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"NEAR MISS" OBSTETRIC EVENTS IN A TERTIARY CARE HOSPITAL: A PROSPECTIVE STUDY

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Abstract

Introduction: Maternal near-miss and maternal mortality cases have common characteristics, especially in terms of risk factors, both of them are indicators of the quality of healthcare services provided to pregnant women. Maternal mortality is an indicator of the quality of maternal health services provided in the country. Despite the therapeutic advances in obstetric care and growing perception of the safety of childbirth over the past few decades, maternal morbidity and mortality remain to be a challenge in developing countries like ours where little attention has been given to the near miss of obstetric events.

Aim: To study the prevalence and clinical profile of maternal near miss in a tertiary care center.

Objective: To evaluate the underlying disorders, contributory factors and socio-demographic variables among maternal near miss cases.

Materials And Methods: This is a prospective study undertaken at the Department Of Obstetrics and Gynecology at Yenepoya Medical College Hospital (Deemed to be University) Mangalore for a period of 1 year, between July 2023 to July 2024.The study population was patients attending the OPD, casualty, and admitted in the Department Of Obstetrics and Gynecology who fulfilled the MoHFW maternal near miss identifying criteria. Detailed history of patients like name, age, date of admission, presenting complaints were recorded. Obstetric history including previous pregnancy and labor, complications in the current pregnancy, past and present medical history were taken. For each case of maternal near miss (MNM), primary obstetric complication leading to the near miss was evaluated. Maternal near miss (MNM) events were noted based on the MoHFW Govt of India guideline 2014. Data was collected, statistical analysis was done using the statistical package of social sciences (SPSS) version. The quantitative data was expressed by mean and qualitative data expressed in percentage.

Results: During the one year study period between July 2023 to July 2024 there were 1527 total number of live births out of which a total of 23 cases of maternal near miss cases (MNM) or Severe Acute Maternal Morbidity (SAMM) were recorded with 7 maternal mortalities. The maternal near miss ratio (MNM) was 15.06 /1000 live births, and the maternal near miss mortality ratio was 3.28:1 and mortality index was 23 percent. Hypertensive disorders in pregnancy were the most common cause of near miss events (34.7%) followed by hemorrhage (21.73%) in the study.

Conclusion: Hypertensive disorders in pregnancy and hemorrhage were the two leading causes of near-miss events and mortality followed by sepsis. As the near-miss analysis indicates, the quality of healthcare and causes are almost similar to maternal mortality, so its registry should be done along with maternal mortality. A near-miss tool that is more generalizable, especially in a low-resource setting where many deliveries occur at home, needs to be developed. It should also be simple enough to be used by accredited social health workers, auxiliary nurses and midwives and other health care workers.

Keywords: maternal near miss, hypertensive disorders in pregnancy, mortality index, quality of healthcare.

INTRODUCTION

Maternal near-miss (MNM) is a condition in which a woman nearly dies from complications of pregnancy or childbirth within 42 days of termination of the pregnancy regardless of location or duration, but survives either due to the good care she receives or due to chance [1].

Maternal mortality is one of the standard indicators to assess the quality of services provided by a health care system [2].But the quality of services provided by the health care system to pregnant women is not only indicated by maternal mortality alone but also by a maternal near miss.

The concept of "near-miss" obstetrical events or severe acute maternal morbidity (SAMM) and the criteria to evaluate these cases was given by the World Health Organization (WHO) in 2009 [2]. Worldwide, there is a continuous fall in the maternal mortality ratio (MMR), and it dropped by 38% from 342 in the year 2000 to 211 in the year 2017 per 100000 live births [3].

As per the sample registration system (SRS) report by the Registrar general of maternal mortality, MMR in India has declined from 130/100000 live births during 2014-2016 to 122/100000 live births during 2015-2017,113/100000 live births in 2016-2018.

MMR in India is far from the target to be achieved in sustainable development goals (SDG) for which countries have united. In SDG 3, we have to reduce the maternal mortality ratio to up to

70 per 100000 live births.Many states in India have achieved it but most of them are far from it [5]. So to achieve national and international targets, we have to empower our health resources.

Extensive studies on "near-miss" obstetrical events have been done in recent years along with maternal mortality. Women who died were part of these near-miss cases at one point in time but due to the delay in seeking health care or other reasons, mortality occurred. So they have many common characteristics particularly on the risk factors. To improve our health care system in terms of availability of investigations, equipment, and manpower, a registry of near-miss cases can give valuable information regarding shortcomings in the healthcare facilities of pregnant women, which will help us identify the need for improvement in the referral facility and the need for health awareness programs.

