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REVIEW ARTICLE

EVALUATION OF OBSTETRIC NEAR MISS AND MATERNAL DEATHS IN A TERTIARY CARE TEACHING HOSPITAL

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ABSTRACT

Objectives: To investigate and determine the causes of maternal near miss cases (MNM) and maternal deaths (MD) in our hospital set up. The major reasons and causes for MNM and MD are the same. So investigating the cases of MNM may yield valuable information regarding severe morbidity, which could lead to death of the mother, if timely intervention does not take place.

Methods: This was a prospective observational study conducted from 1st January 2014 to 31st December 2015. Obstetric complications were analysed. Prevalence of maternal near miss (prevalence ratio), maternal near miss incidence ratio (MNMIR), mortality index, maternal near miss to mortality ratio were calculated.

Results: There were 3375 deliveries, 3340 live births, 114 MNM cases and 5 maternal deaths during the study period. Hypertensive disorders of pregnancy (38.5%) were the commonest causes of MNM cases. Haemorrhage accounted for 29.8% cases of MNM. The MNM ratio was 32.63% and maternal mortality ratio was 149 per 1, 00,000 live births.

Conclusion: Hypertensive disorders of pregnancy and haemorrhage were the leading causes of MNM cases. All the near miss cases should be interpreted as opportunities to improve the quality of health care services.

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INTRODUCTION

Maternal Mortality is a critical indicator to assess the quality of services provided by a health care system. The concept of severe acute maternal morbidity (SAMM) has been found to complement the assessment of maternal health services, since pregnant women's health status is not reflected by mortality indicators alone¹. Maternal near miss cases are more common than maternal deaths. The major reasons and causes are the same for MNM and maternal death rate (MDR). So review of MNM 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 (WHO). Investigating MNM cases provides more reliable data to the providers because the women survives and are able for interview about the care they received. WHO in 2009 has come up with certain criteria for identification of these cases so as to address the need for a consensus which can be used worldwide². These markers

include clinical signs, laboratory test, and management parameters for identifying MNM cases. A maternal near miss case is defined 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. (WHO). The global strategy for women's, children's and adolescents' health³ is a road map for the post 2015 agenda which aims to reduce the global maternal mortality ratio to less than 70 per 1,00,000 live births. This study was conducted with the aim to assess the frequency and nature of MNM and MD in our setup.

MATERIAL AND METHODS

A prospective analysis of maternal near miss cases was undertaken in the department of IMS and SUM Hospital, Bhubaneswar, Odisha, India from 1st January 2014 to 31st December 2015. This is a tertiary care teaching institution

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which provides antenatal care and delivery services for low risk as well as high risk pregnant women. Our hospital has 24 hour emergency obstetric services, and 24 hour blood bank facilities are available. This study was conducted to find out maternal near miss and maternal deaths. For identification of maternal near miss cases, WHO 2009 criteria was taken into consideration. But all components could not be taken into consideration in our set up. Among the laboratory based criteria measurement of pH and PaO₂ /FiO₂ was not done. Potential life threatening conditions were diagnosed and demographic characteristics, gestational age at the time of morbidity, mode of delivery, ICU admissions, duration of ICU stay, need for transfusion and surgical interventions to save the life of the mother was noted. Maternal mortality during the study period was also analysed .The following indices were calculated

- Maternal near miss incidence ratio (MNMIR)
- Maternal near miss to mortality ratio.
- Mortality index.
- Maternal mortality ratio(MMR)

MNMIR refers to the number of near miss cases per 1000 live births. MNIR=MNM/LB. Maternal near miss to mortality ratio is the proportion of cases of near miss to maternal deaths. Mortality index is the number of maternal deaths due to a primary complication divided by the number of MNM cases + maternal deaths due to that complication expressed as a percentage. MMR refers to the number of maternal deaths per 1, 00,000 live births. MMR=MD/LB.

RESULTS

There were 3375 deliveries, 3340 live births, 114 MNM cases and 5 maternal deaths during the study period. The MNM ratio was 32.63%. Most of the cases of MNM were seen in unbooked cases (84.21%). 57% of the cases were referred to our hospital from other hospitals (Table-1).

Table – 1 Demography

Age (yrs)	Near miss	%	Maternal deaths	%
<25	30	26.3	1	20
25-35	82	71.9	4	80
>35	2	1.75		
Parity				
Primipara	58	50.8	4	80
Multi para	36	31.5	1	20
Gestational age(weeks)				
1-12	14	12.5		
13-28	6	5.2		
>28	77	67.5		
Post-natal	11	14.9	5	100
Anc registration status				
Registered	17	14.91		
Un registered	96	84.21	5	100
Referral				
Yes	65	57	4	80
NO	48	42.1	1	20

The demographic characteristics of women who experienced a MNM complication were comparable to those who died. Majority of them were in the age group of 25to 35 years (71.9%)and most of them were primiparous (50.8%)(Table-1).Out of 114 MNM cases, 97(85%) were antepartum and

14.9% were postpartum. The number of cases who required ICU care were 31(27.1%) (Table-2).

