

## MATERNAL NEAR MISS AS AN INDICATOR OF QUALITY OF OBSTETRIC CARE -AT TERTIARY CARE HOSPITAL OF SOUTHERN HARYANA

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### Abstract

**Background:** Maternal morbidity is an important indicator of the quality of a country's maternal health services. Reviewing Maternal near miss (MNM) cases is useful in identifying health care system failures which can indirectly play a major role in reducing maternal mortality ratio in India. The objective is to find the incidence of MNM among the admitted patients and to identify the correlation of socio-demographic and obstetrical risk factors among the Maternal Near Miss patients. **Materials and Methods:** A prospective hospital based observational study was conducted to assess the frequency of MNM as per WHO maternal near miss criteria. For each MNM case sociodemographic characteristics and nature of obstetric complications were evaluated. Data was statistically analysed for the calculation of the sociodemographic correlation, Incidence of Maternal Near Miss, Maternal Near Miss Ratio (MNM), Women with life threatening condition (WLTC), Severe maternal outcome ratio (SMOR), Maternal near miss mortality ratio (MNM:1 MD), Mortality index (MI) at our hospital. **Result:** During our study period of 1 year, there were 5979 obstetric admissions, 5673 live births, 469 MNM cases and 34 maternal deaths (MD). Incidence of Maternal Near Miss at our hospital is 7.8%, MNMR is 82, WLTC is 503, SMOR is 0.088, Maternal Near Miss Mortality Ratio is 14:1 and Mortality Index is 6.7%. Postpartum hemorrhage (67.7%) and hypertensive disorders of pregnancy (41.3%) were the leading causes of MNM. **Conclusion:** In our study the incidence of maternal near miss (7.8%) and maternal near miss ratio (82 per 1000 live birth) were high because of the lack of health care facility at our area, high illiteracy (49.7%), unbooked patients (88.6%), grandmultiparity (46.6%), post-partum hemorrhage (67.7%), severe preeclampsia (23.6%) and eclampsia (17.7%). The near miss approach will provide useful information to health care providers and policy makers about the strengths and weaknesses of the existing emergency obstetric care. This will help in the formulation and revision of obstetric policies and practices provided at the facility.

## INTRODUCTION

Maternal mortality is one of the important indicators for the measurement of maternal health.<sup>[1]</sup> Review of cases at the severe end of maternal morbidity spectrum, who nearly died during delivery, has been found to complement the assessment of maternal health services.<sup>[2,3]</sup> These cases are variably called maternal near miss (MNM).<sup>[4]</sup> In 2009, the World Health Organization (WHO) developed the Maternal Near-Miss tool to introduce a universal approach to compare the quality of maternity care between different countries and identified the risk factors.

The modifiable risk factors for Near Miss include low socio-economic status, illiteracy, inadequate antenatal care, unsupervised delivery, non-availability of blood products and poor quality of care while the non-modifiable risk factors related to near miss include age, parity, gestational age at delivery, pregnancy with a scarred uterus and any pre-existing comorbidity.<sup>[5]</sup>

Maternal Near Miss tool can contribute to monitoring the quality of health care, assessing the implementation of key interventions, informing the mechanisms of referral and strengthening all the levels of health care services.<sup>[6]</sup> All near miss should

be interpreted as free lessons and opportunities to improve the quality-of-service provision. As per NITI Aayog 2018, Nuh (Mewat) is one of the 101 aspirational districts of India.<sup>[7]</sup> This study was planned at the tertiary care teaching hospital of Nuh, to identify the Maternal Near Miss incidence, associated socio-demographic and obstetrical risk factors so that in the long run quality of health care delivery system can be improved at this area.

## MATERIALS AND METHODS

This hospital based prospective observational study was conducted over a period of 12 months from 1 June 2022 to 31 May 2023 at the Department of Obstetrics and Gynecology Shaheed Hasan Khan Mewati Government Medical College and Hospital, Nalhar, Nuh(Mewat), Haryana. All women admitted at the Department of Obstetrics and Gynecology with the life-threatening conditions during pregnancy, delivery, postpartum period till 42 days excluding accidental or incidental causes were included in the study population according to WHO near miss definition,<sup>[6]</sup> Following WHO near miss criteriae (2009) were used for the identification of MNM cases.