In 2014, the Government of India Ministry of Health and Family Welfare MoFHW also gave guidelines based on WHO criteria to identify MNM cases and their registry. By the effective implementation of the guidelines and the near- miss concept of WHO, we can analyze the high-risk group, plan and execute the required intervention for obstetrical emergencies, and make awareness programs for better outcomes. They are useful in understanding and analyzing the differences, similarities and relationships between characteristics of women who survived life threatening pregnancy related complications and women who died of them.

Behind each maternal death, there are many more women with similar conditions who escaped death. Little attention has been given to these near miss obstetric events and evaluation of these cases helps us in monitoring the quality of hospital-based obstetric care and aid in the investigation of maternal deaths. Near miss events occur more frequently than maternal deaths and hence, have the potential to teach us lessons. This study that was conducted provided an insight into the obstetric emergencies, near miss cases, the strength and weakness of the obstetric health care being provided in our tertiary care hospital.

Our tertiary care center which is a medical college hospital receives a large number of referred cases from the rural areas of the state along with adjoining areas of other states too apart from the low risk and high risk pregnancy of our set-up. Hence the study was done to find out the frequency of maternal near miss events in order to improve the overall healthcare.

Aim

To study the prevalence and clinical profile of maternal near miss in a tertiary care center and evaluate the underlying disorders, contributory factors and socio-demographic variables among maternal near miss cases.

MATERIALS & METHODS

This is a prospective study undertaken at the Department Of Obstetrics and Gynecology at Yenepoya Medical College Hospital (Deemed to be University) Mangalore for a period of 1 year, between July 2023 to July 2024.The study population were patients attending the OPD, casualty, and admitted in the Department Of Obstetrics and Gynecology who fulfilled the MoHFW maternal near miss identifying criteria.

Detailed history of patients like name, age, date of admission, presenting complaints were recorded. Obstetric history including previous pregnancy and labor, complications in the current pregnancy, past and present medical history were taken. For each case of maternal near miss (MNM), primary obstetric complication leading to the near miss was evaluated.

A total of 23 cases were included in the study. Critically ill pregnant, laboring, postpartum and post abortable women who were admitted in Yenepoya Medical College, Mangalore were studied.

The identification and inclusion of cases of maternal near miss (MNM) events were noted based on the MoHFW Govt of India guideline 2014.

Inclusion Criteria:

For identification of an MNM case the following criteria (minimum three from each category) must be met with:

1) Clinical findings (either symptoms or signs),

2) Investigations

3) Interventions

Or Any single criteria which signifies cardio respiratory collapse (indicated by a heart symbol)

It could be either

1.1 Pregnancy specific obstetric and medical disorders**:** hemorrhage, sepsis, hypertension disorders in pregnancy, postpartum collapse, liver dysfunction or cardiac dysfunction.

1.2 Pre-existing disorders aggravated during pregnancy **:** anemia, respiratory dysfunction, cardiac dysfunction, hepatic dysfunction, endocrine disorders like diabetic ketoacidosis, thyroid crisis, neurological dysfunction and renal dysfunction.

1.3 Incidental or accidental causes in pregnancy **:** accidents, burns, anaphylaxis, infection.

Exclusion criteria:

1) Patients lost to follow up

2) Patients who leave the hospital against medical advice.

The following indices were calculated :

Primary outcomes

1. Near Miss Ratio (Number of Maternal Near Miss cases per 1000 live births): It refers to the number of maternal near-miss cases per 1000 live births (MNMR = MNM/LB).

2. Maternal Near Miss Mortality ratio (It refers to the ratio between Maternal Near Miss cases and Maternal Deaths): It refers to the ratio between maternal near miss cases and Maternal Deaths.

3. Mortality index: Maternal Deaths /(Maternal Near Miss+ Maternal Deaths)×100 (It refers to the number of maternal deaths divided by the number of women with life threatening conditions expressed as a percentage)

Secondary outcomes

Underlying disorders, factors contributing to near miss situations and socio-demographic variables among near miss cases were evaluated.

Statistical analysis: The collected data was entered in Microsoft Excel and was analyzed and statistically evaluated using the SPSS-25 version. Quantitative data was expressed by mean and qualitative data was expressed in percentage.

The maternal near miss to maternal mortality ratio and the mortality index tell about the quality of care given at a particular institute. The higher the maternal near miss to maternal mortality ratio, the better is the care at the given institute. A lower mortality index signifies better care at the institute. Both of these results were observed in our studies i.e maternal near miss to maternal mortality ratio as 3.28:1 and mortality index as 23%.

RESULTS

A total of 23 cases fulfilling the inclusion criteria were recruited in the study between July 2023 to July 2024. There were 1527 live births and 7 maternal mortalities occurred. During the study period of one year, the maternal near miss incidence ratio was 15.06/1000 live births, maternal near miss to mortality ratio was 3.28% and the mortality index was 23%.

Table 1 : Frequency of near miss cases and maternal deaths

	TOTAL
LIVE BIRTHS	1527
Near Miss Cases	23
Near Miss Ratio	15.06
Maternal Deaths	7
Maternal Near Miss Mortality Ratio	3.28:1
Mortality Index	23.33%

Table 2 : **Demographic Features**

Characteristics	Number Of Patients	Percentage (%)
Age In Years		
18-24	9	39.13
25-29	6	26.08
30-34	5	21.73
>35	3	13.04
Literacy Status		
Illiterate	2	8.69
<10	5	21.73
<12	12	52.17
Undergraduate	3	13.04
Postgraduate	1	4.34
Socio-economic Status		

Upper Class	4	17.39
Lower Class	15	65.21
Middle Class	4	17.39
Residency Status		
Rural	19	82.60
Urban	4	17.39

Table 2 shows the comparison of the demographic profiles of the near miss cases. Most of the women in this study belong to the age group of 18-29 years. Mean age of near miss cases was. 25.90 years with maximum 15 (65%) cases seen in 18-29 years of age. Near miss cases were higher in women with lower literacy. 15 women of 23 near miss cases belong to lower socio-economic status and 19 out of 23 near miss cases were women referred from the rural and peripheral areas with poor health care facilities.

Table 3 : Obstetric Parameters

Booking Status	Number Of Cases	Percentage (%)
Booked cases	8	34.78
Unbooked cases	15	65.21
Gestational Age		
<28 weeks	1	4.34
28-32 weeks	1	4.34
32-36 weeks	10	43.47
>36 weeks	5	21.73
Intrapartum & Post-partum	6	26.08
Parity		
Primigravida	7	30.43
Multigravida	16	69.56

Mode of Delivery		
Vaginal delivery	5	21.73
C-Section	13	56.52
Laparotomy	5	21.73

Table 3 Obstetric parameters 15 out of 23 (65.21%) near miss cases were unbooked cases, 16 out of 23 (69.5%) cases were multigravida and 19 out of 23 (82.6%) near miss cases were in the third trimester and postpartum period.

Although undesirable, high rates of c-section were acceptable among women who developed severe maternal morbidity, due to the urgency required to resolve the gestation and the factors that make a vaginal delivery difficult to occur.

C-section constituted 13 (56.52%) cases, vaginal delivery of 5 (21.7%) cases and laparotomy in 5 (21.7%) cases of 23 near miss cases.

Table 4 : Distribution of cases according to causes of near miss cases

Pregnancy specific Obstetric & Medical Causes of near miss cases

Causes	**Number Of Patients**	**Percentage (%)**
Hypertension		
Severe pre-eclampsia	3	13.04
Ante-partum eclampsia	2	8.69
Postpartum eclampsia	3	13.04
Hemorrhage		
Ectopic pregnancy	2	8.69
Ante-partum hemorrhage	1	4.34
Postpartum hemorrhage	1	4.34
Abortions	1	4.34

Ruptured Uterus	0	0
Gestational trophoblastic disease	0	0
Amniotic fluid embolism	0	0
Sepsis	3	13.04
Postpartum collapse (AFE,uterine inversion)	0	0
Liver dysfunction/failure(AFLP, acute fulminant hepatitis, hepatic failure)	1	4.34
Cardiac dysfunction (cardiomyopathy)	1	4.34

Pre-existing disorders aggravating during pregnancy

Renal Dysfunction	0	0
Respiratory Dysfunction(TB, pneumonia)	0	0
Anaemia (iron/folic acid deficiency, thalassemia, sickle cell disease, aplastic anemia)	2	8.69
Cardiac dysfunction (RHD, CHD, cardiomyopathy, aortic aneurysm)	1	4.34
Hepatic dysfunction (portal hypertension, cirrhosis)	0	0
Endocrine (thyrotoxicosis, thyroid storm, pheochromocytoma)	0	0

Neurological dysfunction (epilepsy)	0	0
Renal dysfunction (ARF, Collagen disease)	0	0

