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Original Research Article

The need for life saving interventions in near miss cases

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ABSTRACT

Background: A maternal near-miss case or severe acute maternal morbidity is "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy. Near miss cases are more common than maternal deaths. The major reasons and causes are the same for both maternal near miss and maternal death, so review of maternal near miss cases is likely to yield valuable information regarding severe morbidity, which could lead to death of the mother, if not intervened properly and in time. The met need for emergency obstetric interventions is one such indicator that has been estimated to show levels of health facility utilization in improving safe motherhood.
Methods: A prospective study with subjects admitted with severe maternal morbidity and mortality to the Department of Obstetrics and Gynaecology, Government Rajaji Hospital, Madurai. The duration of study was 6 months from May 2022 to October 2022.
Results: The total live births during the study period were 7821, maternal near miss was 64 and maternal deaths was 17. Women with life threatening conditions was 81 during the study period. Maternal near miss incidence ratio was 8.18 per 1000 and severe maternal outcome ratio was 10.3 per 1000 and maternal near miss: mortality ratio was 3.76. Maternal near miss cases with CNS, renal and endocrine disorders had poor antenatal care with more than 50% of the cases lacking antenatal care. More than 40% of the cases with hemorrhage and infection did not have antenatal care. Almost all causes of maternal near miss cases were higher among LSCS patients compared to vaginal delivery patients and the difference was statistically significant. Except heart disease, almost all causes of maternal near miss cases had higher proportion of admission by referral compared to self-admission and the difference was statistically significant. Hemorrhage was most common in post-natal period.
Conclusions: The main aim of the study was to assess the incidence and type of near miss events, emergency, their presentation, diagnosis, critical care interventions that can be lifesaving, and the outcome of such interventions. The recommendations are proper preparation of standard of protocol and its implementation should be done. Further study to assess various levels of failure among near miss cases should be conducted. The assessment of health literacy among the subjects should be ascertained.

Keywords: Life saving interventions, Maternal death, Maternal near miss, Maternal mortality

INTRODUCTION

Maternal mortality is a useful metric for evaluating the quality of medical care. Maternal mortality is not given enough attention in emerging and underdeveloped nations, although it occurs less frequently in industrialized nations. The study of severe maternal morbidity survivors (near miss) may be helpful in addition to or instead of the research on mother death occurrences as a health care indicator. In many nations with high maternal death rates, progress in reducing this statistic has been a goal previously in Millenium Development Goals and currently

in sustainable development goals. There is an urgent need for reduction in mortality ratios and solutions to this global issue. In this situation, the WHO and others have advised that all deliveries be attended by a qualified healthcare professional to undertake appropriate measures to avoid and treat any difficulties that may emerge during labour .This has prompted an increasing number of nations to develop measures meant to encourage more women to give birth in hospitals. The idea of facility-based care for all birth is still unachievable and costly in middle-income nations in the short to medium term.[1-3] A maternal near-miss case or severe acute maternal morbidity is "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy".[4]

Clinical criteria related to a specific disease entity

The use of specific diseases as a starting point is followed by the definition of morbidity for each disease. Pre-eclampsia, for instance, is the disease entity, and severe morbidity is defined by consequences such renal failure, eclampsia, and pulmonary oedema.[5]

Intervention based criteria

The marker of a maternal near miss in this system is an intervention, such as admission to an intensive care unit, the requirement for an emergency hysterectomy, the requirement for a blood transfusion, or a caesarean section.[17]

Organ system dysfunction-based criteria

This method is predicated on the idea that there is an orderly progression from health to death. Clinical insult is followed by a condition of systemic inflammation, then organ dysfunction, organ failure, and eventually death.[10] Mothers who survive despite having organ failure and malfunction are considered maternal near miss cases. Each organ system's definition of a maternal near miss includes certain conditions. There are specific indicators for organ system malfunction or failure.[15]

METHODS

A Retrospective study design with subjects admitted with severe maternal morbidity and mortality to the Department of Obstetrics and Gynecology, Government Rajaji Hospital, Madurai. This study conducted from From May 2022– October 2022.

Inclusion criteria

Patients with post-partum hemorrhage, severe pre-eclampsia, sepsis, rupture uterus, severe complications of abortion. Patients with cardiovascular dysfunction, respiratory dysfunction, renal dysfunction, CNS dysfunction. Patients who were in ICU care, laparotomy including hysterectomy, interventional radiology (like uterine artery embolization), use of blood products, dialysis included.

Exclusion criteria

Patient with atonic PPH medically managed and needed blood transfusions less than 4 units were excluded.

