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RESEARCH ARTICLE

A prospective study of maternal near-miss and maternal mortality cases in FAAMCH, Barpeta; with special reference to its aetiology and management: First 4 months report.

Hem Kanta Dev Sarma
Hem Kanta Sarma[1]
Arup Kumar Kalita[2]

Registrar, Dept of Obst & Gynae, [1] Prof. & HOD, Dept of Obst & Gynae, [2] PGT, Dept of Obst &Gynae, Fakhruddin Ali Ahmed Medical College, Barpeta, Assam, India.

Correspondence: Dr Hem Kanta Dev Sarma**,** Registrar, Dept of Obst & Gynae, FAAMCH, Barpeta email: **susmitasarma16@gmail.com**

ABSTRACT

Objective: To know the age, parity, gestational age, causes, and feto-maternal outcome of maternal near miss cases with respect to the mortality cases. **Methodology**: It was a prospective observational study conducted in the Department of Obstetrics & Gynaecology, Fakhruddin Ali Ahmed Medical College & Hospital (FAAMCH), Barpeta from 16th June, 2014 to 15th October 2014. The WHO maternal near miss case definition and their inclusion criteria were used in the study. **Results**: There were 1729 numbers of deliveries during the study period. Out of them; 1567 were live births and 162 were stillbirths. There were 66 near miss events and 17 maternal deaths during the period. The maternal death to near miss ratio was 1 / 3.9. Among near miss cases, 59% cases were primipara and 37.8% cases were in the age group of 15 – 20 years. The most common type of near miss events were eclampsia (39.4%) whereas severe anaemia was responsible 47.1% of all maternal death. Mortality index was 20.4%. 53% of the near-miss cases and 47% of the death cases had live birth. **Conclusion**: The study showed that for almost every 4 woman who survived life threatening complications, one died. Evaluating the disease process at an early stage and then early referral from the primary health care level is of utmost important to save life of both the baby and mother.

Keywords: Maternal near miss, maternal death.
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The status of health care in a community can be accessed by the maternal mortality rate and infant mortality rate. A maternal death is one of the most devastating events in obstetrics with widespread implications on both the family and the medical staff involved. Every woman goes through a risk for this sudden and unexpected event during pregnancy, childbirth and after delivery. According to World Health Organisation (WHO), a maternal death is defined as death of a woman while pregnant or within 42 days of termination of pregnancy; irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes [1]. A maternal near miss case is defined as a woman who nearly died but survived a complication that occurred during

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pregnancy, childbirth or within 42 days of termination of pregnancy [1]. In practical terms, women are considered near-miss cases when they survive life-threatening conditions i.e. organ dysfunction. Severe maternal outcome (SMO) is the maternal near-miss cases and maternal death [1]. Despite therapeutic advances in medical science and a growing perception of the safety of childbirth; morbidity and mortality continue to occur in obstetrics specially in the developing countries like India [2]. Fortunately, most of the obstetrical complications can be prevented or managed provided a timely and properly taken intervention is secured to the patient. Near- miss cases share many characteristics with maternal death and can directly inform on obstacles that had to overcome after the onset of an acute complication. Corrective actions for identified problems can be taken to reduce mortality and long term morbidity [2]. Over the last decade, identification of cases of severe maternal morbidity has emerged as a promising complement or alternative to the investigation of maternal death.

Maternal mortality rate is very high in our country including Assam. Although government is trying a lot to reduce maternal and infant mortality rate, still it is very high compared to the developed countries. Fakhruddin Ali Ahmed Medical College & Hospital (FAAMCH), Barpeta, being the only rural medical college in the entire lower Assam; it receives a large number of obstetric patients daily from undeveloped area. Many of them get admission in the hospital in a moribund state. While most of them survive but few patients lose their lives. A continuing study is being carried out on these critical patients to know the various factors related to maternal near miss and mortality cases in our set up. The first four months data and analysis has been reported in this paper.

The aim of the study was

1) To know the age and parity distribution of the cases.

2) To know the causes of maternal near miss and maternal mortality.

3) To know the proper interventions taken to treat the patients.

4) To know the outcome of pregnancy in the affected cases.

