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STUDY OF MATERNAL NEAR MISS CASES AT A TERTIARY HEALTH CARE CENTRE

Obstetrics & Gynaecology

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ABSTRACT

Background: Maternal health is an integral part of a country's health-care system and fifth Millennium Development Goal. The maternal mortality ratio (MMR) in India is 212 with figures up to 390 in some states. Stones et al. were the first to use the term "near miss morbidity" to define a narrow category of morbidity encompassing "potentiality life-threatening episodes. MOHFW defines a MNM (maternal near-miss) case as a woman who survives life-threatening conditions during pregnancy, abortion, and childbirth or within 42 days of pregnancy termination, irrespective of receiving emergency medical/surgical interventions. **Material and methods:** A cross-sectional observational study conducted in Department of Obstetrics and Gynaecology, Sri Krishna Medical College and Hospital (SKMCH), Muzaffarpur, Bihar from 1st JAN 2020 to 30th JUNE 2020 on 114 maternal near miss cases admitted during the study period as per the inclusion criteria. Results: Most patients were from the age group of 20-24 years i.e., 47 (41.23%) and cases from rural areas are the most i.e., 66 (57.89%). Based on type of admission most cases were referred from one health facility i.e., 69 (60.53%). Cases of Multi-Gravida are more than Primi-Gravida i.e., 72 (63.16%) & 42 (36.84%) and based on Antepartum/Postpartum status of patients at the time of admission, most cases were antepartum i.e., 86 (75.44%). Most cases were reported as hypertension in pregnancy i.e., 69 (60.53%). Covid -19 also found in 24 cases i.e., 21.05% with overlapping diagnosis. On the basis of organ dysfunction most common was respiratory dysfunction i.e., 28 (24.56%). Most common mode of delivery was LSCS i.e., 56 (59.57%) and most common intervention done was Use of blood and blood products i.e., 74 (64.91%). The maximum number of days in ICU in near missed cases is 8 while in hospital stay its 41. Out of 74 cases where blood transfusion done, most cases were got PCV i.e., 38 (51.35%) and blood transfusion given in 74 cases i.e., 64.91%. Based on neonatal outcome most common was live birth i.e., 81 (71.05%). **Conclusion:** Major determinants were hypertensive disorders of pregnancy, followed by haemorrhage, anaemia and sepsis. Although there is improvement in health care, haemorrhage and hypertensive disorders of pregnancy remain the leading causes of near-miss cases and maternal mortality. Maternal near-miss is a good proxy indicator to assess and monitor the activities aimed for prevention of maternal mortality. Results for maternal near-miss in our study, which was conducted in India, are similar to those of other developing countries.

KEYWORDS

Maternal near-miss, Maternal mortality, WHO, Organ dysfunction

Introduction:
Maternal health is an integral part of a country's health-care system and fifth Millennium Development Goal. It reflects the status of obstetric health and helps in reviewing the achievements of facility/country. Around 20% of all maternal deaths occur in India[1-2]. The maternal mortality ratio (MMR) in India is 212 with figures up to 390 in some states[3]. A mother's death has ruinous upshot on the family unit and compromises subsistence of the kid at least up to a decade[4]. MM is believed to be a consequence of the innate risks related with gravidity and parturition, as well as the monetary and socio-cultural aspects keeping women away from the available health services. Even after being successful to reach a health in primary, non-availability of vital facilities and subnormal care may compromise maternal survival[5]. Conventionally, MM has been used as an indicator of maternal health. It is a sentinel event[6]. It is judged by MMR, i.e., no of maternal deaths per 1 lakh live births. For this purpose, maternal death review was launched by the MOHFW in India in 2010[7]. However, now, it is not considered sufficient for the evaluation of obstetric health in isolation. MM is "just the tip of iceberg" with a vast base to the iceberg maternal morbidity, which remains undescribed, relatively unevaluated[8].

