Original Article

Maternal Near Miss: Unraveling Our Experience in the Tertiary Care Hospital of Andaman and Nicobar Islands

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Abstract

Context: Women who survive life-threatening complications related to pregnancy and delivery have many common aspects with those who die of such complications. This similarity brought forward the near miss concept in maternal health. Analysis of the similarities, differences, and the relationship between these two groups of women provide a complete assessment of quality of maternal health care. **Aims:** The aim of this study is to assess the baseline indices of maternal near miss (MNM) and analyze the quality of care at a tertiary care center in Andaman and Nicobar Islands. **Settings and Design:** Facility-based, cross-sectional study. **Subjects and Methods:** The study was conducted for a period of 18 months from January 1, 2015, to August 31, 2016. Cases, who met the World Health Organization (WHO) criteria of severe obstetric morbidity, were included and followed up during their hospital stay and till their discharge or death. Quality of maternal health care was assessed through the WHO near-miss criteria and criterion-based clinical audit methodology. **Statistical Analysis Used:** Descriptive statistics using mean and percentages and Student's *t*-test were used. **Results:** Among 4720 women who delivered in our hospital, there were 4677 live births, 52 patients were near miss, and there were 9 maternal deaths. The MNM incidence ratio was 11.11%, the MNM mortality ratio was 5.77, and the mortality index 14.75%. The most common cause of maternal morbidity was hemorrhage followed by hypertensive disorders. **Conclusions:** Improving referral systems, effective use of critical care, and evidence-based interventions can potentially reduce severe maternal outcomes.

Keywords: Intensive care unit, maternal near miss, morbidity, mortality index

Introduction

A maternal near miss (MNM) case is defined as, "a woman who nearly died but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy."[1,2] Severe acute maternal morbidity (SAMM) is a life-threatening disorder that can end up in near miss with or without residual morbidity or mortality. Near-miss cases and maternal deaths (MDs) together are referred to as severe maternal outcome (SMO).[3] A near-miss is only an inch or two away from a tragedy. In the airline industry, an investigation of the causes and contributing events is carried out not only when two aeroplanes collide with each other, but also when they pass within 100 feet of each other because it is a potential disaster which was averted due to extraordinary skill of the navigating team or sheer good luck. Similarly, in health-care literature, near miss refers to a severe life-threatening condition that did not cause death, but had the potential to do so. The investigation of near-miss provides superior information about disease burden and indicates the quality of care in mothers. It can also broaden the understanding of factors that contribute to both maternal morbidity and mortality.

The aim of our study was to identify among all women admitted to the hospital during pregnancy, delivery and in the postpartum period, cases of SAMM, analyze the cause of their condition, and to know the various indices of morbidity.

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Subjects and Methods

Study design

Facility-based cross-sectional study.

Study population

All women admitted for delivery or within 42 days of delivery or spontaneous loss/termination of pregnancy, who met World Health Organization (WHO) inclusion criteria[1,2] of severe obstetric morbidity were included (appendix a).

Study period

The study period was 18 months from January 2015 to August 2016.

Main outcome measures

MNM incidence ratio (MNMR), MNM mortality ratio, and mortality index (MI).

Methods

This study was conducted in the tertiary care referral center of Andaman and Nicobar Islands Institute of Medical Sciences and associated G B Pant Hospital, Port Blair. This hospital caters the local and tribal population of the entire island and has a well-equipped 24 h labor ward facility, blood bank, and medical and surgical intensive care unit (ICU).

All women who fulfilled the inclusion criteria were identified and followed up during their hospital stay and till their discharge or death. All MDs during the same period were also analyzed and compared with near-miss ones.

Data collection

For each eligible patient, medical records from the maternity unit and ICU were reviewed. A detailed history was taken if possible and their sociodemographic features, including age, education level, parity, booking status, whether came directly or referred from outside, hospital where antenatal care received, whether in life-threatening condition at arrival or became so later on, gestational age at admission, history of previous cesarean section, adverse events, medical disorders, organ system dysfunction, mode of delivery, diagnosis on admission, surgical intervention, ICU admission, need for blood and blood products, duration of hospital stay, and outcome were collected. Data were updated daily by a senior resident posted in the maternity ward until the discharge of the patient or death. The study pro forma was the same as the WHO near-miss form. We also explored the administrative problems regarding the transfer of patients from different islands so that appropriate solutions can be brought forward.

