

## Maternal Near Miss Obstetrics Events and Maternal Death in a Tertiary Care Centre- a Retrospective Study.

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### Abstract

**Objective:** To determine the frequency and demographic characteristics of maternal near miss(MNM) patients. To analyse the causes of MNM events. To determine indicators of severe maternal morbidity and mortality in our hospital.

**Method:** A retrospective study was conducted in the department of obstetrics and gynaecology in Jhalawar Medical College for a period of 12 months from March 2019 to February 2020. Data was collected retrospectively from the case records.

**Study Population:** All antenatal patients and up to 42 days postpartum , who fulfill the WHO criteria, were included.

**Result:** During the study period, there were total 12,288 deliveries and 12,158 live births. 177 women with severe maternal outcome included with 131 MNM cases and 46 maternal deaths (MD). Severe maternal outcome ratio 14.56/1000 live births. MNM ratio is 10.77/1000 live births. MNM mortality ratio (MNM:MD) is 2.85. Mortality index of 0.259. Leading causes of MNM were hypertensive disease(48.1%) and hemorrhage(37.4%).

**Keywords:** MNM, WHO,

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### Introduction

Women who survive life-threatening conditions arising from complications related to pregnancy and childbirth have many common aspects with those who die of such complications. This similarity led to the development of the near-miss concept in maternal health. Exploring the similarities, the differences and the

relationship between women who died and those who survived life-threatening conditions provide a more complete assessment of quality in maternal health care.[1]

Maternal mortality is one of the important indicator used for the measurement of the maternal health. According to World

Health Organization (WHO), a maternal death is defined as death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes.[2] Maternal mortality is frequently described as “just the tip of the iceberg” indicating that there is a vast base to the iceberg in the form of MNM, i.e., maternal morbidity which has remained largely undescribed.

“Near-miss” describes a patient with an acute organ system dysfunction, which, if not treated appropriately, could result in death. WHO defined maternal near miss in 2009 as “a woman who nearly died but survived a complication during pregnancy, child birth or within 42 days after termination of pregnancy”. [2]

Near-miss cases share similar pathological and circumstantial factors as maternal deaths, with the advantages of offering a larger number of cases for analysis, greater acceptability of individuals and institutions since death did not occur, and the possibility of interviewing the woman herself.

Recently maternal near miss concept has been receiving more attention worldwide to assess severe maternal morbidity leading to death and is adopted by present health care system. Near miss audit has been considered a better approach than maternal death audit, and can be used to identify what intervention can be done to improve quality of maternal health care.

Near miss cases generally occur more frequently than maternal deaths and therefore a more reliable quantitative analysis can be carried out, which can provide a more clear profile of our functioning health system.

Identification of the obstacles and gaps in the health system and a co-ordinated approach to resolve these can ultimately lead to an improved health system.

The most vital 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.

Hence, we have undertaken this study in our institute, being a tertiary care center as study on near miss cases may provide a better understanding of quality of health care provided at our institution.

### **Aims & Objectives**

The objective of the present study is-

1. To determine the frequency of maternal near miss events
2. To know the demographic characteristics of near miss patients
3. To analyze the causes of near miss events

To determine the indicators of severe maternal morbidity and mortality in our hospital.

### **Material and Method:**

This retrospective study was conducted in the Department of Obstetrics and Gynaecology in SRG Medical College Jhalawar for a period of 12 months, from march 2019 to February 2020. This is a tertiary care institution, which serves as the referral centre for other private and govt hospitals from the nearby areas. In addition to providing emergency obstetric services the hospital also provides antenatal care and delivery services for both unreferral low and high risk pregnant women. Study population- In this study all women during pregnancy and up to 42 days post delivery, who fulfill the WHO criteria, were included. As per WHO, the near miss cases will be the 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 as shown in Table 1. The maternal deaths occurred during the study period were also reviewed. Initially we were planning to use

the WHO maternal near-miss criteria to choose cases (Table 1) but in most cases, it was impossible to meet the full WHO criteria because most of the laboratory tests used to define those events, were not performed at our hospital. So additionally, patients were also included if they had severe maternal complications at baseline or received critical interventions or intensive care unit admission according to the WHO guidelines. Data was collected and extracted retrospectively from the case records. All maternal deaths were reviewed as well. Using the provisional and final diagnosis documented in the register of the hospital, case files of women whose diagnoses met the WHO criteria was extracted. For each case, information on socio-demographic characteristics, parity, gestational age at the time of the near miss

morbidity, educational status, nature of the obstetric complication, presence of organ and/or system dysfunction was collected. Socio-demographic characteristic data, parity and gestational age was compared between the near-miss cases and maternal deaths.

