

Analysis of Maternal Near Miss at Tertiary Level Hospitals, Ahmedabad: A Valuable Indicator for Maternal Health Care

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Abstract

Background: Complications during pregnancy and childbirth remain a leading cause of illness and death among women of reproductive age in India. In the recent years, the concept of the WHO maternal near miss (MNM) has been adopted by the tertiary level hospitals as it has an added advantage of offering a large number of cases for intervention and for the evaluation of the maternal healthcare being provided by the health-care system. **Materials and Methods:** In the present study, near miss criterion-based audit of MNM cases and maternal death (MD) cases, based on the WHO near miss approach and MD, was conducted from the record section of the four tertiary level hospitals. In the present study, the WHO MNM approach was adopted to assess the quality of maternal healthcare in tertiary level hospitals. Retrospective secondary data analysis from the records of record section and maternity wards pertaining to June 2015–May 2016, of the hospitals of Ahmedabad city, was conducted from January 2016 to November 2017. **Results:** The total number of live births of all the four hospitals under surveillance was 21,491. Severe maternal outcome cases were 326, of which 247 (75.8%) were of MNM cases and 79 (24.2%) were of MD. MNM mortality ratio was found to be 3.13:1. Eclampsia (29.45%) followed by preeclampsia (25.46%) and severe postpartum hemorrhage (22.39%) were the leading causes of potentially life-threatening conditions. **Conclusion:** Above finding suggests the development of a comprehensive framework for the assessment of MNM and further improvement in the quality of maternal health care.

Keywords: Maternal death, maternal near miss, maternal outcomes, tertiary level

INTRODUCTION

In most of the developing countries, complications during pregnancy and childbirth remain a leading cause of critical illness and death among mothers. The developing regions accounted for approximately 99% of the global maternal deaths (MDs) in 2015.^[1] In the present time, severe maternal morbidity or maternal near miss (MNM) has been suggested as a better indicator for the quality of maternity care as compared to maternal mortality.^[2]

In recent years, the concept of MNM is adopted by the present health-care system and has received growing attention to assess severe maternal morbidity potentially leading to death. According to the WHO, “Near miss” describes a patient with an acute organ system dysfunction which, if not treated appropriately, could result in death. It has also been described as a situation of lethal complication during pregnancy, labor, or puerperium in which the woman survives either because of quality medical care or just by chance.^[3]

Near-miss cases have similar pathways as MDs, with the advantages of offering a larger number of cases for analysis and intervention and to evaluate the quality of obstetric care provided by the institution. In many developed countries, maternal mortality has fallen to single digits, whereas near miss cases are more and hence useful in evaluation of the present health system.^[4]

Very few studies have been conducted in India to assess the MNM cases. Lack of adequate information prompted me to conduct this study. Study on near miss cases may provide a further understanding of the quality of healthcare provided in the tertiary level hospitals. The objective of the present study is

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to know the demographic characteristics of near miss patients and to determine the indicators of severe maternal morbidity and mortality in hospitals of Ahmedabad city.

MATERIALS AND METHODS

Ahmedabad, having an extended population of 6 million, is the fifth-largest city and seventh-largest metropolitan area of India. A cross-sectional study was conducted in the four largest tertiary care hospitals taken randomly from six different zones of Ahmedabad city, and facility-based retrospective secondary data analysis from the records of June 2015 to May 2016, of the hospitals of Ahmedabad city, was conducted. The study was carried out from January 2016 to November 2017.

Maternal mortality is one of the important indicators used for the measurement of maternal health. Although maternal mortality remains a significant public health problem, MDs are rare in absolute numbers within a community, and hence that the assessment of the effects of health care is difficult. To overcome this challenge, notion of severe acute maternal mortality and near miss event was introduced in maternal health care to complement information obtained with a review of MD.^[5]

Near miss criterion-based audit of MNM cases and MD cases, based on WHO near miss approach and MD, was undertaken from the records sections of the four tertiary level hospitals to evaluate the quality provided by the health-care system.^[1] Obstetrics and gynecological wards were visited every 2nd day, and all the medical records of admitted patients were reviewed to identify the cases. The record books, in which sisters documented severe cases, were also examined. Data on demographic and clinical characteristics were collected from the medical records and antenatal cards. MD files, routinely gathered by the hospital staff, were reviewed monthly based on the questionnaire of MNM WHO document. The four medical colleges of Ahmedabad city, which were included in the study, are as follows:

1. Civil Hospital, Ahmedabad
2. Sheth Vadilal Sarabhai General Hospital
3. Gujarat Cancer Society Medical College and Hospital
4. Civil Hospital, Sola.