The following operational definitions were used for the study purpose:[2]

- MNMR: It refers to the number of MNM cases per 1000 live births (LBs) (MNMR = MNM/LB)
- MI refers to the number of MDs divided by the number of women with life-threatening conditions expressed as a percentage (MI = MD/[MNM + MD]). The higher the index the more women with life-threatening conditions die (low quality of care), whereas the lower the index the fewer women with life-threatening conditions die (better quality of care)
- MNM to mortality ratio: It is the proportion between MNM cases and MDs (MNM: 1 MD)
- MD: MD is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy and from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes. Data were expressed as percentage rate 100,000 LBs
- Prolonged hospital stay was defined as hospital stay lasting for more than 7 days.

Data were then entered on the excel sheet, and descriptive statistics, including mean and proportions, were calculated.

Results

During the study period (January 2015–August 2016), there were 4720 deliveries in the hospital including vaginal and cesarean. There were 4677 LBs, 52 near-miss cases, and nine MDs. The MNMR was 11.11 per 1000 LBs, the MNM mortality ratio was 5.77, and the overall MI was 14.75%. The SMO ratio was 6.1 per one thousand LBs (n = 61; 52 + 9).

Table 1 shows the sociodemographic characteristics of women with near-miss cases and mortality. The mean age of the patients with near-miss was 26.44 ± 5.23 while that of MDs was 28.1 ± 5.74. However, the difference in age was not statistically significant (P = 0.6304).

Majority of the cases in both the categories, i.e., near miss and MDs were Hindus (46/52; 8/9). All the cases were registered, and none was unbooked. The major proportion of near-miss cases were either in the third trimester (78.8%) or in the postnatal period (13.4%).

Table 2 highlights the condition of patients at admission and shows that nearly 36.5% were near-miss on arrival. More than half of patients (31/52; 59.6%) were residing more than 50 km from the hospital. Means of transport for most of them were ships or local buses. The mean distance of their residence from the hospital was 252.136 km [Figure 1].

The MI of all WHO severity markers and comparison of MNM events and MDs is depicted in Table 3. The highest MI was for hemorrhage (40%) followed by hepatic and neurological dysfunction (16.6% each).

The most common cause of maternal morbidity was also hemorrhage followed by hypertensive disorders.

Twenty-four patients were transferred to the ICU. The major indications for transfer to high-dependency unit/ICU care are shown in Figure 2.

As far as management was concerned, magnesium sulfate infusion was given to all eclamptic and severe preeclamptic patients (n = 11), hemodialysis was indicated in seven patients:

Table 1: Demographic profile of cases with near-miss morbidities and mortalities

Characteristics	Near miss (n_1=52)	Mortality (n_2=9)
Mean age (years)±SD	26.44±5.23	28.1±5.74
Parity		
Primi	22 (42.3)	7 (77.7)
Multi	30 (57.6)	2 (22.2)
Religion		
Hindu	46 (88.4)	8 (88.8)
Muslim	5 (9.61)	0
Christian	1 (1.92)	1 (11.1)
Gestational age in weeks		
≤14	4 (7.6)	Nil
15-28	Nil	Nil
>28	41 (78.8)	1 (11.1)
Postnatal	7 (13.4)	8 (88.8)

SD: Standard deviation

Institution for Transforming India Aayog report 2014–2016 was 130 per lakh LBs and has significantly reduced as compared to the previous years.[4] MD and in the last decade, MNM, have become the standard measures of quality of care on which progress can be assessed.[5] This article is unique as it is first of its kind from Andaman and Nicobar Islands and highlights the positive as well as negative aspect of the location and infrastructure.

In our study, the MNMR was 11.11 per 1000 LBs which was similar to a study done recently in Ahmedabad (MNMR = 11.49).[6] The MNMR has been documented to be as low as 2.2 in a study from Malaysia, whereas in another study from Nigeria, it has been documented as very high, i.e., 198 per 1000 LBs.[7,8] MNMR index is an estimation of the amount of care and resources that would be needed in an area or facility. Higher the near-miss incidence ratio, more the need for care and resources in the form of infrastructure and transport.