Methodology

It is an ongoing prospective observational study conducted in the department of Obstetrics & Gynaecology, FAAMCH, Barpeta. During this study "The WHO near-miss approach for maternal health" was followed. Any patient that met any one of the WHO inclusion criteria mentioned below was included in study. The present article reports the findings of the first four months, i.e. the period between 16th June, 2014 to 15th October 2014.

Patients who met the WHO inclusion criteria for "Near Miss Mortality" and all cases of maternal death during the period June 2014 to October 2014 were included in the study. Data have been collected from the patients having Near Miss Mortality event during the hospital stay or immediately following maternal death. Data collection was done with a pro-forma prepared for the study.

WHO Inclusion criteria

According to WHO, any of the following conditions that is/are present during their stay at the health-care facility would be eligible. Women that develop those conditions unrelated to pregnancy (i.e. not during pregnancy or 42 days after termination of pregnancy) are not eligible. Women who are already dead when they are brought to the health-care facility or those who die on arrival at the facility should be included because they are likely to represent cases involving a major delay in accessing care. The eligibility is not restricted by gestational age at which complications occurred (i.e. women having abortions or ectopic pregnancies and presenting with any of the inclusion criteria are eligible).

The conditions are as follows-

1. Severe maternal complications

- *Severe postpartum haemorrhage*
- *Severe pre-eclampsia*
- *Eclampsia*
- *Sepsis or severe systemic infection*
- *Ruptured uterus*
- *Severe complications of abortion*

2. Critical interventions or intensive care unit use

- *Admission to intensive care unit*
- *Interventional radiology*
- *Laparotomy (includes hysterectomy, excludes caesarean section)*
- *Use of blood products*

3. Life-threatening conditions (near-miss criteria)

- *Cardiovascular dysfunction — Shock, cardiac arrest (absence of pulse/ heart beat and loss of consciousness), use of continuous vasoactive drugs, cardiopulmonary resuscitation, severe hypoperfusion (lactate >5 mmol/l or >45 mg/dl), severe acidosis (pH <7.1)*
- *Respiratory dysfunction— Acute cyanosis, gasping, severe tachypnea (respiratory rate >40 breaths per minute), severe bradypnea (respiratory rate <6 breaths per minute), intubation and ventilation not related to anaesthesia, severe hypoxemia (O2 saturation <90% for ≥60 minutes or PAO2/FiO2 <200)*
- *Renal dysfunction — Oliguria non-responsive to fluids or diuretics, dialysis for acute renal failure, severe acute azotemia (creatinine ≥300 µmol/ml or ≥3.5 mg/dl)*
- *Coagulation/haematological dysfunction — Failure to form clots, massive transfusion of blood or red cells (≥5 units), severe acute thrombocytopenia (<50 000 platelets/ml)*
- *Hepatic dysfunction — Jaundice in the presence of pre-eclampsia, severe acute hyperbilirubinemia (bilirubin >100 µmol/l or >6.0 mg/dl)*
- *Neurological dysfunction — Prolonged unconsciousness (lasting ≥12 hours)/coma (including metabolic coma), stroke, uncontrollable fits/status epilepticus, total paralysis*
- *Uterine dysfunction — Uterine haemorrhage or infection leading to hysterectomy*

4. Maternal vital status - Maternal death.

Maternal near- miss and maternal mortality cases were identified among women with pregnancy related complications whose diagnosis met the above mentioned criteria and who were admitted in our hospital . Patient characteristics including age, parity; gestational age at admission and surgical intervention taken to save the life of the patient were also noted. Investigations were done for anaemia, septicaemia, eclampsia and for organ system dysfunction/ failure. Data was collected for determining the nature of obstetric complication, presence of organ system dysfunction and timing of near miss events with respect to admission. Fetal outcome and mode of delivery was also noted. Detailed information of maternal mortalities for the underlying cause and time period was noted. The descriptive analysis of the collected data was done and the results were given in percentages. The incidence of near miss cases and maternal death to near miss ratio was calculated. Various indices related to maternal health were calculated to know the disease process involved and the quality of treatment provided to the patient.

Results & