noted. The number of maternal deaths during the same period was noted. Comparing the maternal deaths with near-miss would give the ratio of deaths to near-miss indicating the efficiency of the health system.

INCLUSION CRITERIA: We included all antenatal and postnatal women with maternal near miss criteria defined by WHO¹.

EXCLUSION CRITERIA: Women that developed the above conditions unrelated to pregnancy

STATISTICAL ANALYSIS: Data was collected and entered in Microsoft Excel sheet version 2019, tabulated and analysis was done. Various indicators of maternal health at our institution were calculated and compared with other studies.

Results

This is a retrospective observational study done at the Department of Obstetrics and Gynaecology, in a tertiary care teaching hospital, between June 2021 to July 2022. During the study period a total of 10260 obstetric patients were admitted, out of which 78 patients were maternal near-miss cases.

The majority of the patients in the present study were between 18-25 (56.4%) years. This corresponds to the peak reproductive age group. In our study, 83.3% patients were multipara, 14.4% were nulliparous and grand multipara were 2.6%. Increasing parity is associated with an increasing prevalence of pregnancy-related complications further compounded by ignorance on the part of the patient and family members.

In the present study, 85.9% of cases were antepartum, 6.4% cases postpartum, 6.4% were ectopic, 1.3% were rupture uterus cases. In Purandare et al (Grant medical college '2013) the antepartum cases were 70.5%, postpartum were 21.4% and postabortal were 8.1%⁶. Majority (74.4%) of MNM

cases were emergencies. A higher number of emergency cases reflect the non-acceptance of available antenatal care.

Table 1: Demographic characters of near-miss cases in the present study

Parameters		MNM Frequency	MNM (%)
Age	18-25 yrs	44	56.4
	26-30 yrs	22	28.2
	>30 yrs	12	15.4
Parity	1	11	14.1
	2-4	65	83.3
	>4	2	2.6
Residence	Rural	30	38.5
	Urban	48	61.5
Referral Status	Referred	52	66.7
Period of Gestation	Antepartum	67	85.9
	Postpartum (Includes Septic Abortion)	5	6.4
	Ectopic	5	6.4
	Rupture Uterus	1	1.3
Antenatal Care Status	Emergency	58	74.4
	Booked	20	25.6

48 patients (61.5%) belonged to urban areas. Out of these 48, 29(60%) were emergency cases. Despite the widespread availability of health care facilities, unawareness, ignorance and delay in seeking obstetric care among our population make them more susceptible to near-miss events.

Table 2: Indicators proposed by WHO to describe maternal events

Indicators	Present Study	Parmar Et Al 2016 ⁹	ShravyaTallapureddy 2017 ⁷	Ruchita Dadhich 2018 ⁸
Total number of deliveries (during study period)	10260	3900	3784	6028
Absolute number of near-miss cases	78	32	32	164
Maternal near-miss ratio/1000 live births (MNMIR)	7.6	8.2	8.46	28.7
Ratio of maternal near-miss to maternal death (MNM/MD)	8.9:1	5.3:1	5.34:1	1.46:1
Maternal deaths	9	6	6	111

A total of 10260 deliveries were conducted at our hospital and 78 patients were identified as near miss cases during the study period.

Maternal near-miss incidence ratio (MNMIR) was 7.6/1000 live births in the present study, while in the study conducted by Parmar et al⁹ (Gujarat,2016) MNMIR was 8.2. Another study in Andhra Pradesh⁷ shows MNMIR OF 8.46 while Madhya Pradesh⁸ shows MNMIR of 28.7. This indicates good health care penetration in Gujarat compared to other states and wider acceptance of existing health care facilities by the population.

The maternal near-miss to maternal death ratio in our study is 8.9:1, which means for every 8-9 life-threatening conditions there was one maternal death, while in the study in Madhya Pradesh⁹ in 2018, MNM/MD was 1.46:1, which means for every 1-2 life-threatening conditions, there was 1 maternal death. A higher ratio indicates better care.

Table 3: Obstetric causes leading to near-miss

Cause	Number	Khushpreet Kaur et al 2017 ¹⁰
Obstetric Haemorrhage	54 (69.2%)	40(42.69%)
APH	34	18(18.75%)
PPH	14	14(15.62%)
Ectopic Pregnancy	5	5(5.2%)
Rupture Uterus	1	4(4.0%)
Hypertensive Disorder of Pregnancy	24 (30.7%)	20(21%)
Severe Pre-Eclampsia	10	12(12%)
Eclampsia	14	8(8.3%)
Sepsis	4 (5.1%)	10(10.4%)
Medical Causes	12 (15.4%)	9(9.4%)
Severe Pneumonia (Covid-19)	4 (5.1%)	-

In this study, after identifying cases of MNM according to WHO criteria, we evaluated the obstetric complications leading to MNM in each case. In many patients more than one underlying condition was present.

Obstetric Haemorrhage (69.2%) was the commonest presenting condition. Second most common presenting condition in near miss cases was hypertensive disorder of pregnancy (30.7%). Sepsis (5.1%) and Medical causes (15.4%) were other causes. 4 maternal near-miss cases suffered covid-19 infection associated pneumonia at the time of admission. These were similar to a study done by Dr.Khushpreet Kaur at the Government Medical College, Patiala, Punjab in 2017¹⁰.

Table 4: Obstetrical outcome of near-miss cases

OBSTETRICAL OUTCOME	CASE
Normal Vaginal Delivery	15 (19.2%)
Caesarean Section	53 (67.9%)
D&E	1 (1.3%)
Vbac	1 (1.3%)
Obstetric Hysterectomy	6 (7.6%)

In the present study, Caesarean section was done in 67.9%, normal delivery in 19.2%. In 6 cases, Obstetric hysterectomies were carried out.

Reena RP et al in their study showed major surgical interventions were required in 75% of women¹¹. In our study, a level 1 delay was found in 12.8% of cases, which is due to ignorance and lack of awareness among the patient and family, inability to recognize danger signs for obstetric complications, thus not seeking healthcare facility in time, adding to the maternal morbidity. A level 2 delay was found in 6.4%, which is due to late referral, delay in reaching proper healthcare facility, improper diagnosis and management at the periphery hospitals, or lack of transportation services. This can be reduced if adequate medical facilities are available at primary and secondary health care level. This information had been obtained by asking questions to patients and their relatives and hence some degree of error is likely, further emphasizing the need for in-depth study in this matter. One striking feature noted is that earlier, lack of availability of transportation facilities was an important cause of delay, however now this has been curtailed quite a lot as emergency and ambulance services are readily available.

Table 5: Distribution of various causes of referral

CAUSE OF REFERRAL	N (%)
Non-Availability of Doctor	2 (2.6%)
Non-Availability of Operation Theatre	3 (3.8%)
Non-Availability of Blood products	8 (10.2%)
Non-Availability of NICU	11 (14.1%)
Non-Availability of essential facilities (HDU Equipment, super-speciality etc.)	28 (35.8%)
LEVEL OF DELAY	
Level 1 (delay in the decision to seek care by patient or family)	10 (12.8%)
Level 2(delay inreaching healthcare facility)	5 (6.4%)
Level 3 (delay in receiving adequate and appropriate treatment after reaching the health care centre)	3 (3.8%)

Discussion

Maternal mortality is the tip of the iceberg and there is an outsized base of the severe maternal morbidity, which is frequently ignored or unnoticed. By studying maternal morbidity, we can identify and fill the gaps in the health system. A near miss case if not treated appropriately and in time, can be fatal. Maternal near-miss is just one step away from maternal mortality, any information about the event will prove beneficial in preventing it¹².

The near-miss to mortality ratio in our study was found to be 8.9:1, while a study in Nepal shows a ratio of 7.2:1¹³, higher ratio reflects better care at our institute which was possible due to availability of multidisciplinary team comprising of anaesthetist, obstetrician and intensivist. European countries have ratios of 117-223:1, indicating far better health care¹⁴.