Table 2: Condition of near-miss cases at admission

Condition at admission	Number of cases (*n*=52)	Most common cause
Patients admitted with severe illness or already in critical condition	19 (36.53 %)	Referred cases for multiple reasons*
Admitted with no disorder and became near miss	17 (32.69)	Most common cause was hemorrhage
Admitted with disorder (but stable) and became near miss	16 (30.76)	Most common reason was severe preeclampsia, followed by heart disease
Total	52	

*Ruptured ectopic and ruptured uterus with hemorrhagic shock, heart diseases, jaundice, cerebral venous thrombosis with uncontrolled seizures, and severe anemia in cardiac failure

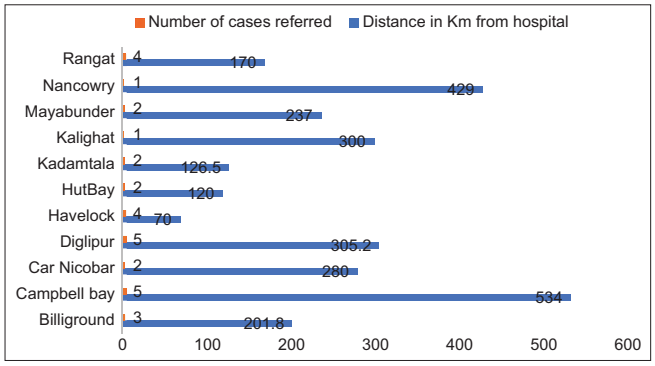

Figure 1: Distance in km from the tertiary referral hospital

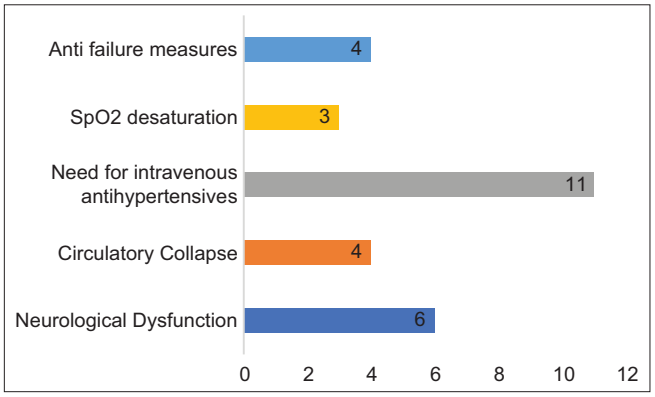

Figure 2: Indications for intensive care unit transfer

five survived and two died, six patients with post-partum haemorrhage (PPH) required noninvasive ventilation, and three required invasive ventilation along with massive blood transfusion and inotropes support. Emergency hysterectomy was done in four patients and relaparotomy was done in three patients. All survived except one. Anticoagulants in the form of low-molecular-weight heparin were given to all cerebral venous thrombosis cases (n = 6), out of which one could not be saved.

Discussion

The maternal mortality in India according to the National

Table 4 highlights the comparison of MNM indicators from various studies.[9-14]

Majority of the cases of near-miss are near-miss on arrival. This may be attributed to the failure of recognition of the seriousness of the condition as in our study the case with complaint of pain lower abdomen who was treated in a private hospital for gastritis and sent home; she landed up 4 h later as acute abdomen in the surgery department and during workup, diagnosed as ruptured ectopic pregnancy. It can also be attributed to delayed decision to seek medical assistance as in the case of a home delivery

with postpartum hemorrhage or delay in the treatment due to the lack of transport facility as one case which was diagnosed with ruptured ectopic pregnancy, could only be transferred to our institute in the morning as she had to be brought by helicopter from another island. This hospital is the only tertiary care hospital of the island where people used to be ferried by helicopters from remote islands. Addressing this "first delay" needs research to understand the health-seeking behavior of the women and regular updating of knowledge and skills among the medical fraternity. No doubt, the Government has taken a lot of pains to appoint specialists in remote islands so that emergency services are provided there and then. Apart from the main hospital in Port Blair which has now been associated with the medical college, two more hospitals at Mayabunder covering the north and middle Andaman and Car-Nicobar covering the Nicobar Islands have taken over the responsibility of health services. However, if we see the brighter side of the coin, MNM on arrival also reflects the effectiveness of emergency referrals. The fact is that few among these 52 cases who were just an inch away from tragedy, survived just because of good communication of the staff with the specialists at tertiary hospital, prior information about the blood group and subsequent arrangement of the required blood, adequate and proper counseling of the attendants, consent for surgery beforehand, prompt referral and timely resuscitation. Moreover, cases, which are difficult to be managed in Port Blair, are referred to Chennai on Government expense under the Andaman and Nicobar Islands Scheme for Health Insurance scheme. Another positive fact is that 100% of patients were booked. The credit goes to the authorities who tried their best to ensure such high standards and the medical team, the auxiliary nurse midwives and health-care workers who work on ground.

