



PROSPECTIVE EVALUATION OF SEVERE ACUTE MATERNAL MORBIDITY: INDICATORS, PREVALENCE & ITS CONTRIBUTION TO NEAR MISS IN A TERTIARY CARE HOSPITAL

Obstetrics & Gynaecology

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ABSTRACT

Background: Maternal mortality, though a critical indicator, reflects only the most extreme outcome of obstetric complications. Maternal near miss—survival following life-threatening conditions—offers a more sensitive measure of care quality, capturing systemic gaps in timely recognition and management. As emphasized by the WHO, integrating near miss reviews with mortality audits enables a more robust evaluation of maternal health services, particularly in resource-constrained settings. **Methods:** An 18-month prospective observational study was conducted in the Department of Obstetrics and Gynaecology at a tertiary care hospital. The study included 150 NMM cases >18 years of age, admitted with life-threatening conditions during pregnancy, labor, or within 42 days postpartum. Near-miss cases were identified using WHO criteria. Detailed clinical assessments and relevant laboratory investigations were performed to determine underlying causes. Maternal outcomes were followed until discharge. Data analyzed using SPSS version 26.0. **Results:** Out of 1954 deliveries, 150 cases were identified as maternal near miss, giving an incidence of 76.77 per 1000 deliveries. The MNM to maternal death ratio was 8.3:1. Most cases were seen in women aged >30 years (37.3%) and multigravidas (76%), with 47.3% occurring at term. Obstetric haemorrhage (30.67%), particularly postpartum haemorrhage, was the leading cause, followed by hypertensive disorders (22.66%). The majority required intensive care, with 66.7% receiving blood transfusions, 16% requiring ventilatory support, and 6% undergoing hysterectomy. **Conclusions:** Obstetric haemorrhage, hypertensive disorders and infection remain the leading causes of maternal near miss. MNM analysis provides valuable insights into maternal healthcare quality. Recommendations include strict surveillance for pre-eclampsia, better postpartum hemorrhage management, improved pregnancy monitoring, and timely referrals.

KEYWORDS

Maternal Near Miss (MNM), Severe Acute Maternal Morbidity (SAMM), Maternal Mortality Ratio (MMR)

INTRODUCTION

Over the decades, there have been continuous global efforts to improve women's reproductive health. The Millennium Development Goals (MDGs) aimed to reduce the maternal mortality rate (MMR) by three-quarters and achieve universal access to reproductive health between 1990 and 2015. The Sustainable Development Goal (SDG) 3.1 now targets reducing the global MMR to less than 70 per 100,000 live births by 2030, while ensuring that no country exceeds an MMR of 140 per 100,000 [1]. India's progress towards this goal has been relatively slow. In 1990, India's MMR was 570 per 100,000 live births [2]. Since 2013, India has reduced its MMR by 26.9%, from 167 in 2011-2013 to 130 in 2014-2016, 122 in 2015-2017, and further down to 97 in 2018-2020 [3]. Globally, the MMR has also decreased by 38%, from 342 to 211 deaths per 100,000 live births between 2000 and 2020 [4]. Over the years, efforts in India have focused on developing strategies to improve women's health. The maternal mortality ratio reflects the overall health status of women in society. MMR is widely regarded as a key indicator of social, economic, and healthcare development and is used to assess maternal deaths in populations [5]. However, MMR alone is not sufficient to thoroughly evaluate the health status of pregnant women. With the decline in the absolute number of maternal deaths, MMR has become less reliable for measuring the effectiveness of healthcare systems [6]. Many women survive acute obstetric events despite being critically ill, escaping maternal mortality. Severe Acute Maternal Morbidity (SAMM), or 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 pregnancy termination" [7]. In recent years, MNM has become a widely used measure to assess the quality of obstetric care provided at healthcare facilities. The advantages of using MNM cases as a health indicator include:-Near misses are more common than maternal deaths. -Reviewing near-miss cases can provide useful insights into the same pathways that lead to severe morbidity and death. -Investigating the care received may be less threatening to healthcare providers, as the woman survived. -Survivors can be interviewed to provide firsthand accounts of the care they received. -Near misses offer valuable opportunities to improve service quality. -Maternal deaths are often just the "tip of the iceberg," as many women survive but endure lifelong disabilities [7]. Near-miss registries offer valuable data on deficiencies in healthcare systems for pregnant women, helping to identify areas needing improvement, such as

testing facilities, equipment, and personnel. They also highlight the need for better referral facilities and health awareness programs. In line with the WHO's mandate to conduct near-miss reviews in all settings and countries, India's national technical group proposed local-specific expert consensus criteria in 2014 [8]. By effectively implementing these guidelines and the WHO's near-miss concept, high-risk pregnancies can be analysed, and essential interventions planned to address obstetric emergencies and raise awareness for better outcomes. As our centre is a tertiary care facility that receives a significant number of referral cases from rural and underserved areas, we designed this study to determine the prevalence of Severe Acute Maternal Morbidity (SAMM) in an effort to develop solutions to reduce near-miss events

METHODS: Study Area-Department of Obstetrics and Gynaecology, Tertiary care centre and hospital. Study Population-Near Miss cases attending Obstetrics and Gynaecology department of our hospital. Study Design -A Prospective observational study. Sample Size Calculation: The sample size was calculated using following formulae: $n = (Z_{\alpha/2})^2 * (PQ) / E^2$ Where; n- Sample size, $Z_{\alpha/2}$ - Z value at 5% error (1.96), P - Prevalence of maternal near miss (taken as 1.7%), Q- 1-P

E - Absolute error (taken as 2%)

$$n = \frac{(1.96)^2 * (1.7 * 98.3)}{(2)^2}$$

n- 160 (approx.)