Sample size calculation

According to Kamal et al study, considering the prevalence of near miss cases as 2.4% with a precision of 3% and 95% confidence interval, the sample size is calculated a:[5]

$N = Z21\text{-}\alpha/2 *p* (1 - p)/d2$

Where, $Z1\text{-}\alpha/2$ - two tailed probability for 95% confidence interval = 1.96, p (%) - prevalence of prevalence of near miss cases = 0.024, d (%) - precision or allowable error for prevalence of near miss cases = 0.03.

$N = 1.962 * 0.024 * (1 - 0.024) / 0.032$

$N = 99.98$

Thus the total sample size required for the study is 100.

Study procedure

Study subjects were assessed for thorough and detailed history of present and past medical illness. Routine investigations including coagulation profile/PIH investigations/cardiac evaluation, general and systemic examination monitors: ECG, ECHO, pulse oximeter monitoring.

Results of investigations including complete blood count, Coagulation profile, blood sugar, renal and liver function tests, serology for associated medical illnesses, urine routine, ultrasound abdomen and pelvis, blood sugar, chest radiograph, ECHO, CT SCAN, MRI for associated illness and vaginal swabs were studied. Interventional techniques implemented to shift the focus from mortality towards morbidity are documented. Duration for which HDU care was needed and duration of hospital stay was documented.

Analysis includes

Total number of near miss cases and total number of maternal death (MD).

Women with life threatening condition: Maternal Near Miss (MNM) + Maternal Mortality
Maternal near Miss incidence ratio=Total no of maternal near miss cases per 1000 live births
Severe maternal outcome ratio =MNM+MD/ 1000 Livebirths.
Maternal Near Miss: Mortality ratio
Mortality Index: MD/MNM + MD.

Table 1: Maternal near miss indicators.

Index	Frequency
Live births (LB)	7821
Maternal near miss (MNM)	64
Maternal deaths (MD)	17
Women with life threatening conditions=MNM+MD	81
Maternal near miss incidence ratio=MNM/LB	8.18 per 1000
Severe maternal outcome ratio=MNM+MD/LB	10.3 per 1000
Maternal near miss: mortality ratio=MNM:MD	3.76

RESULTS

Month of admission of near miss cases

The distribution of total live births, maternal deaths and maternal near miss cases during every month from May to October 2022 are depicted below. During the study period 7821 live birth, 17 maternal death and 64 near miss cases occurred.

Table 2: Month of admission of near miss cases.

Month of admission	Total live birth	Maternal deaths	Near miss cases
May	1320	4	11
June	1337	5	10
July	1227	1	11
August	1216	4	10
September	1285	1	11
October	1436	2	11
Total	7821	17	64

Table 3: Maternal near miss indicators.

Index	Frequency
Live births	0.7821
Maternal near miss (MNM)	64
Maternal deaths (MD)	17
Women with life threatening conditions=MNM+MD	81
Maternal near miss incidence ratio MNM/LB	8.18/1000
Severe maternal outcome ratio=MNM+MD/LB	10.3/1000
Maternal near miss:mortality ratio=MNM:MD	3.76

Duration of ICU stay (days)

The mean duration of hospital stay among the subjects was 40 ranging from 15 to 60 days (Figure 1 and Figure 2).

Table 4: Age (years).

	Age (years)
Mean	25.17
Median	25
Std. deviation	1.82
Range	8
Minimum	22
Maximum	30

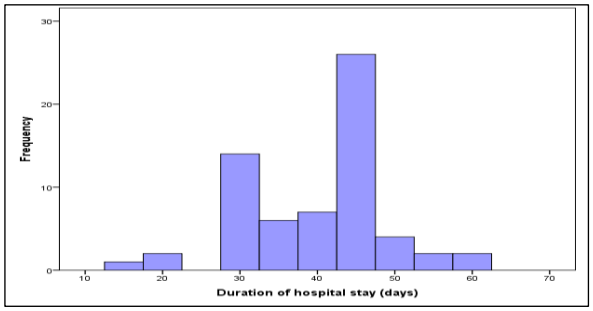

Figure 1: Duration of hospital stays.

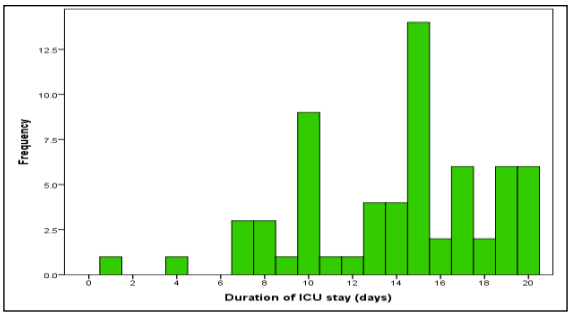

Figure 2: Duration of ICU stays.

The mean duration of ICU stay (days) among the subjects was 13.97 (± 4.34) ranging from 1 to 20 days.

Status at admission

The antenatal was 21.88%, postnatal-34.38%, and postop-43.75%.

Antenatal care

Patients received AN care -57.81% and patients not received AN care-42.19%.

According to mode of delivery

Vaginal delivery was 35.94% and LSCS was 64.06%.

The total live births during the study period were 7821, maternal near miss was 64 and maternal deaths was 17 (Table 2).

Women with life threatening conditions were 81 during the study period. Maternal near miss incidence ratio was 8.18

per 1000 and severe maternal outcome ratio was 10.3 per 1000 and maternal near miss: mortality ratio was 3.76. The mean Age (years) among the subjects was 25.17 (±1.82) ranging from 22 to 30 (Table 3).

Among the subjects, 19 (29.69%) had haemorrhage, 12 (18.75%) had infection and 9 (14.06%) had heart disease (Table 5).

Table 5: Maternal nearmiss causes.

Maternal near miss causes	Status at admission						Fisher Exact p value
	Antenatal		Postnatal		Post-op		
	Count	%	Count	%	Count	%	
Haemorrhage (19)	6	31.6	9	47.4	4	21.1	0.001
Infection(11)	0	0.0	5	41.7	7	58.3	
Heart Disease(9)	3	33.3	2	22.2	4	44.4	
CNSdisorder(8)	1	12.5	2	25.0	5	62.5	
Renal disorder(6)	1	16.7	1	16.7	4	66.7	
Endocrine disorder(5)	3	60.0	2	40.0	0	0.0	
Liver dysfunction(2)	0	0.0	1	50.0	1	50.0	
Respiratory disorder(1)	0	0.0	0	0.0	1	100.0	
Accidental(2)	0	0.0	0	0.0	2	100.0	

Among the subjects, 15 (23.44%) had hysterectomy, 7 (10.94%) had third generation cephalosporins and dialysis each, 6 (9.38%) had stepwise devascularisation (Table 6).

Table 6: Interventions for nearmiss cases.

Interventions	Frequency	Percent
Hysterectomy	15	23.44
Stepwise devascularisation	6	9.38
Multiple transfusion	4	6.25
3rd gen cephalosporins	7	10.94
Antioedema measures	6	9.38
DKA management	5	7.81
Vasopressors and cardiotonic	3	4.69
Dialysis	7	10.94
Digitalisation	4	6.25
Intubation	4	6.25
Bladder injury repair	2	3.13
Manual removal of placenta	1	1.56
Total	64	100

The haemorrhage manifestation was controlled by hysterectomy in 47%, stepwise devascularization in 32% and multiple transfusions in 15%. Hysterectomy and treatment with third generation cephalosporins was intervened equally in cases with infection. 44% of the heart disease cases was handled by digitalization, 33% by cardiotonics and vasopressors and 22% by intubation. CNS disorders were mostly treated by antioedema measures. The accidental causes were bladder injury and treated the injury. Endocrine causes were due to DKA and managed according to its protocol (Table 7).

Maternal near miss cases with CNS, renal and endocrine disorders had poor antenatal care with more than 50% of the cases lacking antenatal care. More than 40% of the cases with haemorrhage and infection did not have antenatal care. Almost all causes of maternal near miss cases were higher among LSCS patients compared to vaginal delivery patients and the difference was statistically significant. Except heart disease, almost all causes of maternal near miss cases had higher proportion of admission by referral compared to self-admission and the difference was statistically significant. Haemorrhage was most common in post-natal period. Mostly other causes are more predominant in post op cases. DKA was only predominant in antenatal period. The differences were statistically significant (Table 6).

Table 7: Maternal nearmiss causes with interventions.

Maternal near miss causes	Interventions	Count	Percent
Hemorrhage	Hysterectomy	9	47.4
	Stepwise devascularisation	6	31.6
	Multiple transfusion	3	15.8
	Manual removal of placenta	1	5.3
Infection	Hysterectomy	6	50.0
	3rd gen cephalosporins	6	50.0
Heart diseases	Vasopressors and cardiotonic	3	33.3

Continued.

Maternal near miss causes	Interventions	Count	Percent
	Digitalisation	4	44.4
	Intubation	2	22.22
CNS disorders	Antioedema measures	6	75.0
	Intubation	2	25.0
Renal	Dialysis	6	100
Endocrine	DKA management	5	100
Liver dysfunction	Multiple transfusion	1	50
	Dialysis	1	50
Respiratory disorder	3rd gen cephalosporins	1	100
Accidental	Bladder injury repair	2	100

DISCUSSION

In the study 15 (23.44%) near miss cases had an intervention by hysterectomy, another 32% had procedural intervention like dialysis, stepwise devascularization multiple transfusion and intubation by identifying the pattern of severe maternal morbidity and mortality, the strengths and weaknesses of the referral system, the clinical interventions that are available, and the ways in which improvements can be made, the near-miss approach assists in evaluating and improving the quality of care provided by the health system. The main aim of the study is to assess the incidence and type of near miss events, emergency, their presentation, diagnosis, critical care interventions that can be lifesaving, and the outcome of such interventions.