Approximately 20,000 deliveries and 60–70 deaths occur annually in all the four hospitals. These four hospitals are referral hospitals for both public and private hospitals in Ahmedabad and other surrounding states of Gujarat. In addition to providing 24-h emergency obstetrics services, the hospitals also provide antenatal care and obstetrics care. The WHO-based criteria for maternal mortality and near miss were identified for studying the cases.^[5]

A predesigned and pretested questionnaire adapted from the WHO near miss approach for maternal health was used to collect the data. Data entry was done in Microsoft Excel and data were analyzed using Epi Info software (7.1.0.6) (Centre for Disease Control in Atlanta, Georgia). The prevalence

of MNM and MD in different age-groups was analyzed. The Chi-square test and z-test were applied. Permission for conducting this study was obtained from the Ethical Review Board of the Institute.

RESULTS

The mean age of MNM and MDs is 25.7975 ± 3.708855 standard deviation (SD) and 26.33 ± 4.41362 SD, respectively. The difference between the two was found to be insignificant. Of 247 MNM cases, 115 (46.56%) women and of 79 MD cases, 37 (46.84%) women were found to be nullipara. Seventy-seven (31.17%) women in MNM and 30 (37.97%) women in MD group were primipara or second para.

Table 1 shows that, of 247 MNM cases, 90 (36.43%) women and of 79 MD cases, 31 (39.24%) women were residing more than 50 km away from the treating hospital. Sixty (24.30%) MNM women and 19 (24.05%) women in MD group had residence 10–30 km away from the hospital. However, the association between maternal complication and distance of hospital from the residence was statistically not significant.

Eclampsia was the leading cause of potentially life-threatening conditions (29.45%) followed by preeclampsia (25.46%) and severe postpartum hemorrhage (22.39%), respectively.

Table 2 demonstrates the various severe maternal outcomes and near miss indicators. The total number of live births of all the four hospitals under surveillance was 21,491. Severe maternal outcome cases are 326, of which 247 are of MNM and 79 of MD. Severe maternal outcome ratio is 15.17/1000 live births. MNM ratio is 11.49/1000 live births. MNM

Table 1: Distance of residence from the hospital for both the groups

	Place of residence	
	MNM (<i>n</i> =247), <i>n</i> (%)	Maternal death (<i>n</i> =79), <i>n</i> (%)
Within 10 (km)	61 (24.70)	16 (20.25)
10-30 (km)	60 (24.30)	19 (24.05)
30-50 (km)	36 (14.57)	13 (16.46)
>50 (km)	90 (36.43)	31 (39.24)

$\chi^2=0.7693$, $P=0.856791$. MNM: Maternal near miss

Table 2: Severe maternal outcomes and near miss indicators

Overall near miss indicators (live births=21,491)	
Indicators	Ratio/Percentage
Severe maternal outcome ratio (per 1000 live births) (<i>n</i> =326)	15.17
MNM ratio (per 1000 live births) (<i>n</i> =247)	11.49
MNM mortality ratio	3.1:1
Mortality index (maternal death=79) (%)	24.23

MNM: Maternal near miss

mortality ratio (MNM: MD) is 3.13, whereas mortality index (MI) ($MI = MD/[MNM + MD]$) as counted is 24.23%.

Table 3 shows the process and outcome indicators for the prevention and treatment of potentially life-threatening conditions. For the prevention of postpartum hemorrhage, oxytocin was given to 88.33% women during delivery and in 98.77% women, oxytocin, with any other uterotonic, was used. For the treatment of postpartum hemorrhage, the use of oxytocin was done in 82.19% women, ergometrine in 41.10% women, misoprostol in 54.79%, and hysterectomy was done in 24.66% of women. Magnesium sulfate was given to 100% of women having eclampsia. Other anticonvulsants were used in 53.13% of women having eclampsia. It was also found that 100% women who underwent cesarean section received preoperative antibiotics. 100% women with systemic infection received therapeutic parenteral antibiotics. Nearly 93.33% women underwent laparotomy for the treatment of rupture uterus.