In our study, obstetric haemorrhage was the underlying complication in 69.2% cases, hypertensive disorder of pregnancy in 30.7%, sepsis in 5.1% and 1.2% had ruptured uterus.

Roopa et al also showed among the causes of near-miss events, obstetrical haemorrhage was the leading cause with 44.2%, and hypertension was 23.6%¹⁵.

In our study, 67.9% patients were delivered by Caesarean section while 19.2% were delivered vaginally. Caesarean section has higher maternal morbidity and mortality in terms of increasing incidence of Placenta Accreta Spectrum (PAS) disorders, scar site pregnancy, haemorrhage and peripartum hysterectomy, which contributes significantly to maternal near miss events. Hence our prime concern is to decrease primary Caesarean section rates and Robson Ten Group classification of Caesarean section can help to optimize the CS rates, thus eventually helping to reduce maternal near miss cases.

In this study, 35.8% of cases were referred from peripheral hospitals, due to non-availability of HDU facility and trained medical and paramedical staff. 10.2% were referred due to lack of blood and blood products. Distribution of iron and folic acid tablets, regular antenatal check-up for evaluation of anemia and timely treatment will help to improve the overall health status of women and help reduce the morbidity and mortality associated with haemorrhagic complications. Blood bank facilities should be available at primary and secondary health care facilities. In this study, 31.5% required blood and blood product transfusion. 25% were admitted to the intensive care unit.

14.1% were referred due to non-availability of neonatal care services, 3.8% were referred due to non-availability of operation theatre, and 2.6% referred due to non-availability of a doctor.

A total of 18 near-miss cases (23.1%) were identified to have a delay.

Delay in the decision to seek care (Delay 1) occurred in 12.8% of women. Educational backwardness, ignorance of pregnancy itself, lack of regular antenatal care, and failure to pay heed to warning signals may be the contributing factors. Educating the public about various health programmes offered by the government can encourage more women to receive regular obstetric care and decrease the first level of delay.

Delay in accessing adequate care (Delay 2) was identified in 6.4% of women. This included lack of adequate transport facilities, delayed referral from peripheral hospitals and delay in reaching a facility with comprehensive obstetric care.

There was a delay in receiving adequate and appropriate treatment after reaching the health care centre (Delay 3) in 3.8% of women. Delayed recognition of a life-threatening condition or unwarranted persistence with conservative management had contributed to this.

Peripheral hospitals see a large number of near-miss cases, so they should be well equipped, have trained medical and paramedical staff, have a well-functioning operation theatre, NICU facility and a blood bank.

Access to a good emergency obstetric care unit (EmOC) will play an important role in improving maternal outcomes. It is the term used to describe the essential elements of obstetric care to take care of complications arising during pregnancy, delivery, and the postpartum period. Tamil Nadu has been successful in declining maternal deaths due to a series of initiatives such as skilled birth attendance for all births and making emergency obstetric care units available¹⁶.

Conclusion

Developing countries like India carry the highest burden of maternal mortality and morbidity. Obstetrical haemorrhage, hypertensive disorders of pregnancy and sepsis are the leading causes of near-miss events. Anticipation, early diagnosis, prompt treatment of maternal complications and timely referral to the right centre can reduce maternal morbidity and mortality. Awareness regarding the importance of antenatal care to reduce the incidence of near-miss cases should be created. Mobile medical units should be made available to reach the periphery. Identifying preventable underlying causes leading to near miss cases like correction of anemia, optimizing rates of Caesarean Sections, organizing blood donation camps, awareness about health programmes, placement of trained staff and multidisciplinary management at peripheral hospitals can help in reducing the burden of maternal morbidity. Improved documentation, analysis and interpretation of near-miss will also lead to an improvement in maternal health care and further decline in maternal morbidity and mortality.

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