In our study, total live births during the study period were 7821. Maternal near miss was 64. Maternal deaths was 17. Women with life threatening conditions was 81 during the study period. Maternal near miss incidence ratio was 8.18 per 1000. Severe maternal outcome ratio was 10.3 per 1000. Maternal near miss: mortality ratio was 3.76. The assessment of various other studies is given below.

The brackets represent the maternal near miss/ maternal death. Ratio of maternal near miss: maternal death in various studies.

Table 8: Ratio of maternal near miss: maternal death in various studies.

Studies	Ratio of maternal near miss: maternal death
Our study	3.76 (64/17)
Khatik et al[25]	11.4 (1656/145)
Tallapureddy et al[22]	5.3 (32/6)
Mazumdar etal[24]	2.6 (46/18)
Ray et al[21]	12.9 (220/17)
Gupta et al [23]	5.6 (131/23)

The vast variation in these figures may be due to disparity in the study criteria, study period, study setting (community/hospital) and duration. Panwar et al in 2021 showed the majority of near misses (78.32% of near misses and 78.95% of maternal deaths) were between the ages of 21 and 30.[25] Acute severe hypertension 41.9%, acute severe hypotension 27.75%, ruptured ectopic 7.2%, ruptured uterus 4.8%, postpartum haemorrhage 3.0%, antepartum haemorrhage 20%, placenta previa 18.2%, ectopic pregnancy 14.45%, inversion uterus 84% were the most common reasons for near-miss. Parmar et al in 2016 showed that preterm birth rates were 42% and stillbirth rates were 35% among cases of near-misses (16/46).[24] 43 of the 46 MNM had their pregnancies terminated, while 3 had their pregnancies continued (2 abortions, 16 stillbirths, and 25 live births). Gupta et al in 2018 showed 39.1% of near miss cases were discovered in the 15–20-year age group, while 53.33% of maternal deaths were discovered in the same age group.[23] Primipara cases outnumbered multipara cases in both the near miss (60.8%) and maternal death (60.0%) groups. Most patients in the near miss group were in their third trimester (70.2%), while maternal deaths occurred equally in the third trimester (46.6%) and post-natal period (46.6%). In the study, most patients in both groups had vaginal deliveries, with 63.5% in the near miss group and 80.0% in the maternal death group. Hemorrhage was the leading cause of near miss events (40.5%), followed by pre-eclampsia/eclampsia (24.3%) and sepsis (13.5%). Tallapureddy et al in 2017 showed in near-miss cases, haemorrhage was the main cause of morbidity (43.7%), while hypertensive disorders were the main cause of maternal fatalities (66.6%).[22] Severe pre-eclampsia was the most frequent consequence among women with potentially fatal diseases (50.54%). Coagulation/haematological dysfunction was the most common organ dysfunction seen in 11 of the 32 near-miss cases (34.37%), followed by neurological dysfunction in 5 cases (15.62%), renal dysfunction in 4 cases (12.5%), cardiovascular dysfunction in 3 cases (9.37%), hepatic dysfunction in 2 cases (6.25%), and respiratory dysfunction in 1 case. In maternal near-miss cases, a caesarean section was required in 37.5% (12 cases), while normal vaginal delivery was used in 34.38% (11 cases). Ray et al in 2016 showed that Severe hypertensive disorders of pregnancy, obstetrical haemorrhage, ectopic pregnancy, and anaemia accounted for 56%, 11%, 7%, and 6% of all near-miss incidents, respectively.[21] Other reasons

included infections, organ system dysfunction, obstructed labour, and traumatic PPH.

This study has some limitations. Organ dysfunction causes are mentioned, not the specific causes for the near miss events. The analysis of diet and nutrition factor is lacking among the subjects. The assessment of health care contact including who and when history was lacking.

CONCLUSION

The main aim of the study is to assess the incidence and type of near miss events, emergency, their presentation, diagnosis, critical care interventions that can be lifesaving, and the outcome of such interventions. The recommendations are Proper preparation of standard of protocol and its implementation should be done. Further study to assess various levels of failure among near miss cases should be conducted. The assessment of health literacy among the subjects should be ascertained. The study was done among 64 near miss cases as a prospective study design with an aim to assess the incidence and type of near miss events, emergency, their presentation, diagnosis, critical care interventions that can be lifesaving, and the outcome of such interventions.

Recommendations

Proper preparation of standard of protocol of management and its implementation should be done. Further audits to assess various levels of failure among near miss cases in all levels should be conducted. The assessment of social factors, logistic factors, personal factors among the subjects should be ascertained.

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