Table 2 Icu admissions

	MNM	%	Maternal Deaths	%
Total icu required	31	27.1		
Hypertensive disorders of pregnancy	8	25.8	3	9.6
Obstetric hemorrhage	8	25.8	2	6.4
Cardiac disorders	1	3.2		
Jaundice	2	6.45		
Sepsis	4	12.9		
Pulmonary embolism	2	6.45		
Diabetic ketoacidosis	1	3.2		
Duration of icu stay (days)				
1-5	22	70.9	3	9.6
6-10	3	9.6	2	6.4
>10	1	3.2		
Intubation				
Yes	7	22.5	2	6.4
No	19	61.2	3	9.6
Days on ventilator				
1-5	5	16.1	1	3.2
6-10	2	6.4	1	3.2
>10	-	-	-	-

Out of these 31 cases 70.9% (n=22) needed ICU care for 1to 5 days, 22.5 % (n=7) required ventilator support and 16.1% (n=5) needed ventilator support for 1to 5 days. Transfusion of >4 units of blood was required in 28.9% (n=33) case (Table-3).

Table – 3 Transfusion of blood and blood products

Transfusion	MNM	%	MD	%
YES	33	28.9	4	80
NO	81	71.05	1	20

The frequency of caesarean section in the near miss cases was 41.2% (n=47).Laparotomy for rupture ectopic pregnancy /rupture uterus was required in 23.6% cases (n=27)(Table-4).

Table – 4 Pregnancy outcome

Pregnancy outcome	MNM	%	MD	%
Vaginal delivery	15	13.1	2	40
L.s.c.s	47	41.2	3	60
Laparotomy(ep+rupture uterus)	27	23.6	-	-

Organ system dysfunction/failure were recorded in 54 cases (47.3%). The nature of organ system dysfunction or failure were mostly vascular. 38 (33.3%) cases has vascular complications due to PPH/rupture uterus/rupture ectopic pregnancy (Table-5).

Table – 5 Causes of organ system dysfunction/failure

Organ system	Number(n)	Obstetric causes
Pulmonary oedema	2	Severe pih
Coagulation	3	Eclampsia
Renal	4	Severe pih/eclampsia
Haematologic	38	Pph/rupture uterus
		ruptue ep
Hepatic	6	Severe pih
Cerebral	1	Eclampsia

On evaluating the primary obstetric complication leading to MNM, hypertensive disorders of pregnancy (38.5%) were the commonest complications (Table-6). Haemorrhage accounted for 29.8% cases of MNM which included ruptured ectopic pregnancy (10.5%), incomplete abortions (3.5%), rupture

uterus (3.5%), APH (9.6%) and PPH (6.1%). Indirect causes amounted to 20.1% cases (Table-6).

Table – 6 Distribution of maternal near miss events and primary causes of maternal deaths

Diagnosis	Near miss	%	Maternal deaths	%
Hypertensive disorders of pregnancy	44	38.5		
• Severe pih	14	12.2		
• Eclampsia	27	23.6	3	60
• Hellp syndrome	3	2.6		
Haemorrhage	34	29.8		
<i>Early pregnancy</i>				
• Ectopic pregnancy	12	10.5		
• Abortion	4	3.5		
<i>Late pregnancy</i>				
Abruptio /placenta previa	11	9.6	1	20
• Pph	7	6.1	1	20
Sepsis	8	7		
Indirect causes				
• Cardiac diseases	8	7		
• Anaemia	5	4.3		
• Rupture uterus	4	3.5		
• Jaundice	2	1.7		
• Epilepsy	2	1.7		
• Malaria	1	0.8		
• Diabetic keto aciosis	1	0.8		

Among the indirect causes cardiac diseases accounted for 7% (n=8). In our study there were 5 maternal deaths and maternal mortality ratio was 149.7 per 1, 00,000 live births. There were three maternal deaths due to hypertensive disorders of pregnancy and two were due to haemorrhagic disorders. The maternal near miss to mortality ratio was 21.8 for each maternal death. The mortality index was 4.38% in our study.