Overall cases of near miss encountered during the study period were 150 cases, so final sample size was taken as 150 cases of near miss. Study Duration-18 months

Inclusion Criteria:

- Pregnant women older than 18 years admitted with a potentially life-threatening condition in antenatal period.
- Pregnant women with a potentially life-threatening condition during labor.
- Pregnant women with a potentially life-threatening condition in puerperal period i.e., 42 days post child birth

Exclusion Criteria:

- Women less than 18 yrs of age

- Pregnant women who have suffered death.
- Pregnant women attempted of suicide or Homicide.
- Pregnant women who have suffered injuries due to external factors like RTA, natural calamities, fall, etc.
- Women who develop complications more than 42 days after termination of pregnancy are not eligible.

Methodology—A prospective observational study was carried out in a tertiary care hospital for a period of around 18 months after the approval by ethics committee. All 150 near miss events occurred during this period were studied in detail after taking written informed consent. The consent for the study was taken either on admission, when a pregnant woman is admitted with potentially life-threatening conditions or post recovery from the Near Miss event. All cases were either admitted under an Obstetric unit or referred from various specialities or super specialities to the Obstetrician. All such cases who fulfilled the inclusion criteria were taken for study.

Near miss cases was identified based on WHO near miss criteria (clinical criteria, laboratory criteria and management criteria). Detailed history and thorough clinical examination were done for each patient. Necessary laboratory investigations and radiological evaluation were done for identifying the etiology for near miss. Details of management and maternal and fetal outcome was noted for all cases. Cases were followed up till their discharge from the institution. Cases who could not survive during the stay, were excluded from the study.

Expected Study Outcomes

To identify the no. of SAMM cases in our institute and get a better understanding of the factors determining their survival. Identification of causes of maternal adverse events and finding out the gaps in the existing management system more efficiently. Better understanding of SAMM cases helps us in identifying preventable factors and appropriate preventive actions can be implemented at the resident level.

Statistical Analysis

All the data was noted down in a pre-designed study proforma. Qualitative data was represented in the form of frequency and percentage. Quantitative data was represented using Mean $\pm$ SD. Results were graphically represented where deemed necessary. SPSS Version 26.0 was used for most analysis and Microsoft Excel 2021 for graphical representation.

RESULTS

This was a prospective study conducted in a tertiary care hospital for 18 months in Department of Obstetrics and Gynaecology. A total of 150 near miss events were studied during this period after taking written valid informed consent. All these cases were either admitted in the Obstetric unit or they were referred to Obstetrician from various specialities or super specialities. All these cases were identified based on WHO near miss criteria (clinical criteria, Laboratory-based criteria and management-based criteria). They were followed till their discharge from the institute. Women who died from the complications were excluded from the study. Their various background demography, details regarding age, parity, gestational age, course in hospital, treatment given in hospital and final maternal outcome were recorded in case record form and entered in the master chart. Being an observational study, the findings were documented as they occurred, without any intervention to alter the treatment sequence or outcomes.

Table 1. Distribution of study groups as per

Variables	N
Total Deliveries	1954
Near Miss	150
Maternal Deaths	18
Incidence of Near Miss (/1000)	76.77
MnM: MR	8.3

During the 18-month study period, there were 1954 total deliveries, with 150 maternal near-miss cases and 18 maternal deaths. The incidence of maternal near miss was 76.7 per 1000 deliveries. The maternal near miss to maternal death ratio was 8.3:1.

Table 2: Showing age distribution of the patients

Age group (yrs)	N	%
≤ 20	9	6.0%
21-25	37	24.7%

26-30	48	32.0%
> 30	56	37.3%
Total	150	100.0%

Most near-miss cases occurred in women >30 years (37.3%), followed by 26–30 years (32%) and 21–25 years (24.7%), with the least in <20 years (6%). However, mortality was higher at extremes of age (<20 and >40 years), indicating poorer outcomes in these groups.

Figure 1: Pie chart showing the distribution of patients by age groups in our study

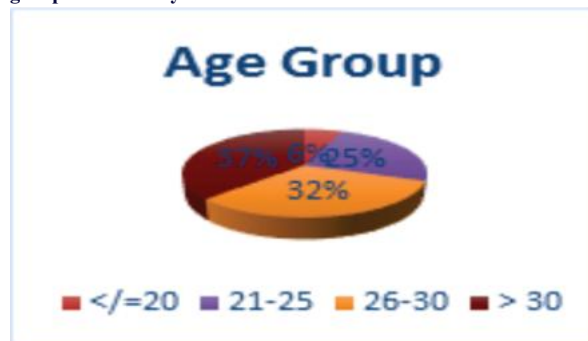


Table 3: Categorisation of Near Miss events with regard to gestational age:

Gestational age	N	%
>37 wks	71	47.33%
28-36+6wks	50	33.33%
<28 wks	29	19.33%
Total	150	100%

With regard to the gestational age (Table 3), in our study, we found most cases (47.33%) of maternal miss occurring at term.

Figure 2: Bar diagram showing distribution of Near Miss events based on Gestational age

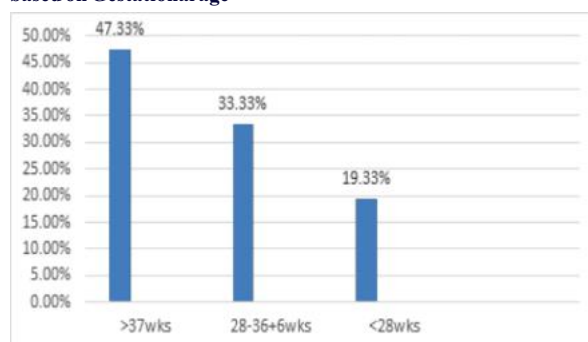


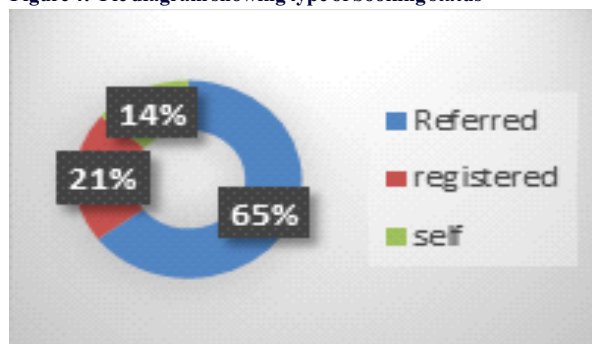
Table 4: Showing booking status of the patients with Near Miss

Registered	N	%
Yes	141	94.0%
No	9	6.0%
Total	150	100.0%

Among 150 cases, 94% were registered and 6% unregistered. Most patients (64.67%) were referred from peripheral hospitals, while 21.33% were registered cases who presented directly.

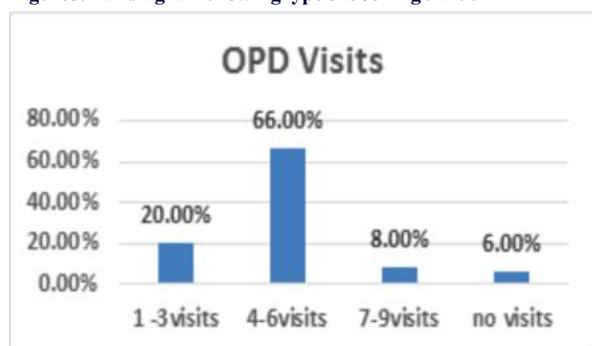
Figure 3: Bar diagram showing booking status of the patients with Near Miss



Figure 4: Pie diagram showing type of booking status**Table 5: Distribution of Cases showing number of ANC visits**

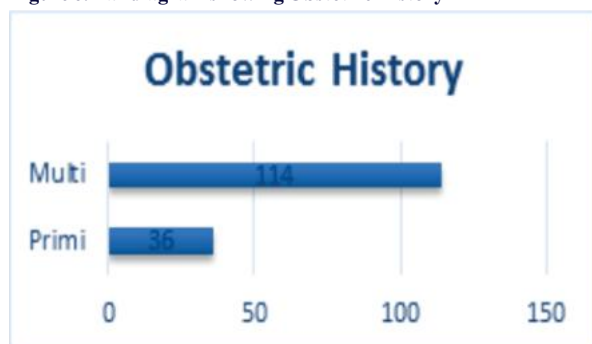
No. of OPD Visits	N	%
1 -3visits	30	20.00%
4-6visits	99	66.00%
7-9visits	12	8.00%
no visits	9	6.00%

Most cases (64.67%) were registered at peripheral hospitals and had poor follow-up. The majority (66%) had 4–6 OPD visits, while 8% had 7–9 visits and 6% had no OPD visits.

Figure 5: Bar diagram showing type of booking status**Table 6: Distribution of Cases as per Obstetric History**

Obstetric History	N	%
Primigravida	36	24.0%
Multigravida	114	76.0%
Total	150	100.0%

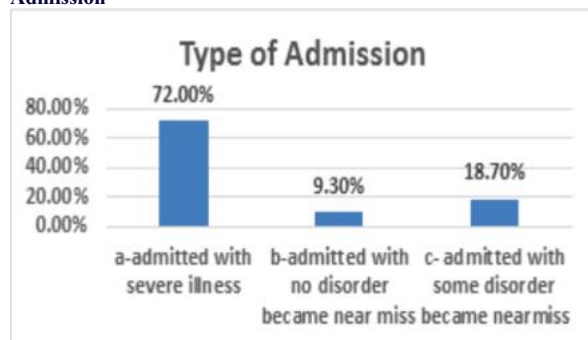
out of 150 cases, 76% were multigravida and 24% were primigravida, indicating a predominance of women with previous pregnancies.