DISCUSSION

Despite the improvements in obstetric care over the few decades, maternal morbidity and mortality remain a challenge in the developing countries. Maternal mortality is “Just the tip of the iceberg” and has a vast base to the iceberg, maternal

morbidity, which remains undescribed. Near miss cases generally occur more frequently than MDs, and therefore, it is a more reliable indicator. Quantitative analysis of near miss cases provides a more comprehensive profile of health system functioning.

Among the four tertiary level hospitals, a total of 247 cases of MNM and 79 cases of MD were found. The mean age for MNM was 25.80 ± 3.71 , and the mean age for MD was 26.33 ± 4.4 . The difference between the two means is statistically not significant ($P > 0.05$). A study done in a tertiary care hospital by Roopa *et al.* at Udipi, Karnataka, and by Almerie *et al.* in Syria shows similar age of the mothers in both the group.^[4,6] A study done by Rathod *et al.* at Aurangabad at tertiary referral center of rural India shows a mean age of 23.63 ± 3.69 SD in MNM group and 24.12 ± 4.20 SD in MD group.^[7] However, in all the studies, WHO near miss criteria were used the reason for the difference in age might be the early age of marriage in some parts of the country where women conceive early and because of which, chances of MNM and mortality are increased. In this study, half of the women in MNM and MD were nullipara, whereas one-third in MNM and MD group were primipara or second para. Similar findings were found in the study done by Patankar *et al.* on severe acute maternal morbidity (near miss) in a tertiary care center in Maharashtra.^[8] However, a study done in a rural referral hospital in northern Tanzania by Nelissen *et al.* shows more cases of multipara in both MNM and MD.^[9]

In the present study, one-third of the women were residing more than 50 km away from the treating hospital. Association between the distance of resident from treating hospital and maternal complication was found to be insignificant. However, a study done by Molla Gedefaw *et al.* in Northwest Ethiopia depicts a positive association between residences of the clients and referral hospital.^[10] According to their study, improvement in transport facility can prevent a MD. In India, delay in transport of the patient, leading to maternal morbidity and mortality cannot be denied. Keeping this in view, 108 ambulance service started by the government of Gujarat is a good initiative to decrease the rate of maternal mortality and morbidity.

In the present study, one-third of the women with potentially life-threatening conditions experienced eclampsia, followed by one-fourth of the women who experienced severe postpartum hemorrhage and severe preeclampsia. However, very few women had sepsis and rupture uterus. A similar finding was there in the study done by Shrestha *et al.* in Nepal.^[11] However, in a study done by Bakshi *et al.* in North India, few cases of eclampsia were detected in a tertiary care hospital while cases of severe postpartum hemorrhage were more than one-third among women with potentially life-threatening conditions.^[12]

The maternal mortality ratio (MMR) at our setup was 367/100,000 live births, which was slightly higher than that in the study done by Roopa *et al.* in 2013.^[4] A study conducted in Karnataka and Aurangabad showed an MMR of 313/100,000

Table 3: Process and outcome indicators for five potentially life-threatening conditions

Indicators	n (%)
Prevention of postpartum hemorrhage (n=326)	
Oxytocin use	288 (88.33)
Use of any uterotonic (including oxytocin)	322 (98.77)
Treatment of severe postpartum hemorrhage (n=73)	
Oxytocin use	60 (82.19)
Ergometrine	30 (41.10)
Misoprostol	40 (54.79)
Tranexamic acid	41 (56.16)
Artery ligation	4 (5.48)
Hysterectomy	18 (24.66)
Packing	25 (34.25)
Proportion of cases with severe maternal outcome	73 (22.39)
Mortality	12 (16.44)
Anticonvulsants for eclampsia (n=96)	
Magnesium sulfate	96 (100)
Another anticonvulsant	51 (53.13)
Proportion of cases with severe maternal outcome	96 (29.45)
Mortality	18 (18.75)
Prevention of cesarean section-related infection (n=113)	
Prophylactic antibiotic during cesarean section	113 (100)
Treatment for sepsis (n=51)	
Parenteral therapeutic antibiotics	51 (100)
Proportion of cases with severe maternal outcome	51 (15.64)
Mortality	35 (68.63)
Women with rupture uterus (n=15)	
Laparotomy	14 (93.33)
Proportion of cases with severe maternal outcome	15 (4.60)
Mortality	6 (40)