Accidental & Incidental Causes

Accidental		
Fall/accidents	0	0
Blunt trauma	0	0
Burns	0	0
Poisoning	0	0
Suicide	0	0
Snake bite	0	0
Anaphylaxis		
Anesthetic drugs	1	4.34
Antibiotics	0	0
Blood transfusion reactions	0	0
Infections		
Malaria	0	0
Dengue	0	0
H1N1, ARDS	1	4.34
Meningitis/Encephalitis	0	0

Table 4 shows causes of near miss. With reference to the primary determinant factors of near miss cases hypertension was the most common cause of near miss events 8 out of 23 (34.7%), followed by hemorrhage 5 out of 23 (21.73%), in this study.

Collectively hypertension disorders in pregnancy and hemorrhage were the most common causes of both near miss as well as maternal mortality. Most of these cases either were referred or reached to us in late stages in moribound conditions. Followed by hypertension and hemorrhage was sepsis 3 out of 23 (13.04%) near miss cases.

Table 5: Different Interventions

Intervention	Number Of Patients	Percentage (%)
Vasoactive drugs	17	73.91
Ventilatory support	12	52.17
Laparotomy	3	13.04
Evacuation	1	4.34
Hysterectomy	1	4.34
Dialysis	4	17.39
Blood transfusion	15	65.21

Table 5 Shows different interventions done in near miss cases. Out of all 23 near miss cases 17(73.91%) patients required vasoactive drugs, 12 (52.17%) patients received ventilator support, 4 (17.39%) patients underwent dialysis, 15 (65.21%) patients of 23 required >5 units of blood transfusion.

DISCUSSION

Maternal near miss provides robust data for the assessment of obstetric care. This study was conducted to find out the incidence of near miss events based on the government of India health and family welfare MoHFW guidelines 2014, to identify the common causes responsible for the maternal near miss with maternal mortality.

Our tertiary center is a medical college hospital not just for patients of Mangalore but also from the nearby cities, peripheral rural areas of the state, and also adjoining areas of the nearby states, because of the infrastructure and availability of multi-disciplinary facilities. Apart from being the referral center it also provides antenatal care to both low risk and high risk pregnancies as well.

In our study the maternal near miss incidence ratio 15.06/1000 live births. This is in close range comparable with the studies conducted by Bansal et.al, Behera R et.al, Kamal S et.al and Sahijwain DV et.al.

Maternal near miss incidence ratio in developing countries shows the same trend and varies between 15-40/1000 live births. A study by Bansal et.al [7] in Bastar, Chhattisgarh in 2016

showed a maternal near miss incidence ratio of 11.9/1000 live births. Another study by Jain et.al [8] in 2019 in Shivpuri in Madhya Pradesh shows a ratio of 14.3.

Studies conducted in the other countries like in Nigeria by Akpan et.al [9] showed an incidence of maternal near miss ratio of 68.3/1000 live births which was higher than found in our study. One of the highest near miss incidence ratios, 379.5/1000 live births was reported by Kumar and Tiwari et.al using Filippi et.al criteria and high frequency of near miss cases was attributed to the selective referral of high risk pregnancies and use of disease specific near miss criteria used in the study.

Maternal near miss incidence ratio was 3.28:1. This meant that for every 1 maternal death 3 to 4 cases of near miss cases were identified, higher the ratio of near miss ratios indicated better is the obstetric care which was observed in our facility.

During the 12 months of study 1527 live births were recorded in our institution out of which we had 23 women who were diagnosed as near miss cases and had 7 maternal deaths. In our study the mortality index was 23%. Majority of the mortality that occurred were the patients who reported or were referred in severe moribund conditions wherein any kind of intervention would not reduce the morbidity or mortality.

In our study near miss was highest amongst younger women, aged between 18-29. The mean age of women in our study was 25.90 which was comparable to Indian and international studies like Rakesh HJ et.al,[12] where mean age was 27.75 years and Bolivian study [11] where it was 27 years. This age group of women was more commonly affected both by maternal near miss and maternal mortality due to the fact it is the most common reproductive age group. This is also similar to the study by Bansal et.al [7] Bastar Chhattisgarh 2016 and Jain et.al [8] in Shivpuri, Madhya Pradesh.

Most of the near miss cases had lower literacy rates in our study which was also seen in the Nigerian study [9]. The Nigerian study also concluded that amongst women with tertiary level education, maternal mortality was the least with 3%, MNM of highest being 97%. In the group with no formal education women had the highest mortality of 41.7% and least MNM of 58.3%.