### 1. Severe maternal complication

Severe postpartum haemorrhage, Severe pre-eclampsia, Eclampsia, Sepsis or severe systemic infection, Ruptured uterus, Severe complication of abortion, Ruptured ectopic pregnancy

### 2. Critical intervention or ICU care

Admission to the ICU, Interventional radiology, Laparotomy including hysterectomy excluding LSCS, Use of blood products >5 units

### 3. Organ system dysfunction or failure criteria

#### A. Cardiovascular dysfunction

Shock, Cardiac arrest and cardiopulmonary resuscitation, Use of continuous vasoactive drugs, Severe hypoperfusion (lactate >5 mmol/l or >45 mg/dl), Severe acidosis (pH<7.1).

#### B. Respiratory dysfunction

Acute cyanosis, Gaspings, Respiratory rate >40 or <6, Intubation and ventilation (not related to anaesthesia), Severe hypoxemia (O<sub>2</sub> saturation <90% for ≥60 minutes or PaO<sub>2</sub>/FiO<sub>2</sub>< 200)

#### C. Renal dysfunction

Oliguria non-responsive to fluids or diuretics, Dialysis for acute renal failure, Severe acute azotemia (creatinine ≥3.5 mg/dl)

#### D. Coagulation/haematological dysfunction

Severe acute thrombocytopenia (<50 000 platelets/ml), PT or aPTT>1.5 times of normal

#### E. Hepatic dysfunction

Jaundice in the presence of pre-eclampsia, Severe acute hyperbilirubinemia (bilirubin >6.0 mg/dl).

### F. Neurological dysfunction

Prolonged unconsciousness (lasting ≥12 hours), Coma (including metabolic coma), Stroke, Uncontrollable fits/status epilepticus

For each case of MNM, demographic characteristics, gestational age at the time of morbidity, nature of obstetric complication, details about delivery/abortion, need for blood transfusion and fetal outcome were recorded. Data was entered on a Microsoft excel spreadsheet and statistically analysed for the calculation of the Incidence of Maternal Near Miss, Maternal Near Miss Ratio (MNM/R), Women with life threatening condition (WLTC), Severe maternal outcome ratio (SMOR), Maternal near miss mortality ratio (MNM:1 MD), Mortality index (MI) at our hospital.

## RESULTS

During our study period the total number of obstetric admissions were 5979. Total Number of live births were 5673, out of which there were 469 maternal near miss cases (MNM) and 34 maternal deaths (MD). Incidence of Maternal Near Miss at our hospital is 7.8%

$\frac{\text{Total number of maternal near miss} \times 100}{\text{Total population at risk during the study period}}$

$$\frac{469 \times 100}{5979} = 7.8\%$$

Maternal Near Miss Ratio (the number of maternal near miss cases per 1000 live births) at our institution is 82 ([MNM/R] = MNM/LB)x 1000= 82). Women with life threatening condition (the sum of maternal near miss and Maternal death) at our hospital is 503 (WLTC=[MNM+MD] =503). Severe maternal outcome ratio (the number of women with life threatening conditions (MNM+MD) per 1000 live births) at our hospital is 0.088 (88 life threatening conditions per 1000 live birth). It gives an estimate of the amount of care and resources that would be needed in an area or facility. Maternal near miss mortality ratio (the ratio between maternal near miss cases and maternal deaths) at our institute is 13.7:1, there is 1 maternal mortality per 13.7 maternal near miss cases. Higher maternal near miss mortality ratio indicates better care.

Mortality index (the number of maternal deaths divided by number of women with life threatening condition expressed as a percentage) at our hospital is 6.7%. Higher mortality index indicates low quality of care and lower the mortality index higher is the quality of care.

**Table 1: Age distribution of Maternal near miss cases**

Age (Years)	Number of maternal near miss cases (N = 469)	Percentage of Maternal Near Miss CASES (%)
<20yrs	94	20.0 %
20-25yrs	130	27.7%
25-30yrs	107	22.8%
30-35yrs	67	14.3%
35-40yrs	50	10.7%

>40yrs	21	4.5%
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Majority of MNM cases (50.5%) belonged to 20-30 year age group. Out of 469 MNM cases 233 (49.7%) were illiterate.

**Table 2: Parity distribution of Maternal near miss cases**

Parity Distribution	Number of maternal near miss cases(N=469)	Percentage of maternal near miss cases (%)
Primiparity	107	22.8%
Multiparity (2-4)	143	30.4%
Grand multiparity (>5)	219	46.6%

Almost half of MNM cases (46.6%) belonged to grand multipara group.

**Table 3: Booked / Unbooked Maternal near miss cases**

Booked/unbooked status	Number of maternal near miss cases (n =469)	Percentage of maternal near miss cases (%)
Booked	54	11.4%
Unbooked	405	88.6%

Majority of MNM cases (88.6%) were unbooked.

**Table 4: Life threatening causes of Maternal near miss cases**

Life threatening causes	Number of maternal near miss cases(n=469)	Percentage of maternal near miss cases(%)
Postpartum bleeding	223	47.5%
Severe preeclampsia	111	23.6%
Eclampsia	83	17.7%
Shock	63	13.5%
Antepartum Hemorrhage with Placenta Previa	60	12.7%
Antepartum Hemorrhage with Abruption Placentae	45	9.5%
Ruptured Ectopic Pregnancy	37	7.8%
Abortions (Septic & Incomplete abortions)	34	7.2%
Retained placenta	31	6.6%
Maternal Sepsis	31	6.6%
Rupture uterus	22	4.6%
GTDs	13	2.7%
Inversion of uterus	9	1.9%
DIC	6	1.3%

**Table 5: Comparison of sociodemographic characters of Maternal near miss with other studies**

Socio Demographic Characters	Our study	Begg et al <sup>[11]</sup>	Verma et al <sup>[12]</sup>	Gupta et al <sup>[13]</sup>	Vinita Singh et al <sup>[14]</sup>	Sharma et al <sup>[15]</sup>
Age	<20yrs	20.0%	-	14.5%	39.1%	9.8%
	20-35YRS	64.8%	27.7%	67.3%	48.6%	79.7%
	>35YRS	15.2%	-	18%	60.8%	10.5%
Parity	Primiparous	22.8%	48%	45.1%	39.1%	37.3%
	Multipara	30.4%	52%	44.1%	-	62.7%
	Grandmultipara	46.6%	-	-	-	14%
Booked/ unbooked status	Booked	11.4%	-	36.8%	-	15.7%
	Unbooked	88.6%	96%	63.2%	-	84.35
Educational status	Illiterate	49.7%	-	46.1%	-	-
	Primary	29.6%	-	23.1%	-	-
	Secondary	14.5%	74%	10.2%	-	-
	Graduate	6.1%	-	-	-	-

**Table 6: Comparison of the incidence of Maternal near miss (%) with other studies.**

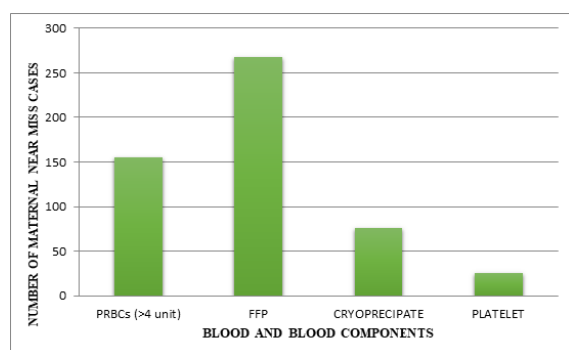
Studies	Setting	Total number of maternal near miss	Maternal Death	Total number of obstetric cases admitted	Incidence of maternal near miss in percentage
Our study	SHKM Medical College Nuh Haryana	469	34	5979	7.8%
Vinita Singh et al (2021) <sup>[14]</sup>	Tata main tertiary care hospital Jamshedpur	153	38	15377	0.99 %
Verma et al (2020) <sup>[12]</sup>	Tertiary care hospital, Etawah	144	77	8793	1.6 %
Abdel et al (2016) <sup>[16]</sup>	Women health care hospital Assiut university	342	47	17503	1.9%
Gupta et al	Medical college, Indore	74	15	4786	1.5%