Globally, the MMR dropped from 385 maternal deaths per 1, 00,000 live births in 1990 to 210 in 2013[9] to 150 in 2015 with 38% reduction. In 2016, MMR in India is 130/1, 00,000 live births. A sustainable developmental goal for 2030 is to reduce the global MMR to 70/1, 00,000 live births and for no country to exceed 2 times the ratio[6]. For every woman who dies, many survive from a pregnancy complication.

Despite therapeutic advances during this century and a growing perception of the safety of childbirth, morbidity and mortality continue to occur in obstetric patients. More than one woman dies every minute from such causes; 585,000 women die each year. In addition to maternal death, women experience more than 50 million maternal health problems annually. For every maternal death, there are many serious life-threatening complications of pregnancy. Yet relatively little attention has been given to identifying a general category of morbidity that could be called near misses. Stones et al. were the first to use the term "near miss morbidity" to define a narrow category of morbidity encompassing "potentiality life-threatening episodes."[10]. The WHO defines it as "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy." In practical terms, women are considered near-miss cases when they survive life threatening conditions (i.e., organ dysfunction). MOHFW defines a MNM (maternal near-miss) case as a woman who survives life-threatening conditions during pregnancy, abortion, and childbirth or within 42 days of pregnancy termination, irrespective of receiving emergency medical/surgical interventions[11].

Currently, near miss audit has been considered a better approach than maternal death audit, and can be used to identify what need to be done to improve the quality of maternal health care[12]. Compared with maternal death review, the fear of blame and punishment is less in near miss review, so, if a near miss review is performed effectively, it can in practice more easily lead to implementation of changes that will improve the quality of services. Near miss cases generally occur more frequently than maternal deaths and therefore a more reliable quantitative analysis can be carried out[13], which can provide a more comprehensive profile of health system functioning. It is, therefore, quite obvious that, for adequate evaluation of maternal health, all the survivors should also be included in analyses[13]. Considering the importance of the factors revolving around the causes of maternal morbidity and mortality, this study aims at identifying such causes and their trends in a tertiary health care centre.

Aim and objectives:
To study cases of maternal near miss with respect to baseline assessment, analysis of cause of maternal near miss cases and interventions for improving health care.

Material and methods:
A cross-sectional observational study conducted in Department of Obstetrics and Gynaecology, Sri Krishna Medical College and Hospital (SKMCH), Muzaffarpur, Bihar from 1st JAN 2020 to 30th JUNE 2020 on 114 maternal near miss cases admitted during the study period as per the inclusion criteria.

Patient data collection and evaluation- Data were collected from all patients, irrespective of their background /socio economic status (Based on Modified BG prasad classification[14]). The patients were evaluated and followed up according to protocol, near miss cases were identified and analysed according to the maternal near miss guidelines published by NRHM, on behalf of The Ministry of Health and Family Welfare, Government of India, in December 2014 and detailed history of patient was entered in Proforma.

Inclusion criteria: Severe maternal complication like: Postpartum haemorrhage, Antepartum haemorrhage, Severe preeclampsia, Eclampsia, Sepsis/systemic infection, Ruptured uterus, Complications of abortion, Admission to intensive care unit
Cardiovascular dysfunction, Shock, Cardiac arrest, use of continuous vasoactive. Drugs, cardiopulmonary resuscitation.

Respiratory Dysfunction: Acute cyanosis, gasping, severe tachypnea (respiratory rate >40/min), Severe bradypnea (<6/min) intubation and ventilation not related to anaesthesia, severe hypoxia O2 SATURATION <90% FOR >60 MINUTES)

Renal Dysfunction: Oliguria non-responsive to fluids or diuretics, dialysis for acute renal failure, severe acute azotaemia(creatinine>2 Mg/dl)

Coagulation/? Hematological dysfunction: Failure to form clots, massive transfusion of blood or blood products (>5 units) severe acute, thrombocytopenia (<50000 platelets/ml).

Hepatic Dysfunction: Jaundice in the presence of preeclampsia, severe acute hyperbilirubinemia (sr. bilirubin >6 mg/dl).

Neurological Dysfunction: Prolonged unconsciousness (>12 hrs) coma, stroke status epilepticus, paralysis.

Exclusion Criteria: All Maternal near miss cases turning out into maternal mortality cases and patients and relatives not giving consent for study

Some definitions[1]:
Major obstetric haemorrhage: Estimated blood loss >2500ml or transfused 5 or more units of blood or received treatment for coagulopathy.

Eclampsia: Seizure in presence of preeclampsia.

Renal or liver dysfunction: Acute onset of biochemical disturbance, urea >15mmol/l, creatinine >400mmol/l, AST/ALT>200u/l.

Cardiac arrest: No detectable major pulse.

Pulmonary edema: Clinically diagnosed pulmonary edema associated with acute breathlessness and O2 saturation <90% lasting >60 mins, requiring O2, diuretics or ventilation.

Acute respiratory dysfunction: Requiring intubation or ventilation for >60min.

Coma: Including diabetic coma, unconscious for >12hr.

Cerebrovascular event: Stroke, cerebral / cerebellar haemorrhage or infarction, subarachnoid haemorrhage, Dural venous sinus thrombosis.

Status epilepticus: Unremitting seizures in patient with known epilepsy.

Anaphylactic shock: An allergic reaction resulting in collapse with severe hypotension, difficulty breathing and swelling/ rash.

Septicaemic shock: Shock in association with infection, no other cause for decreased blood pressure. Pulse of 120bpm or more.

Anaesthetic problem: Aspiration, failed intubation, high spinal or epidural aesthetic- severe hypotension sys BP < 90mmHg for >60 mins.

Massive pulmonary embolism: Tachypnoea (RR>40 breaths/ min), tachycardia, hypotension, diagnosed on ECG, spiral chest CT scan, V/Q scan Treated by heparin, thrombolysis.

Intensive care admission, coronary care admission: Unit equipped with all instruments to ventilate adults. Admission for one of the above problems or for any other reason.

STATISTICAL ANALYSIS: Statistical analysis was carried out, taking into account the major causes of maternal morbidity, obstetrics events, outcomes of the neonate and the mother, interventions needed, and were compared, using IBM, SPSS statistics software 27.0 Version. To describe the data, descriptive statistics frequency analysis, unpaired t-test and percentage analysis were used for categorical variables and the mean and SD was used for continuous variables.

Results: The present hospital based Crossectional Study was carried out among 114 near missed cases admitted under department of obstetrics and gynaecology in a tertiary care centre done and findings were as follows:

Table 1: Socio-Demographic parameters among studied cases

Parameters	Number of patients	Percentage
Distribution of age in years among studied cases		
15-19 years	4	3.51
20-24 years	47	41.23
25-29 years	40	35.09
30-34 years	17	14.91
35-39 years	4	3.51
40-45 years	2	1.75
Mean ± SD of age: 25.35 ± 05.19		
Distribution of cases according to place from cases belong		
Urban	48	42.11
Rural	66	57.89
Socio-economic status according to modified BG Prasad Classification		
I	11	9.65
II	25	21.93
III	55	48.25
IV	20	17.54
V	3	2.63
Educational Status of near missed mothers		
Illiterate	12	10.53
Up to 8th standard	45	39.47
Above 8th standard	57	50.00
Type of admission in tertiary care centre		
1.Direct admission to hospital	36	31.58
2.Referral	78	68.42
-One referral between health facility	69	60.53
-More than one referral between health facility	9	7.89
Obstetric score of near missed mothers		
Primi-Gravida	42	36.84
Multi-Gravida	72	63.16
Antepartum/Postpartum status of patients at the time of admission		
Antepartum	86	75.44
Postpartum	28	24.56

Based on age distribution among studied patients, most of the patients are from the age group of 20-24 years i.e., 47 (41.23%) followed by 25-29 years i.e., 40 (35.09%) respectively. Patients from rural areas are the most i.e., 66 (57.89%). On socio-economic division most patients belong to socio economic status III i.e., 55 (48.25%) and in view of literacy, most of the near missed mothers were literate above the 8th standard i.e., 57 (50%). Based on type of admission most cases were referred from one health facility i.e., 69 (60.53%). Cases of Multi-Gravida are more than Primi-Gravida i.e., 72 (63.16%) & 42 (36.84%) and based on Antepartum/Postpartum status of patients at the time of admission, most cases were antepartum i.e., 86 (75.44%) (Table 1).