8 of 23 near miss cases in our study were booked. Out of the booked cases 2 were fully booked at our institute and 6 were registered at health care facilities referred from outside.15 were unbooked cases and had a higher rate of mortality as the high risk cases remain undiagnosed till complications and morbidity set in. The reasons not seeking antenatal included lack of awareness, lack of accessibility, lack of funds and social problems.

Near miss cases have been seen more often in the third trimester across several studies done in the country and globally. In our study most of the near miss cases were seen in the 3rd trimester of pregnancy and postpartum and so maternal mortality also occurred in the same gestational age

group which was statistically significant. It may be because most obstetric complications occur during the 3rd trimester and immediate postpartum and also since our center is a referral center receiving a large population from the peripheral and rural areas across the state. The patients referred either would have delivered at the other centers or at home and then referred or come on their own when complications occur.

The study conducted at Ahmedabad by Mansuri et.al [13], in Karnataka by Roopa et.al [14], Rakesh HJ et.al [12] 59.25%, also showed similarity in that most near miss cases and mortality were higher in the third trimester of pregnancy.

Near miss cases were found higher in multigravida, 16 out of 23 (69.5%) as compared to primigravida.

Although undesirable, high rates of c-section (56.52%) may be acceptable among women who develop the same maternal morbidity due to the urgency required to resolve the gestation and factors that may make vaginal delivery difficult to occur.

In the present study the incidence of c-section was increased and it is possible that the principal determinant of this rate was the severe morbidity in itself, since the rate of

c-section was significantly higher in the population of women who developed severe morbidity during pregnancy compared to those who developed it during puerperium.

With reference to the primary determinant factors of maternal near miss it was observed that hypertensive disorders in pregnancy 8 out of 23 (34.7%) occupied the main role, hemorrhage 5 out of 23 (21.73%) and non obstetric complications were the other most common primary determinant factors of severe morbidity.

The most common cause of a maternal near-miss was hypertensive disorder in this study, which was similar to the study done by Jain in 2019 [8] and the study by Mansuri et al. [13] in Ahmedabad, Gujrat, in 2018, whereas the study by Bansal et al. [7] in 2016 and Roopa et al.[14] in 2013 showed hemorrhage as the most common SAMM followed by hypertensive disorders in pregnancy. Another study done by Sultana et al.[15] in Karachi, Pakistan, showed hemorrhage, hypertensive disorder in pregnancy, and sepsis as the most common causes of near-miss events. Other studies done by Chikadaya et al.[16] in Zimbabwe and by Dessalegn et al.[17] in Ethiopia showed the most common cause of a near-miss as hemorrhage and hypertensive disorder in pregnancy followed by early pregnancy complications. In all these studies, hemorrhage and hypertensive disorder are the most important causes for both maternal morbidity and mortality. So to prevent mortality, we should work for early recognition and referral if required, to improve outcomes.

CONCLUSION

The study of severe acute maternal morbidity (SAMM) or maternal near miss (MNM) worldwide may provide a valuable contribution to the reduction of maternal mortality. The study signifies the importance of monitoring obstetric care and identifying near miss cases to enhance maternal health outcomes. Maternal mortality mostly occurs in undiagnosed cases, late referral or in moribund cases.

Hence,

a) It is necessary to boost referral services so as to reach patients to the hospital timely and decrease morbidity and mortality.

b) Awareness raising programs should be conducted for increasing the knowledge regarding antenatal checkups, need for blood investigations for the timely diagnosis, awareness regarding morbid conditions during pregnancy so that patients can contact the healthcare facility in time.

c) As the near miss analysis indicates the quality of healthcare and causes are almost similar to maternal mortality, and hence its registry should be done.

d) Additional studies are still needed, but the adoption of a 2 level screening strategy may be appropriate. The first level should be based on comprehensive criteria of severe maternal morbidity, followed by application of restrictive criteria such as organ dysfunction or failure. This approach may be effective for development of a consistent severe maternal morbidity surveillance system. To have an efficient transport system, availability of beds, blood and blood products, proper utilization of health care services at peripheral hospitals and training of health care professionals in the peripheries to identify high risk pregnancy, and refer at the earliest.

Strength and limitations Strength

This kind of study gives an opportunity to identify gaps in our system and formulate remedies on how to apply them.

Limitations

Since there was no long-term follow-up, post-partum and long term perinatal complications were not addressed in this study.

A control group was not taken in for comparison with the normal population.

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