- The following indices are calculated-

Maternal near miss incidence ratio per 1000 live births

Maternal near miss to mortality ratio

Mortality index – (number of maternal death/ number of maternal death+ near miss ) ×100

The difference between proportions of two groups is analyzed using chi square/fischer exact test. P value <0.05 is considered statistically significant.

**Table 1: The WHO Near Miss Criteria**

Dysfunctional system	Clinical Criteria	Laboratory markers	Management based proxies
Cardiovascular	Shock Cardiac arrest	pH <7.1 Lactate >5mEq/ml	Use of continuous vasoactive drugs Cardio-pulmonary resuscitation
Respiratory	Acute cyanosis Gaspings or Respiratory rate >40 <6bpm	Oxygen saturation <90% for ≥60 minutes  PaO <sub>2</sub> /FiO <sub>2</sub> <200mmHg	Intubation and Ventilation not related to anesthesia.
Renal	Oliguria non responsive to fluids or diuretics	Creatinine ≥300µmol/l or ≥3.5mg/dl	Dialysis for acute renal failure
Hematologic/ Coagulation	Failure to form clots	Acute severe Thrombocytopenia (<50,000platelets/ml)	Transfusion of ≥5 units of blood/ red cells
Hepatic	Jaundice in the presence of pre-eclampsia	Bilirubin >100µmol/l or >6.0 mg/dl	
Neurologic	Any loss of consciousness lasting >12h Stroke Uncontrollable fit/ status epilepticus Total paralysis		
Alternative severity proxy			Hysterectomy following infection or haemorrhage

## Results

During the study period, there were total 12,288 deliveries and 12,158 live births. In the study period 177 women with severe maternal outcome were included comprising of 131 maternal near miss (MNM) cases and 46 maternal deaths(MD). Table 2 shows the demographic and clinical characteristics of the two groups. There were no statistical differences in characteristics between the group of maternal near miss and the group of maternal deaths. 39.7% of all MNM cases

were of(n = 52) gestational age 28 weeks or more, compared to 17.4% of all MD (n = 08). Almost 26% of all women who died (n = 12) died undelivered. Most of the critical obstetric events, 41.2% MNM and 73.9% MD, occurred in postpartum period. Majority of the patients were unbooked in both MNM and MD group. Of 131 MNM cases, 67 (51.1%) women and of 46 MD cases, 28 (60.7%) women were found to be primipara or second para. 29 (22.1%) women in MNM and 05 (10.7%) women in MD group were nullipara.

**Table 2: Distribution of Cases According to Age, Parity and Gestational Age in Both Groups**

DISTRIBUTION ACCORDING TO AGE				
AGE (IN YEARS)	MNM	PERCENTAGE	MD	PERCENTAGE
18-25	73	55.72%	20	43.47%
26-30	48	37.00%	14	30.43%
31-35	08	6.10%	09	19.56%
>35	02	1.52%	03	6.52%
DISTRIBUTION ACCORDING TO PARITY				
PARITY	MNM	PERCENTAGE	MD	PERCENTAGE
P <sub>0</sub>	29	22.13%	05	10.86%
P <sub>1</sub> - P <sub>2</sub>	67	51.14%	28	60.86%
P <sub>3</sub> - P <sub>4</sub>	21	16.03%	10	21.73%
> P <sub>4</sub>	14	10.68%	03	6.52%
DISTRIBUTION ACCORDING TO GA				
GA(IN WEEKS)	MNM	PERCENTAGE	MD	PERCENTAGE
<12	17	12.97%	01	2.17%
13-28	08	6.10%	03	6.52%
>28	52	39.69%	08	17.39%
Post-natal	54	41.22%	34	73.91%

**Table 3: Study Profile**

TOTAL DELIVERIES	12288
TOTAL LIVE BIRTH	12158
TOTAL NEAR MISS CASES	131
TOTAL MATERNAL DEATH	46
NEAR MISS RATE (MNM/LB)	10.77/1000 LIVE BIRTH
MATERNAL MORTALITY RATIO(MD/LB)	378.35/100000 LIVE BIRTH
MNM: MATERNAL DEATH RATIO	2.85
MORTALITY INDEX (MD/ MNM+MD)	0.259
SEVERE MATERNAL OUTCOME	14.56/1000 LIVE BIRTH

Various severe maternal outcomes and near miss indicators are shown in Table 3. The total number of live births was 12,158. Severe maternal outcome cases are 177, of which 131 are of MNM and 46 of MD. Severe maternal outcome ratio is 14.56/1000 live births. MNM ratio is 10.77/1000 live births. MNM mortality ratio (MNM: MD) is 2.85, whereas mortality index (MI) (MI = MD/[MNM + MD]) as counted is 0.259%.