Table 2: Diagnostic distribution of near miss cases

Diagnosis	Number of patients	Percentage
Hemorrhage	62	54.39
1.Early Pregnancy	-	-
Ectopic	06	5.26
Abortion	10	8.77
2. Late pregnancy	-	-
Abruptio placenta	09	7.89
Placenta previa	12	10.53
Post-partum hemorrhage	21	18.42
Rupture uterus	04	3.51
Hypertension in pregnancy	69	60.53
Severe preeclampsia	38	33.33
Imminent eclampsia	18	15.79
Eclampsia	13	11.40
Severe Anaemia	22	19.30
Obstructed labour	04	3.51
Infections	06	5.26
Heart disease	01	0.88
Other (COVID 19)	24	21.05

Table 3: Organ dysfunction in maternal near miss cases

Organ Dysfunction	No. of patients	Percentage
Cardiovascular dysfunction	24	21.05
Respiratory dysfunction	28	24.56
Renal dysfunction	07	6.14
Coagulation/hematological dysfunction	26	22.81
Hepatic dysfunction	08	7.02
Neurological dysfunction	07	6.14
Uterine dysfunction	06	5.26
Multiple organ dysfunction	03	2.63

Fig 1: Mode of delivery of near missed cases

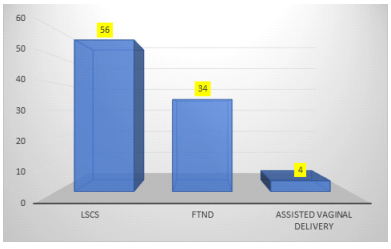


Table 4: Critical Intervention of maternal near miss cases

Variable	Number of patients	Percentage (%)
Use of blood and blood products	74	64.91
Surgical intervention		
B lynch Suture	08	07.02
B/L Uterine artery ligation	37	32.46
B/L Internal Iliac artery ligation	14	12.28
Emergency obstetric Hysterectomy	04	03.51
Laparotomy (other than LSCS)	06	05.26
Broad spectrum Antibiotic	72	63.16
ICU Admission	39	34.21
Use of inotropic drugs	22	19.30
Mechanical Ventilation	26	22.81
Cardio Pulmonary Resuscitation	00	0.00
Dialysis for acute renal failure	02	1.75

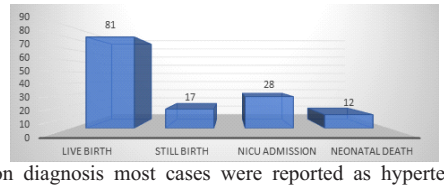
Table 5: Comparison of hospital stay and ICU stay of near missed cases

Stay in days	Minimum	Maximum	Mean	Standard deviation
ICU stay	01	08	03.46	01.46
Hospital stay	07	41	20.35	07.69
p-value	t-statistic = 13.601, Degrees of freedom = 147, Two-tailed probability < 0.001, Written as: t (147) = 13.601, p<0.001, Conclusion at the 0.05 critical alpha level: The difference is significant.			

Table 6: Blood transfusion and type of transfusion of near missed cases

Blood Transfusion	Number of patients	Percentage (%)
Yes	74	64.91
No	40	35.09
Type of Transfusion	Number of patients	Percentage (%)
PCV	38	51.35
PCV + FFP	08	10.81
PCV + FFP + PRP	28	37.84