(2018) <sup>[17]</sup>					
Parmar et al (2016) <sup>[18]</sup>	Tertiary care hospital Vadodara	46	18	2238	2.05%
Pandey et al (2014) <sup>[19]</sup>	Medical college Lucknow	633	247	6357	9.9%

In our study atonic postpartum hemorrhage was most common cause of maternal near miss 47.5% (223) followed by other causes like severe preclampsia (23.6%), eclampsia 17.7% (83), shock 13.5% (63), placenta previa 12.7% (60), abruption placentae 9.5% (45), ectopic 7.8% (37), abortion 7.2% (34), retained placenta 6.6% (31), maternal sepsis 6.6% (31), rupture uterus 4.6% (22), GTD 2.7% (13), inversion of uterus (9) and DIC 1.3% (6).

Out of 469 maternal near miss cases 211 delivered vaginally, 127 cases had Cesarean Section and Exploratory Laparotomy was done in 65 patients (37 patients had ectopic pregnancy with hemoperitoneum, 12 patients had Uterine Perforation, 9 patients had inversion of uterus and 7 patients were explored post-delivery for broad ligament hematoma).

Hysterectomy was done in 17 MNM cases out of which 9 patients had uncontrolled Atonic postpartum hemorrhage, 5 patients had Rupture Uterus and 3 patients had Adherent placenta.



**Figure 1: Blood and blood components received by Maternal near miss cases.**

155 near miss patients received > 4 unit of PRBCs within 24hrs, 268 were given FFP, 76 received Cryoprecipitate and 26 had Platelet transfusion.

Out of 385 maternal near miss cases 21.6% had early neonatal death.

## DISCUSSION

Millennium Development Goals introduced in 2000 year aims to reduce the Maternal Mortality Rate to 70 per 100000 live births by 2030.<sup>[8]</sup> High maternal morbidity and mortality remains a major challenge in developing countries due to the lack of financial resources, lack of skilled health care professionals, lack of health care services, low literacy rate and low socio-economic status.<sup>[9]</sup> A clinical audit of MNM cases yields useful information on pathways leading to severe morbidity and death and is

proposed to be a useful approach to investigate and monitor the quality of obstetric health care system.<sup>[10]</sup> During our study period, there were 469 MNM cases and 34 Maternal deaths out of 5979 obstetric admissions.

In our study, a significant proportion of maternal near miss cases (27.7%) were in the age group of 20-25 years, unbooked (88.6%), illiterate (49.7%) and grand multipara (46.6%) which is similar to other Indian studies.<sup>[12-15]</sup>

Maternal near miss incidence in our study (7.8%) was higher in comparison to other studies done by Vinita Singh et al (2021),<sup>[14]</sup> Verma et al (2020),<sup>[12]</sup> Abdel et al (2016),<sup>[16]</sup> Gupta et al (2018),<sup>[17]</sup> Parmar et al (2016).<sup>[18]</sup> Maternal Near Miss incidence was observed higher in our study due to the fact that our hospital is the only tertiary care center located at Nuh (Mewat) district which is ranked as one of the most backward district according to NITI Aayog 2018,<sup>[7]</sup> catering all the high-risk referrals from local, private and government hospitals (District Hospital, primary healthcare centre, community health centre) of Mewat and also the neighbouring border districts from Uttar Pradesh and Rajasthan. Moreover, majority of women in this area are unbooked, illiterate with poor health awareness and inadequate family planning practices leading to high rates of grandmultiparity. Delayed decision making at family level and poor transportation facilities further adds to the high maternal near miss incidence.