Table 4 shows the underlying causes for both groups. As far as MNM cases are concerned, 63 patients (48.1%) experienced

complications from hypertensive disease, of which 29.8% were in the form of severe preeclampsia and 14.5% were eclampsia. 5 patients were diagnosed with HELLP syndrome. Similar nature of complications was also found in cases of obstetric mortality with hypertension accounting for 22 (47.8%) cases. Among them, 13 (28.3%) cases were of severe preeclampsia, 5(10.9%) were of eclampsia and 4(8.7%) cases were of HELLP. All cases of eclampsia received magnesium sulfate. Other anticonvulsant used in 33.8% (8) cases of eclampsia.

**Table 4: Distribution of Cases According to Primary Obstetrics Event in Both Groups**

PRIMARY OBS. EVENT	MNM	PERCENTAGE	MD	PERCENTAGE
SEVERE PRE-ECLAMPSIA	39	29.77%	13	28.26%
ECLAMPSIA	19	14.50%	05	10.86%
HELLP	05	3.81%	04	8.69%
PPH	16	12.21%	08	17.39%
APH	10	7.63%	02	4.34%
RUPTURE ECTOPIC	14	10.68%	01	2.17%
RUPTURE UTERUS	06	4.58%	02	4.34%
ABORTION	03	2.29%	0	0%
PERPUERAL SEPSIS	06	4.58%	04	8.69%
CARDIAC DISEASE	02	1.52%	02	4.34%
INFECTIOUS DISEASE	03	2.29%	02	4.34%
MULTIORGAN FAILURE	07	5.34%	02	4.34%
CEREBRAL CAUSE	01	0.76%	01	2.17%

Second leading cause of MNM as well as MD was hemorrhage accounting for 37.4% of total near-miss cases and 28.7% of maternal mortality. Out of 49 cases of MNM, 12.21% were due to postpartum hemorrhage, 7.63% were due to antepartum hemorrhage, 10.68% due to rupture ectopic and 4.58% was due to rupture uterus and 2.29% due to abortion. In MD 17.39% were due to postpartum hemorrhage, 4.34% were due to antepartum hemorrhage, 4.34% were due to rupture uterus, 2.17% due to rupture ectopic. In all cases blood products were given, 11 patients required hysterectomy. All cases of ruptured ectopic underwent laparotomy.

Other causes of MNM were puerperal sepsis (4.58%), cardiac causes (1.52%), infectious diseases (2.29%) and organ system failure (5.34%). Other causes of maternal mortality were puerperal sepsis (8.69%), cardiac causes (4.34%), infectious disease (4.34%), organ system failure (4.34%) and cerebral cause (2.17%). Among infectious diseases 4 cases were of H1N1, of which 2 died and 1 case had dengue hemorrhagic shock. 100% of women that were diagnosed with puerperal sepsis received parenteral antibiotics.

### Discussion

In 2008, WHO recommended investigating near miss as a benchmark tool for monitoring maternal health care and has standardized the criteria for diagnosis. WHO criteria are unique in considering not only clinical but also laboratory and management based criteria. With the understanding of obstetric near miss, the quality of obstetric care can be accessed and where possible measures to prevent progression of complications from severe maternal morbidity to mortality instituted. This study revealed 177 cases with severe maternal outcome which included 131 maternal near miss cases and 46 maternal deaths. The incidence of near-miss is observed to be 10.77/1,000 live births and maternal mortality ratio 378 per 100000 live births. Tallapureddy et al. studied total

of 184 women with severe maternal complications while there were 32 near-miss cases and 6 maternal deaths. He observed MNM ratio to be 8.46/1000 live birth. [4] This may be because our center is in a rural area and covers most of the referral centers in these areas. A study by Bansal et al. in Bastar, Chhattisgarh, in 2016 showed a maternal near-miss incidence ratio of 11.9 /1000 live births, while another study by Jain in 2019 in Shivpuri, Madhya Pradesh, shows an MNM incidence ratio of

14.3, Mansuri et al found the ratio to be 11.49/1000 live birth, which was slightly higher than our study.[7][8][3] MNM ratio reflects an estimation of the amount of care and resources that would be needed in a facility.