Fig 2: Fetal outcome in studied cases



Based on diagnosis most cases were reported as hypertension in pregnancy i.e., 69 (60.53%) followed by haemorrhage i.e., 62 (54.39%) and anemia i.e., 22 (19.30%) respectively. Covid -19 also found in 24 cases i.e., 21.05% with overlapping diagnosis (Table 2). On the basis of organ dysfunction most common was respiratory dysfunction i.e., 28 (24.56%) followed by Coagulation/haematological dysfunction i.e., 26 (22.81%) and cardio-vascular dysfunction i.e., 24 (21.05%) respectively (Table 3). Most common mode of delivery was LSCS i.e., 56 (59.57%) followed by full term normal delivery i.e., 34 (36.17%) respectively (Figure 1). Based on critical intervention required most common intervention done was Use of blood and blood products i.e., 74 (64.91%) followed by IV antibiotics use i.e., 72 (63.16%) respectively (Table 4). The maximum number of days in ICU in near missed cases is 8 while in hospital stay its 41 (Table 5). Out of 74 cases where blood transfusion done, most cases were got PCV i.e., 38 (51.35%) followed by PCV + FFP + PRP i.e., 28 (37.84%) respectively and blood transfusion given in 74 cases i.e., 64.91% (Table 6). Based on neonatal outcome most common was live birth i.e., 81 (71.05%) followed by NICU admission i.e., 28 (24.56%) respectively (Figure 2).

Table 7: Severe maternal outcomes and near miss indicators, overall, near miss indicators (live births=6,898)

MNM Indicators	Values
Total IPD admissions	9534
Number of delivers	7296
Number of live births	6898
Number of near-miss cases	114
Number of maternal deaths	16
Women with life threatening condition	130
SMOR {(MNM+MD)/1000LB}	18 per 1000 live birth
MNMR (MNM/1000LB)	16 Per 1000 live birth
MNM-MR (MNM: 1MD)	7.1 Per 1 MD
MI(MD/{MNM+MD})	0.12

Discussion:

The present hospital based Crossectional Study was carried out among 114 near missed cases admitted under department of obstetrics and gynaecology in a tertiary care centre. Among 114 near cases 4 patients were ANC which was managed conservatively and discharged. 2 patients were of severe anemia and 2 patients were diagnosed as COVID-19. During the study period, COVID-19 pandemic had arrived globally thus in this study out of 114 near miss cases 24 cases got COVID-19 infection. The effect of this pandemic resulted in increased maternal mortality i.e., among 16 maternal deaths 9 were COVID -19 positive. Out of 114, cases, 39 cases were ICU admissions i.e., 35.45%, the maximum number of days in ICU in near missed cases

was 8 while in hospital stay it was 41. Among 114 near miss cases, four patients were ANC, which had twin pregnancy and delivered. 6 patients had ectopic pregnancy and 10 patients were aborted in our hospital.

Patankar A et al[13] (2016), prospective observational study, conducted in Indira Gandhi Government Medical College and Hospital, stated that Mean ± standard deviation (SD) of age is 27.84 ± 3.43 years which is very similar to our study. Most of the cases, in this study, 62 (63.26%) were from rural area, while 36 patients (36.73%) were from urban area but in our study rural patients are more than urban patients. In this study, 36 cases (36.74%) belonged to urban area and were classified according to Kuppuswamy (1976) classification, 19 out of 36 cases that belonged to urban area were of middle socio-economic class and 17 of 36 cases belonged to lower socio-economic class. About 62 from 98 cases (63.26%) belonged to rural area and were classified according to BG Prasad classification. Majority of the rural population, i.e., 48 cases (48.98%) belonged to lower socio-economic class and the rest of the 14 cases (14.28%) belonged to middle socio-economic class. None of them were in upper socio-economic class.

Studies	Mean age and std deviation
Present study	25.35 ± 05.19 years
Patankar A et al[13] (2016)	27.84 ± 3.43 years
Rathod AD et al[15] (2016)	21.75 years
Mansuri F et al[16] (2019)	25.79 ± 3.70 years
Ps R et al[17] (2013)	27 ± 4.5 years

Based on type of admission most cases were referred in the present study i.e., 78 (68.42%). Similarly, Patankar A et al[13] (2016), out of 98 cases, 69 cases i.e., 70.40% were referred to our institute. Remaining 29 cases i.e., 29.59% were admitted in our institute directly. Additionally, Kamal S et al[18] (2017), 40% of the cases were referred from other hospitals in a critical care for ICU/HDU care. 52% of the cases were critical on arrival to hospital.