Maternal near miss ratio in our study was 82 per 1000 live birth, which is higher in comparison to other studies done by Vinita Singh et al,<sup>[14]</sup> Verma et al,<sup>[12]</sup> Mansuri et al,<sup>[20]</sup> Gupta et al,<sup>[17]</sup> Tallapueddy et al,<sup>[21]</sup> Parmar et al,<sup>[18]</sup> Ray.<sup>[22]</sup> This variation could be due to a large population with resource constraint, referral of critically ill women from periphery, poor maternal health services in rural areas, and underutilization of health care services by the masses. Obstetric delay due to low literacy, poor health seeking behavior, delayed decision at family level, and poor transportation facility perhaps adds to the high MNM and maternal deaths at our facility. This indicator gives an estimation of healthcare need and resources that would be required in an area or hospital facility. In our study maternal near miss mortality ratio (MNM:1MD) was 13.7:1 which is higher in comparison to other studies done by Vinita Singh et al,<sup>[14]</sup> Verma et al,<sup>[12]</sup> Mansuri et al,<sup>[20]</sup> Gupta et al,<sup>[17]</sup> Tallapueddy et al,<sup>[21]</sup> Parmar et al.<sup>[18]</sup> Higher maternal near miss mortality ratio indicates better care.

In our study, majority of the maternal near miss cases had vaginal delivery 44.9% followed by LSCS 26.01%, Laparotomy 13.8% and suction evacuation

10.44% which is comparable with the study done by Deepti Gupta et al.<sup>[17]</sup> and Vinta Singh et al.<sup>[14]</sup> Out of Exploratory Laparotomy group, 37 patients had ectopic pregnancy with hemoperitoneum, 12 patients had Uterine Perforation, 9 patients had Inversion of uterus and 7 patients had post-delivery broad ligament hematoma. Hysterectomy was done in 17 MNM cases out of which 9 patients had uncontrolled Atonic postpartum hemorrhage, 5 patients had Rupture Uterus and 3 patients had Adherent placenta

Post partum haemorrhage and hypertensive disorders of pregnancy were the leading causes of MNM (67.7 and 41.3 %, respectively) at our hospital which is similar to the findings of other Indian studies done by Shrestha NS et al.<sup>[23]</sup> Rathod AD et al.<sup>[24]</sup> Verma et al.<sup>[12]</sup> Sharma et al.<sup>[15]</sup> Life-threatening obstetric hemorrhage was the commonest cause of MNM but mortality due to this condition in near miss women was low due to timely management, blood and blood products transfusion. Improving resources and focussed strategies for managing PPH, APH and early pregnancy hemorrhage can further help in reducing morbidity due to this condition. Hypertensive disorder of pregnancy (HDP) was the second commonest cause of MNM but maternal death due to this condition was high due to its associated maternal complications (Eclampsia, Abruptio placentae, Acute Renal Failure, DIC). Early antenatal registration, screening, diagnosis and timely management of HDP must be made universally available to prevent maternal morbidity and mortality due to this condition.

## CONCLUSION

The WHO maternal near miss approach has been suggested for routine use in national health care programs to evaluate and improve the quality of health care provided within the health care system and implementation of this approach in health services will serve to determine the frequency of severe maternal complications, maternal near miss cases and maternal death.<sup>[6]</sup> In our study incidence of maternal near miss (7.8% ) and maternal near miss ratio (82 per 1000 live birth) were high because of the lack of health care facility at our area, high illiteracy (49.7%), lack of health awareness, unbooked patients (88.6%), grandmultiparity (46.6%), post-partum hemorrhage (47.5%), severe preeclampsia (23.6%) and eclampsia (17.7%). Our hospital is the only tertiary care center located in Nuh (Mewat) district which is ranked as one of the aspirational district of India according to NITI Aayog 2018.<sup>[7]</sup> Through this study we want to recommend that instead of performing “maternal death audit” we should be carrying out “maternal near miss audit” because it will be more helpful in identifying the obstacles and gaps in the maternal healthcare delivery system. This audit will allow us

to get a better understanding of the challenges faced by near miss patients who survived from serious illness during pregnancy. Statistical results obtained from this audit can subsequently inform our policy decision makers to improve the quality of maternal health care provided at the hospital facilities and the community.

**Limitation of the study:** This study was conducted at a single tertiary hospital, the population was restricted, hence could not give the picture of a large geographical area.

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