Figure 6: Bar diagram showing Obstetric History**Table 7: Distribution of cases as per Type of Admission**

Type of admission	N	%
a-admitted with severe illness	108	72.00%
b-admitted with no disorder became Near Miss	14	9.30%
c- admitted with some disorder became NearMiss	28	18.70%

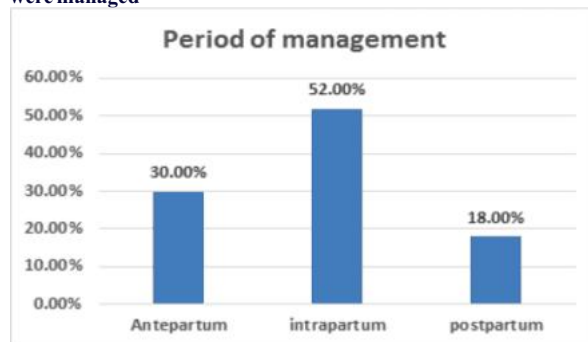
Most maternal near-miss cases (72%) were admitted with severe illness, indicating critical condition at presentation. About 18.7% had pre-existing disorders that progressed to near miss, while 9.3% developed complications after admission despite no initial disorder.

This highlights that the majority of cases were already severe on arrival, with a smaller proportion evolving during hospital stay.

Figure 7: Bar diagram showing distribution of cases as per Type of Admission**Table 8: Distribution as per the period during which cases were managed**

Managed	N	%
Antepartum	45	30.0%
Intrapartum	78	52.0%
postpartum	27	18.0%

The majority of maternal near-miss cases (52%) were managed during the intrapartum period, underscoring the critical importance of vigilant monitoring and timely intervention during labour. A significant proportion (30%) occurred in the antepartum period, indicating substantial risk prior to delivery. In contrast, 18% of cases were observed in the postpartum period, reflecting a comparatively lower incidence after delivery.

Figure 8: Bar diagram showing the period during which cases were managed**Table 9: Chief complaints reported by patients who experienced near-miss situations**

Chief Complaints	N	%
Breathlessness	26	17.3%
Pain in Abdomen	48	32.0%
Nausea/ Vomiting	7	4.7%
Bleeding PV	17	11.3%
Fever	28	18.7%
Pedal oedema	9	6.0%
Orthopnoea	4	2.7%
Leaking PV	4	2.7%
Yellowish discoloration of skin	7	4.7%
Cough	7	4.7%
Cold	2	1.3%
Weakness	9	6.0%
Burning Micturition	1	0.7%

Most high-risk patients with pre-existing conditions were referred during labour, with the majority of near-miss events occurring intrapartum (52%) or in the immediate postpartum period. Most patients presented with labour pains at admission. The most common presenting complaints were abdominal pain (32%) and breathlessness (17.3%), followed by fever (18.7%) and bleeding per vaginum (11.3%). Other symptoms such as nausea/vomiting, pedal edema, and weakness were less frequent but clinically relevant.

Figure 9: Bar diagram showing chief complaints reported by near miss patients:

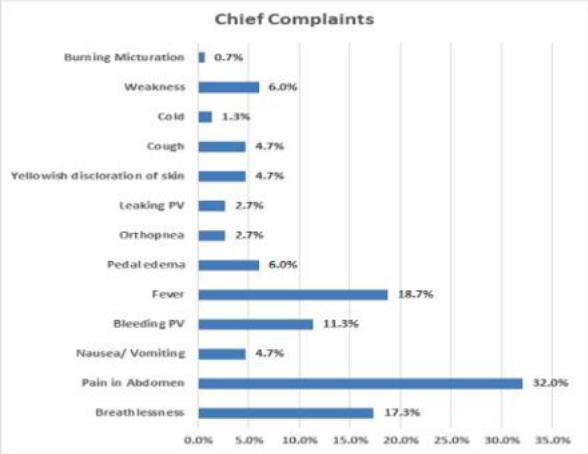
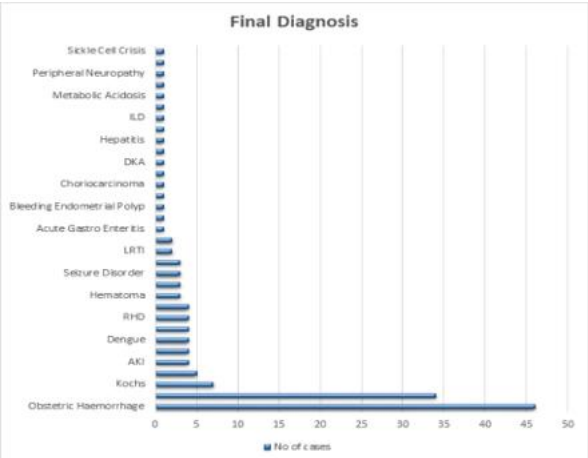


Table 10: Distribution of Cases as per final Diagnosis:

Diagnosis	No of cases	%
Obstetric Haemorrhage	46	30.67%
PIH	34	22.66%
Kochs	7	4.67%
Sepsis	5	3.33%
AKI	4	2.67%
Cardiac Failure	4	2.67%
Dengue	4	2.67%
Malaria	4	2.67%
RHD	4	2.67%
Severe Anaemia	4	2.67%
Hematoma	3	2.00%
Leptospirosis	3	2.00%
Seizure Disorder	3	2.00%
Peripartum cardiomyopathy	3	1.33%
LRTI	2	1.33%
PSVT	2	0.67%
Acute Gastro Enteritis	1	0.67%
Apla With Thrombocytopenia With IHCP	1	0.67%
Bleeding Endometrial Polyp	1	0.67%
Coagulopathy	1	0.67%
Choriocarcinoma	1	0.67%
CKD	1	0.67%
DKA	1	0.67%
Ebstein Anomaly	1	0.67%
Hepatitis	1	0.67%
Hyperthyroidism	1	0.67%
ILD	1	0.67%
Intracranial Haemorrhage	1	0.67%
Metabolic Acidosis	1	0.67%
Obstructive Jaundice	1	0.67%
Peripheral Neuropathy	1	0.67%
Pyelonephritis	1	0.67%
Sickle Cell Crisis	1	0.67%

Figure 10. Bar diagram showing final diagnosis in near miss cases:



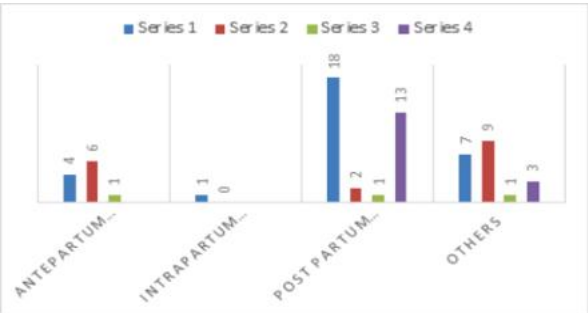
Obstetric haemorrhage was the most common cause of maternal near miss (30.67%), predominantly due to postpartum haemorrhage. Pregnancy-induced hypertension was the second major contributor (22.67%). Other causes included tuberculosis (4.67%), sepsis (3.33%), and conditions such as acute kidney injury, cardiac failure, dengue, malaria, rheumatic heart disease, and severe anaemia (2.67% each). These findings highlight the key etiologies contributing to near-miss events.

Table 11. Distribution of Cases as per type of Obstetric Haemorrhage

	N	%
Antepartum haemorrhage		
Placenta previa	4	2.66%
Abruptio	6	4.00%
Local Causes	1	0.60%
Intrapartum haemorrhage		
Scar Dehiscence	1	0.69%
Rupture uterus	0	0%
Postpartum haemorrhage		
Atonic	18	12%
traumatic	2	1.33%
Retained	1	0.60%
Coagulopathy	13	8.66%
Others		
Abortions	7	4.66%
ectopic	9	6.00%
GTN	1	0.60%
Adherent	3	2%

Postpartum haemorrhage constituted the majority of obstetric haemorrhage cases (34/46). Uterine atony was the most common cause (12%), followed by coagulopathy (8.66%). Traumatic causes (1.3%) and retained placenta were less frequent but important contributors.

Figure 11. Bar diagram showing cases as per type of Obstetric Haemorrhage



Antepartum haemorrhage accounted for 7.33% (11/150) of near-miss cases, with placental abruptio as the leading cause (54.54%), followed by placenta previa (36.36%) and local causes (9.09%).

Table 12. Distribution of Cases as per Hospital Stay

ICU stay	No of cases	%
1-3 days	51	34.0%
4- 7 days	53	35.3%
>7 days	46	30.7%
Total	150	100.0%

ICU stay was between 1 to 3 days in 34% cases, between 4 to 7 days in 35.3% cases and over 7 days in 30.7% cases.

Figure 12. Bar diagram showing ICU stay

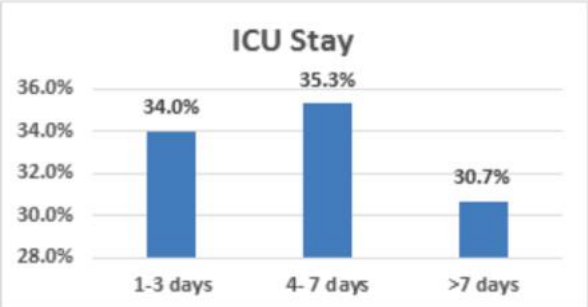
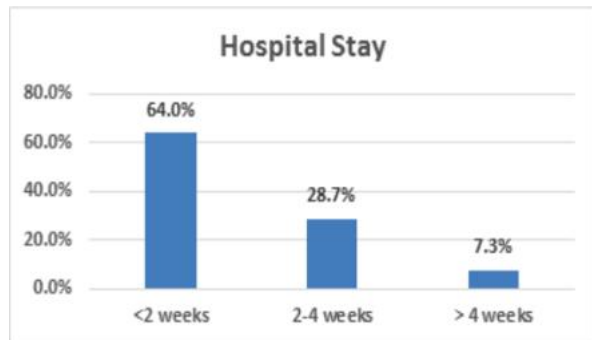


Table 13. Distribution of Cases as per Management

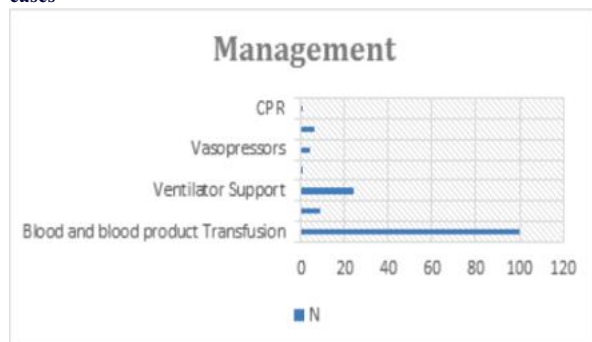
Hospital Stay	N	%
<2 weeks	96	64.0%
2-4 weeks	43	28.7%
> 4 weeks	11	7.3%
Total	150	100.0%

Hospital stay was between less than 2 weeks was in 64% cases, between 2 to 4 weeks in 28.7% cases and over a month hospitalization was required in 7.3% cases.