The maternal mortality ratio in our study was 378/100000 live births, which is comparable to study by Mansuri et al but is slightly higher than that in the study done by Roopa *et al.* in 2013. [3][9] In the present study, MMR was found to be higher than other studies done in the country. This might be due to higher number of complicated cases being referred to the hospital from periphery as well as from the nearby state.

Mortality index was 25.99% in our study which is comparable to Mansuri et al.[4] Higher the index, more women with life-threatening conditions will die. The high mortality index in our centre is due to inadequate utilization of resources, poor antenatal care, delayed referrals, poor transport facilities and lack of skilled personnel at sub centre, PHC and CHC levels.

Near miss to mortality ratio in our study is 2.85:1 which means for every 3 life threatening conditions there was one maternal death. The ratio in our study is comparable to some studies where the ratio is in range of 2-3:1.[3][5][7].

Tallapureddy et al found it to be 5.34:1 which is similar to those of other

developing countries where the range is 5–12:1.[3][10][11] Higher ratios indicate better quality of care. If this ratio increases over a period of time, it reflects on the improvement achieved in obstetric care. So instead of a single estimation, yearly estimation may help us in improving the care provided.

This is a tertiary referral center covering adjacent districts of nearby state, with most of the cases being referred in an already moribund state. The delays in referrals are a major cause of morbidity and mortality. Establishment of a tertiary care in each district is essential. Delayed diagnosis, inappropriate transfer, and inadequate utilization of resources might have been the cause for maternal morbidities and mortalities in our study. Along with increased awareness of one's own health, health education may go a long way in improving the quality of obstetric care.

In our study, hypertension was the most common cause of near miss morbidity, accounting for a total 48.1% cases of which severe preeclampsia was most leading, followed by hemorrhage contributing 37.4% , which was similar to the study done by Mansuri et al. in Ahmadabad, Gujrat, in 2018 and Jain in 2019, whereas the study by Bansal et al. in 2016 and Roopa et al in 2013 showed hemorrhage as the most common SAMM followed by hypertensive disorders in pregnancy.[3,8,7,9]. We observed 46 cases of maternal mortality. Main leading cause was hypertension (47.8%) followed by hemorrhage (28.7%). Other causes were puerperal sepsis, cardiac causes, infectious disease, organ system failure and cerebral cause.

Tallapureddy et al. studied total of 184 women with severe maternal complications while there were 32 near-miss cases and 6 maternal deaths. Among near-miss cases, hemorrhage was the leading cause (43.7%) of morbidity, followed by hypertensive disorders (31.2%) and other causes (15.6%). Hypertensive disorders were the leading cause in both women with

potentially life-threatening conditions (66.8%) and maternal deaths (66.6%).[4] In a study by Kalra et al. 112 patients were identified as Near Miss. The most common complication of obstetrics morbidity was hemorrhage accounting for 56% cases (28.5% was due to postpartum and remaining nearly 28% was due to antepartum hemorrhage). Second leading cause was hypertension in form of eclampsia and preeclampsia accounting for 20 (17.8%) of total near-miss cases. Other complications were infections, ruptured uterus, and medical complications. Similar nature of complications was also found in cases of obstetric mortality with hemorrhage accounting for 34 (62.9%) cases, second leading cause was infections, followed by hypertension, rupture uterus and medical complications.[5]

In all these studies, hemorrhage and hypertensive disorder are the most important causes for both maternal morbidity and mortality, So to prevent mortality, we should work for early recognition and referral, if required, to improve outcomes. An increased level of care and effort are required to deal with near-miss events with high mortality index.

### Conclusion

Reviewing near-miss cases helps in identifying the pattern of severe maternal morbidity and mortality, strengths and weakness in the referral system and the clinical interventions available and the ways in which improvements can be made. Strategies need to be developed to identify life-threatening conditions early, so that such cases reach the appropriate facility in time to prevent maternal and perinatal mortality and morbidity. Delays in seeking care could be prevented if quality antenatal, essential and emergency obstetric care were made available and accessible to all. Audits of severe maternal morbidity at the district and teaching hospital should be encouraged in order to improve the quality of obstetric care and decrease the prevalence of severe maternal morbidity and mortality . Audits

of caesarean delivery indications and practices may help reduce these risks since they would identify the exact cause. Subsequent training may help to eliminate these causes.

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