In our study, the leading cause of near-miss was hemorrhage which is similar to that observed by Rathod *et al*.[11] and Ps *et al*.[10] However, a study from Gujarat showed hypertensive disorders as the leading risk factor for the near-miss, i.e., 62% followed by obstetric hemorrhage 31%.[12] Oxytocin was given in all the cases of postpartum hemorrhage and life-saving hysterectomy was done in four cases.

The maternal mortality ratio in our hospital during this study period came out to be 192.4 per 1 lakh LBs which is quite low if compared with other parts of the mainland, i.e., 277/100,000 in Assam, 201/100,000 in Uttar Pradesh, 199/100,000 in Rajasthan, and 51.6 per 100,000 LBs by Fatima *et al*., 313/100,000 LBs in a study by Ps in Manipal and 298/100,000 LBs in a study by Rathod *et al*. in Yavatmal, Maharashtra.[4,9-11]

Unfortunately, countries and states with the highest burden of maternal mortality and morbidity have the least reliable data on such health indicators.

The major limitation in our health system is that there is no system for reporting near miss events. Every hospital experiences a similar problem. Once we start notifying the

Table 3: Comparison of near-miss events and primary cause of maternal deaths with mortality index

Cause	Near-miss events	Maternal deaths	Mortality index
Hypertensive disorders (severe preeclampsia + eclampsia)	11	2 (eclampsia + S. PE)	15.3
Hemorrhage			
Hemorrhage in early pregnancy (ectopic)	4	Nil	0
Hemorrhage in late pregnancy (abruptio and placenta previa)	4	1 (abruptio placentae)	20
Postpartum hemorrhage	8	2 (MODS)	20
Cardiac	4	Nil	0
Indirect			
Pregnancy with jaundice	5	1 (MODS)	16.6
Cerebral venous thrombosis	5	1	16.6
Pulmonary embolism	-	2	1.0
Others**	11	Nil	0

**Puerperal sepsis, bladder injury, rupture uterus, obstructed labor, septic abortion. S.PE: Severe preeclampsia; MODS: Multiorgan dysfunction syndrome

Table 4: Near miss indicators as shown by other studies

Authors (year of study)	MNMIR per 1000 live births	MNMMR	Mortality index (%)
Index study	11.11	5.7:1	14.75
Norhayati *et al*.,[7] 2016; Malaysia	2.2	23.5	4.1
Mbachu *et al*.,[8] (2017); Nigeria	198	11.4	8.8
Lotufo *et al*.,[9] (2012); Brazil	4.4	8.6:1	10.4
Ps *et al*.,[10] (2013); Karnataka	17.8	5.6:1	14.9
Rathod *et al*.,[11] (2016), Yavatmal, Maharashtra	7.56	3.43:1	29.07
Parmar *et al*.,[12] (2016); Gujarat	23.85	2.6:1	28.1
Reena and Radha[13] (2018) Kerala	9.27	-	-
Mansuri and Mall[6] (2019), Ahmedabad	11.49	3.1 :1	24.23
Sultana *et al*.,[14] (2019); Karachi	31.4	3.8:1	-

near-miss cases, this will set an example and motivation for others to give their best efforts in saving a mother.

Recommendations

There should be a much simpler pro forma to be filled by the residents/duty doctors or on-call persons if any near-miss event occurs.

Conclusions

The near miss reviews and audits act as an adjunct to MD confidential enquiries and provide new ways to improve the health infrastructure. This ultimately will reduce the burden of morbidity.

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Conflicts of interest

There are no conflicts of interest.

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