DISCUSSION

A woman who survives life threatening conditions during pregnancy, abortion, and childbirth or within 42 days of pregnancy termination, irrespective of receiving emergency medical or surgical interventions, is called maternal near miss¹. There are certain advantages of investigating near miss events. Near miss cases are more common than maternal deaths. Moreover the major reasons and causes are the same for both maternal near miss and maternal deaths. So review of MNM cases are more likely to yield valuable information regarding severe morbidity which could lead to death of the mother, if not intervened properly and in time. The maternal near miss incidence ratio (MNMR) was 32.6/1000 live births in our hospital. Several studies from the developing countries show the same trend and vary from anywhere between 15–40/1000 live births^{2,4,5}. The maternal near miss incidence ratio (MNMR) was 17.8/1000 live births in a study done by Roopa *et al.*⁶. Near miss ratios have been reported as 44.3 per 1000 in Brazil⁷, 3.83 per 1000 in Scotland⁸, and 34 per 1000 in a WHO survey⁹. This shows that maternal near miss ratios vary greatly depending on the population studied, how near miss is defined, and how the study is conducted (prospective versus retrospective)^{10,11}.

The near miss to mortality ratio in our study was 21.8. This indicates better care of patients in our hospital. Several studies from developing countries have shown different results. The

near miss to mortality ratio was 9.2:1 in a study done by Swathi *et al.*¹². The near miss to mortality ratio in a study done in Manipal⁶ was 5.6:1 and a Nepal study showed 7.2:1¹³. A Syrian study showed a near miss to mortality ratio of 60:1 and whereas some studies from Western Europe shows a ratio of 117–223:114. Higher ratios indicate better health care¹⁴. This ratio was calculated in the WHO systemic review on near miss and observed to be lower in resource poor settings in Asia and Africa when compared to that in the developed world¹⁵.

The causes of near miss vary in different geographical areas of the world and also there are variations within countries. Haemorrhage, hypertensive disorders, sepsis and obstructed labor are the most important causes in the developing countries¹⁶. Jayarathnam *et al.*¹⁷ in their study reported eclampsia, haemorrhage and sepsis to be the major cause of MNM in a developed country. In our study, the main primary determinant of severe maternal morbidity was hypertensive disorders, eclampsia having a high prevalence of 23.6% cases. Our findings are consistent with the findings of Galvano *et al.*⁷. This was similar to the results reported by other authors^{1,18}. Shrestha *et al.*¹⁹ also found hypertensive disorders to be the major contributor of maternal near miss. Hypertension was the major contributor in other studies^{19,20}. Haemorrhagic complications (mainly postpartum bleeding, rupture ectopic, and uterine rupture) were the second common cause for leading to near miss, accounting for 29.4% in our study. Of the cases of near-miss due to haemorrhage, the most important cause is severe haemorrhage in early pregnancy (rupture ectopic pregnancy and abortion) But several studies^{6,7} have shown haemorrhagic disorders as the primary determinant of severe maternal morbidity. A pilot study by Mantel *et al.*²¹ found emergency hysterectomy was the leading cause of maternal near miss. Hypertension and diabetes have been predictors of near misses in the United Kingdom²².

Most of the cases of our study were unbooked (96%). Majority of the cases of near-miss (82.5%) and maternal deaths (88.6%) were unbooked for antenatal care and delivery in a study by Oladapo *et al.*²³. Thirty one (27.1%) of patients required ICU admissions and 64.5% required surgical intervention in our study. As per Geller's scoring system²⁴, ICU admission and surgical intervention were the commonest factors among the near miss cases with frequencies of 84 and 68 respectively. The type of organ system dysfunction in our study was haematological system (n=38) which is similar to other studies^{19,24}. 28.9% of the cases required massive transfusion of four or more units of blood. Hepatic system came next following the haematological system (n=6). The maternal mortality ratio was 149.7 per 1, 00,000 live births in the present study which is quite low as compared to other studies. The maternal mortality ratio was 313/100000 live births in a study by Roopa *et al.*⁶. A Brazilian study showed a mortality ratio of 260/100000⁹. In other developing countries the maternal mortality ratios were 423/100000 live births and 324/100000 live births^{13,25}. Hypertensive disorders of pregnancy followed by haemorrhage were the causes of maternal mortality in our study. Hypertension was the major contributor in another study¹⁹. The most common cause of maternal deaths in the developed countries is hypertensive disorders followed by haemorrhage. Unlike our study, haemorrhage was the leading

cause of maternal mortality in several studies^{6,26}. Haemorrhage is still the leading cause of maternal deaths in developing countries. Maternal mortality is a critical indicator to assess the quality of services provided by a health care system. Every day, approximately nearly 830 women die from preventable causes related to pregnancy and childbirth mostly in low resource settings (WHO). The target is to reduce the global maternal mortality ratio to less than 70 per 100000 live births between 2016 and 2030, as part of the sustainable Development Agenda³.

CONCLUSION

We suggest near miss approach to evaluate and improve the quality of care provided by the health care system. By reviewing the near miss cases we can learn about the processes and their deficiencies that are in place for the care of pregnant women.

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