In the present study, cases of multi-Gravida are more than Primi-Gravida i.e., 72 (63.16%) & 42 (36.84%) respectively. Patankar A et al[13] (2016), very similar to present study this study has Majority of the cases were multi-Gravida, 39 (39.78%); 26 cases (26.54%) were Primi-Gravida, followed by 33 cases (33.68%); cases who were nulli-para. Rathod AD et al[15] (2016), in contrast to our study this study shows Primi-Gravida were significantly more in number in both near-miss and mortality group. Similarly, Ps R et al[17] (2013), Primi-Gravida were slightly more in the near miss group i.e., 54.4% in comparison to 45.6%.

Based on diagnosis most cases were reported as hypertension in pregnancy i.e., 69 (60.53%), out of which severe pre-eclampsia cases were 38 cases i.e., 33.33% and imminent eclampsia cases were 18 i.e., 15.79% and eclampsia were 13 cases i.e., 11.40%. Followed by haemorrhage i.e., 62 (54.39%) and anemia i.e., 22 (19.30%) respectively. Additionally obstructed labour, infections and heart disease were 04 (3.51%), 06 (5.26%) and 01 (0.88%) respectively. Covid -19 also found in 24 cases i.e., 21.05% with overlapping diagnosis. Patankar A et al[13] (2016), more than two obstetric events occurred concurrently in the same patient. Hypertensive disorder of pregnancy was a major obstetric factor, that is, 50 patients (51.02%), out of these, 29 (29.59%) had severe pre-eclampsia, 16 (16.32%) had eclampsia, and 5 (5.1%) had HELLP. Next in order of frequency were cases of obstetric haemorrhage, total being 43 (43.87%), out of 43 patients, 12 had APH amounting to 12.24%, 28 (28.57%) had PPH, and 3 cases (3.06%) were of rupture uterus. There were 3 cases of obstetric sepsis. Among non-obstetric conditions, one MNM case suffered from complicated malaria. There were 2 cases of viral hepatitis with hyperbilirubinemia. There were 3 MNM cases who suffered from dengue, 3 MNM cases that had H1N1 influenza, and 4 cases of sickle-cell disease in crisis.

Studies	Most common diagnosis of near missed cases	Percentage
Present study	Hypertensive disorder of pregnancy	60.53%
Patankar A et al[13] (2016)	Hypertensive disorder of pregnancy	51.02%
Rathod AD et al[15] (2016)	Hemorrhage	26.70%
Ps R et al[17] (2013)	Sepsis	52.20%
Kamal S et al[18] (2017)	Hypertensive disorder of pregnancy	23.50%

Based on organ dysfunction most common was respiratory dysfunction i.e., 28 (24.56%) followed by Coagulation/haematological dysfunction i.e., 26 (22.81%) and cardio-vascular dysfunction i.e., 24 (21.05%) respectively. During this study period COVID-19 pandemic had arrived, because of this respiratory dysfunction cases were more. Very contrast to our study, Patankar A et al[13] (2016) shows that majority of near miss cases, i.e., 28 of 98 (28.57%) had vascular dysfunction and coagulation dysfunction. The treatment modalities adopted for the management of vascular dysfunction were massive blood transfusion in 19 cases and obstetric hysterectomy was done in 9 cases to control the bleeding. Out of 28 cases, 25 patients required vasopressors to tide over the shock. The next organ system dysfunction was cardiac dysfunction (pulmonary edema) occurring in 21 cases of 98. The next organ system dysfunction was respiratory dysfunction, that is, 19 of 98 cases.