Figure 13. Bar diagram showing Hospital stay**Table 14. Distribution of Cases as per Management**

Management	N	%
Blood and blood product Transfusion	100	66.7%
Hysterectomy	9	6.0%
Ventilator Support	24	16.0%
Dialysis	1	0.7%
Vasopressors	4	2.6%
Iv Diuretics	6	4%
CPR	1	0.7%

Blood and blood product transfusion was the most common management (66.7%), reflecting a high burden of haemorrhage or anaemia. Ventilator support was required in 16% of cases, while hysterectomy was performed in 6%. Smaller proportions needed IV diuretics (4%), inotropes (2.6%), and dialysis. These findings highlight the need for well-equipped centres with blood bank and ICU facilities to manage near-miss cases effectively.

Figure 14. Bar diagram showing Management details in near miss cases

DISCUSSION

The maternal mortality ratio is commonly utilised as a principal measure of social, economic, and health progress, as well as for evaluating maternal fatalities within a community. Nevertheless, the maternal mortality ratio alone is inadequate to assess the health status of pregnant women. Due to the decrease in the absolute number of maternal fatalities, measuring the performance of the healthcare system has become less accurate [5,6].

Severe Acute Maternal Morbidity (SAMM) or Maternal near miss (MNM) is defined as "A woman who nearly died but survived a complication that occurred during pregnancy, child birth or within 42 days of termination of pregnancy" [7]. Near-miss registries offer critical insights into deficiencies within healthcare facilities for pregnant women, thereby enhancing the healthcare system regarding testing accessibility, equipment, and personnel. They assist in identifying the necessities for improved referral facilities and the demand for diverse health awareness initiatives.

Present hospital based observational study aimed to determine the prevalence of severe acute maternal morbidity in a medical college tertiary care hospital. During the study period, a total of 150 near-miss occurrences were analysed following the acquisition of written, valid informed permission. Cases were monitored until their discharge from the facility. Their diverse demographic backgrounds, including age, parity, gestational age, hospital course, administered treatments, and final maternal outcomes were documented in the case record form. The findings of the observational research were recorded as they transpired, without any intervention to modify the treatment sequence or outcome.

Incidence of Maternal Near miss

During the 18 months study period we had total 1954 deliveries out of which 150 cases fit into our inclusion criteria of maternal near miss. The incidence rate of near miss in present study was 76.77 cases per 1000 deliveries or 7.6%. To calculate the prevalence of a disease in a year using the incidence rate and the average duration of illness, we used following formula:

Prevalence=Incidence × Average Duration.

Average duration of illness was 12 days, i.e. 0.03288 years

Prevalence=0.076×0.03288≈0.0025 or 0.25%

So, prevalence rate is 2.5 cases per 1000 deliveries.

In Indian context, Reena et al. [9] reported an incidence of 3.4% MNM based on disease-specific criteria in a tertiary care hospital in Thrissur, Kerala. Chhabra et al. [10] reported an incidence of 3.3% in a pilot study on MNM cases in a tertiary care centre in Delhi. Patankar A et al. [11] conducted a study in similar setting in Department of Obstetrics and Gynaecology, Indira Gandhi Government Medical College, Nagpur, Maharashtra, the prevalence of MNM cases reported in this study was 2.19%. Kamal S et al. [12] observed the prevalence of near-miss case in their study as 2.4%.

Maternal near-miss mortality ratio (MNMMR= MNM: 1MD) refers to the ratio between maternal near miss cases and maternal deaths. MNMMR for the present study was 8.3. Ranatunga G et al. [13] reported it to be 18.2 in their study, a clinical audit carried out five consultant units of the Castle Street Hospital for Women (CSHW), Colombo, while Brace V et al. [14] reported it to be 49 in Scotland it was and in Uganda in Mulago Hospital, Kampala, Uganda it was seen to be 5.9 [15]. Parmar NT et al. [16] did a similar study at Sir Sayajirao General Hospital (SSGH). The ratio of maternal death to MNM event was 3.56. Chandran JR et al. [17] did a retrospective observational study at institute of maternal and child health, Government Medical College Kozhikode. Maternal near miss to mortality ratio was 11.1. Umadevi S et al. [18] observed Maternal near miss to mortality ratio as 3.38. Sunanda N et al. [19] observed the maternal near miss to mortality ratio as 6.8.

Baseline Data:

Over a third of the women were >30years of age (37.3%) while 48 cases (32%) belonged to age group 26-30years, 37 cases (24.7%) belonged to age group 21-25 years and least number of cases belonged to age group less than 20years i.e. 6%. Overall, most common affected age group was between 21-30 years of age (56.7%) with mean age as 27.6 years.