and 299/100,000 live births, respectively.^[4,6] In the present study, MMR was found to be higher than other studies done in the country. This might be due to higher number of complicated cases being referred to civil hospital Ahmedabad from primary, secondary, and even from the tertiary care hospitals of Gujarat as well as from the nearby states.

MNM ratio is an indicator which gives an estimation of the amount of care and resources that would be needed in an area or facility. In the present study, MNMR was found to be 11.49/1000 live births. It was found to be lower than other studies which indicate the requirement of better referral services at our centers.^[4,13,14] In some studies, MNM ratio was found to be lower than the present study.^[3,15,16]

Near miss death ratio was found to be 3.1:1 which means that for every three MNM women, one woman dies of complications. In the present study, near miss: death ratio was found somewhat similar to other studies,^[5,14,17] while in some other states, it was found to be higher.^[4,13,16] Higher near miss mortality ratio indicates a better quality of care at that facility. The present study has been done in a tertiary referral center covering most districts in and around Ahmedabad, with most of the cases being referred in an already moribund state, leading to less near miss and more of MD. The delays in referrals are a major cause of morbidity and mortality.

MI was found to be 24.23% in the present study [Table 2]. It was higher in other studies compared to the present study.^[4,17] Higher the index, more women with life-threatening conditions will die. However, it was found to be lower in some states than the present study, which indicate more deaths of women at our study hospitals.^[4,13,14,16] This might be due to the higher number of complicated cases being referred to the civil hospital, Ahmedabad, from the nearby states which eventually progresses to death during traveling or just after reaching the civil hospital, Ahmedabad. Identification of high-risk cases and timely and fast referral of high-risk patient and institutional delivery can prevent MNM and MD.

Establishment of tertiary care in each district is essential. If this ratio increases over a period, it reflects on the improvement achieved in obstetric care. Hence, instead of a single estimation, the yearly estimation may help us in improving the care provided. Along but in the near future, by analyzing the MNM cases, the quality of the services can be improved.

As suggested by Campbell and Graham, “we should get on with what works” to reduce maternal mortality.^[18,19] The improvement lies in the implementation of evidence-based interventions such as the use of oxytocin immediately after delivery for all women who give birth.^[9] In the present study, almost all women received oxytocin. However, in another study done in Tanzania by Nelissen *et al.*, only half of the women received oxytocin after child birth.^[9] In other studies, it was comparatively low.^[20]

The use of WHO near miss approach revealed opportunities to improve care with a clear indication of effective intervention,

and then, the use of this specific intervention is assessed. In the present study, magnesium sulfate for the treatment of eclampsia, prophylactic antibiotics during cesarean section, and parenteral therapeutic antibiotics in the treatment of sepsis were used in all women who were in need at our facilities [Table 3]. However, a study done by Jabir *et al.* in Iraq has shown that only two-third of the women with eclampsia received magnesium sulfate and three-fifth of the women received prophylactic antibiotics during cesarean section.^[21]

CONCLUSION

Above findings suggest good quality of health care being provided in the hospitals studied; however, the findings also indicate that comprehensive framework should also be developed to increase referral for complicated cases, assess MNM in the tertiary hospitals with improvement, and upgradation in the quality of services being provided to attend maximum MNM and prevent MDs.

Monthly audit of Maternal near miss cases and maternal mortality should be mandatorily done by the tertiary hospitals to prevent further death and training of health care workers should be done regarding the same. Improved documentation, analysis and interpretation of MNM and MD cases will lead to an improvement in the maternal health care and a further decline in the maternal mortality.

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Conflicts of interest

There are no conflicts of interest.

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