Based on mode of delivery most common was LSCS i.e., 56 (59.57%) followed by FTND i.e., 34 (36.17%) respectively. Assisted vaginal deliveries were 4 cases i.e., 04.26%. Among 114 near miss cases, four patients were ANC, which had twin pregnancy and delivered. 6 patients had ectopic pregnancy and 10 patients were aborted in our hospital. Very similar to present study Patankar A et al[13] (2016), maximum number of cases (46) was delivered by caesarean section amounting to 46.93%. Next in order of frequency were patients who delivered vaginally, that is, 44 (44.89%). 3 patients had abortion; one aborted in our institute while 2 had undergone abortion in rural health centre and were referred as post-abortal sepsis.

Based on critical intervention required most common intervention done was Use of blood and blood products i.e., 74 (64.91%) followed by IV antibiotics use i.e., 72 (63.16%) respectively.

Studies	Blood transfusion needed
Present study	64.91%
Patankar A et al[13] (2016)	19.38%
Panda B et al[19] (2018)	35.9%
Tallapureddy S et al[20] (2017)	5.43%

The maximum number of days in ICU in near missed cases is 8 while in hospital stay its 41. In the present study, 39 cases were sent to ICU i.e., 34.21%.

Studies	ICU admission
Present study	34.21%.
Rathod AD et al[15] (2016)	26.70 %
Ps R et al[17] (2013)	62.6%
Kamal S et al[18] (2017)	40%

Based on blood transfusion given in studied cases i.e., 74 (64.91%). Patankar A et al[13] (2016), blood transfusion needed in only 19.38% of near miss cases in this study which is much higher in comparison to our study i.e., 46.36%. Panda B et al[19] (2018), blood products needed in 35.9% of near miss cases. Tallapureddy S et al[20] (2017), in opposite to our study here blood products needed in only 5.43% of near miss cases. Based on neonatal outcome most common was live birth i.e., 81 (71.05%), NICU admission i.e., 28 (24.56%) followed by and still birth was 17 (14.91%) respectively.In present study 56 patients (59.57%) delivered by Caesarean section while 34 patients (36.17%) had normal delivery and 4 patients (4.26%) have assisted vaginal delivery. Panda B et al[19] (2018), Obstetric and perinatal outcome shows that Caesarean section was done in 53.1% (48 cases) of near miss cases, while 46.1% (41 cases) had normal delivery. The live birth rate was 92.1% (82) from near miss cases which is 69.55% in our study.

Near miss indicators	Present study	Mansuri F et al[16] study (2019)	Manjunatha S et al[21] study (2019)	Panda B et al[19] study (2018)	Tallapureddy S et al[20] study (2017)
SMOR	18.10	15.17	08.66	71.90	10.04
MNM ratio	16	11.49	-	65.97	08.46
MNM mortality ratio	7:1	3.1:1	07.46	11.10	05.34

Conclusion:

SMOR for present study: 18 per 1000 live birth, Maternal near miss ratio:16 Number of women with life threatening conditions MNM per 1000 live birth, MNM ratio for present study: 16, MNM mortality ratio: 7.1: 1 MD and Mortality index: 0.12. Major determinants were hypertensive disorders of pregnancy, followed by haemorrhage, anaemia and sepsis. Although there is improvement in health care, haemorrhage and hypertensive disorders of pregnancy remain the leading causes of near-miss cases and maternal mortality. Sepsis, anaemia and COVID- infection are non-obstetric causes for maternal near-miss and mortality. All of them are preventable. The identification of maternal near-miss cases using new WHO set of severity markers of pregnancy related life-threatening conditions is valid, as these conditions are accurately associated with maternal death. Definite protocols and standards of management of SAMM should be established for the developing countries such as India, especially in the health care practices of rural India. Maternal near-miss is a good proxy indicator to assess and monitor the activities aimed for prevention of maternal mortality. Results for maternal near-miss in our study, which was conducted in India, are similar to those of other developing countries. Based on our findings, we recommend the following actions should be taken by the Government to reduce the maternal near miss and maternal death- Early identification of risk factors for preeclampsia and prompt initiation of treatment, improving antenatal care to prevent severe anaemia and pre-eclampsia, availability of blood bank facility and Ventilator support should be mandatory in first referral units.

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