Purandare C et al. [8] reviewed the pilot programme conducted in India to agree on the national MNM policy framework and definition of MNM in the Indian context also reported that all the women (near miss cases) were between 20 and 29 years of age. Reena et al. [9] study observed that mean age of MNM cases as 23.9 years with most of the females belonging to 21 to 30 years age group (63%). Bindal J et al. [20] observed mean age of the near-miss patients (168) as 28 ± 3.11 years.

It was observed that 94% cases i.e. 141 out of the 150 cases were registered and 6% cases were unregistered. A vast majority of 64.67% (97 out of 150) were referred to us from other peripheral hospitals. Out of 53 cases that came by self, 32 cases (21.33%) were registered with us. Majority of individuals (66%) made between 4 and 6 OPD visits. A smaller proportion made fewer visits or none at all, with only 8% making between 7 and 9 visits and 6% having no OPD visits.

Our results are comparable to a study conducted by Kalra and Kachhwaha [21] (64.2%) and Purandare et al. [8] (66.9%), they have

also reported maximum referral was from public hospitals in all the major six medical colleges of the country, which however, reflects poor accountability and care or absence of skilled attendants or doctors at public hospitals or PHC's in rural areas. Studies have shown the availability and access of EmOC to be below the target coverage levels [22,23]. It highlights the importance of the third delay that occurs in receiving adequate care at that facility resulting from errors in diagnosis and clinical decision-making, or lack of medical supplies and of staff proficiency in the management of obstetric emergencies. Visi V et al. [24] in a North-eastern study observed that more than 4 ANC visits were seen in 44.3% cases while 4 or less ANC visits were reported in 55.7% cases.

Obstetric History:

A total of 114 out of 150 cases (76%) were multigravidas and 36 (24%) cases were primigravida. A total of 72% cases were admitted with severe illness while 18.7% admitted with some disorder and then became near miss. A total of 9.3% cases admitted with no disorder became near miss.

Our results are in accordance to Kalra and Kachhwaha [21] (multipara, 67.8%; nullipara, 23.2%; and grand multipara, 8.92%) and Shrestha et al. [25] (multipara, 66.4%; nullipara, 30.5%; and grand multipara, 2.71%). Bindal J et al. [26] study observed that most of the patients of near-miss were of multipara (71.42%).

We observed that a total of 78 out of 150 were managed during the intrapartum period, 45 out of 150 were managed during the antepartum period and a smaller proportion 27 out of 150 (18%) was managed during the postpartum period.

In India, MNM Review was launched as a Pilot Project in 2014 under 6 Medical colleges. They observed that MNM cases of 62.5 % occurred in antenatal phase, 23.8% in postnatal phase, 3.8 % in intranatal phase, 8.1 % abortion phase, and 1.9 % in post-abortion phase [8].

Table 14: Comparing our results with previous studies:

Demographic parameters	Our study	Padmasri et al. [27]	Patankar et al. [11]	Kansara V et al. [28]	Bansal M et al. [29]
Primigravida	24%		60.22%		35.89%
Multigravida	76%		39.78%		64.10%
Registered	94%	8.20%	19.38%	31.25%	
Unregistered	6%	91.80%	80.62%	68.75%	
Antepartum	30%		88%	56.25%	
Intrapartum	52%			37.50%	
postpartum	18%		10.20%	6.25%	
<28wks	19.33%	23.60%	1.14%		
29-36+6wks	33.33%	35.60%	39.77%		
>37wks	47.33%	40.80%	59.09%		

Clinical Presentation:

Abdominal pain (32.0%) and breathlessness (17.3%) are the most frequently reported chief complaints among patients experiencing near-miss situations. Other significant complaints include fever (18.7%) and bleeding per vaginal (11.3%). Complaints like nausea/vomiting, pedal oedema, and weakness are less common but still relevant.

Strict maternal surveillance with more frequent BP check-ups, CBC and urine examination for albuminuria have to be strictly adhered to for early detection of risk factors like pre-eclampsia and impending obstetric hemorrhages. This finding suggests to advocate strict screening protocols from the very first antenatal visit at all levels to identify the various risk factors and to initiate correct treatment modalities for maternal systemic diseases in conjunction with appropriate specialists as early as possible.

Final Diagnosis-

Most common diagnosis was obstetric haemorrhage, seen in 46 cases (30.67%). Out of the 46 cases, 34 cases were due to postpartum haemorrhage, 1 due to intrapartum haemorrhage and 11 cases due to antepartum haemorrhage. Next major contributor to near miss was pregnancy induced hypertension (22.67%), followed by Tuberculosis (4.67%), Sepsis (3.33%), Acute kidney injury, cardiac failure dengue, malaria, rheumatic heart disease and severe anemia (2.67% each). Postpartum haemorrhage accounts for majority of obstetric haemorrhage (34 out of 46 cases)

Among postpartum hemorrhage cases, uterine atony was the most frequently encountered, accounting for 12% of the cases (18 out of 150). Coagulopathy was the second most common cause, representing 8.66% of the cases. Antepartum haemorrhage accounted for 7.33% (11 out of 150) cases of Near Miss. Placental Abruption is the most common cause of antepartum haemorrhage in our dataset. Hypertensive disorders have also been reported to be the most common cause by Almerie et al. [30]. They observed it to be responsible for maximum (52%) of the near miss cases. Abdel-Raheem SS et al. [31] from Egypt also found hypertensive disorders of pregnancy were the first most common direct causes of near miss (60.5%), whereas hemorrhagic disorders of pregnancy were the second observed causes (49.8%), suggesting importance of early monitoring of high blood pressure in pregnancy, prevention and timely management. Umadevi S et al. [18] in their study on burden and causes of maternal mortality and near-miss in a tertiary care centre of Kerala, also reported that of the ante partum risk factors, hypertensive disorders ranked first in near miss group. Mansuri F et al. [32] did a retrospective secondary data analysis from hospitals of Ahmedabad city. Eclampsia (29.45%) followed by preeclampsia (25.46%) and severe postpartum hemorrhage (22.39%) were the leading causes of potentially life-threatening conditions. Kansara V et al. [28] observed leading causes of maternal near miss as hypertensive disorders (62%) and haemorrhage (32%).

A systematic review to determine the causes of maternal deaths conducted by the WHO recorded wide regional variation. Haemorrhage was the leading cause of maternal deaths in Africa (33.9%) and in Asia (30.8%) while in Latin America and the Caribbean, hypertensive disorders were responsible for 25% deaths [33]. In India, MNM Review was launched as a Pilot Project in 2014 under 6 Medical colleges [8]. Hemorrhage was the major complication contributing to 46.9 % of all the cases with intrapartum bleeding and atonic postpartum hemorrhage as 1.9 and 23.7%, respectively. Hypertensive disorders lead to 23.1% MNM cases. Sepsis was observed in 4.4% cases. Medical disorders also contributed to major causes of MNM with anemia in 8.75%, hepatitis in 6.25%. Patankar A et al. [11] reported that the major primary obstetric factor was hypertensive disorder of pregnancy amounting to 51.02%, Roopa et al. [34] also observed hypertensive disorders causes severe morbidity in 44.2% of the pregnant women.

Table 15: Comparing our findings with previous studies:

Comparison based on diagnosis	Our study	Padmasri et al. [27]	Patankar et al. [11]	Kansara V et al. [28]	Bansal M et al. [29]
Hemorrhage	30.67%		43.87%	37.50%	43.50%
Hypertension	22.66%	47.12%	51.02%	62.50%	12.82%
Sepsis	3.33%	9.30%	3.06%	0%	5.12%
Cardiac	2.67%	1.50%		6.25	
Rupture uterus	0%	0.90%			15.38%
Malaria	2.67%		1.02%		5.12%
Hepatitis	0.67%		2.04%		2.56%
Severe anemia	2.67%	9.60%			15.38%
Sickle-cell diseases in crisis	0.67%		4.08%		
Dengue	2.67%		3.06%		

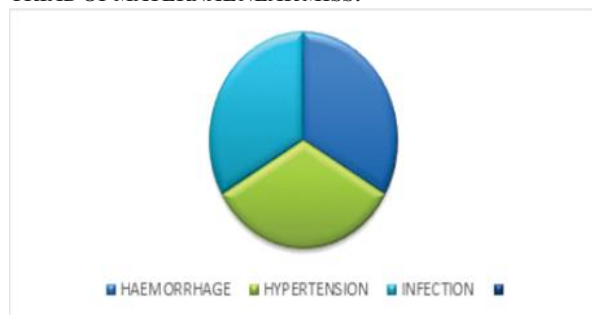
Management Details ICU stay was between 1 to 3 days in 34% cases, between 4 to 7 days in 35.3% cases and over 7 days in 30.7% cases. Hospital stay was between less than 2 weeks was in 64% cases, between 2 to 4 weeks in 28.7% cases and over a month hospitalization was required in 7.3% cases. Blood and blood products were required in 66.7% cases. Ventilator support was required in 16% cases while hysterectomy was done in 6% cases.

Table 16: Comparing our findings with previous studies:

Based on management	Our study	Padmasri et al. [27]	Patankar et al. [11]	Vijay Kansara et al. [28]
Blood and blood product Transfusion	66.70%	80.30%	47.96	50%
Hysterectomy	6.00%	2%	9.18%	37.50%
Ventilator Support	16.00%		13.26	62.50%
Dialysis	0.70%		5.10%	
Vasopressors	2.60%		25.51%	31.25%

Iv Diuretics	4%		21.42%	
CPR	0.70%			
ICU Care	88.00%	16.70%	64.28%	100%

TRIAD OF MATERNAL NEAR MISS:



Upon reviewing various studies on Maternal Mortality, it has been observed that the primary causes include Obstetric haemorrhage, hypertensive disorders during pregnancy, and sepsis. These causes align closely with those of Maternal Near Miss cases. This emphasizes the critical need to identify and address these issues promptly to improve maternal health outcomes. Raising awareness about these common causes among healthcare professionals and pregnant women can promote timely recognition of symptoms and prompt medical attention, thereby preventing complications. Identifying the same causes that lead to near misses and maternal mortality allows healthcare providers to implement targeted interventions and preventive strategies. By addressing these risk factors, healthcare systems can significantly reduce the incidence of severe complications. This ensures that staff are prepared to handle emergencies related to haemorrhage, hypertension, and infection. Understanding these causes provides valuable data for policy makers to develop and refine maternal health programs and policies aimed at improving maternal health outcomes.

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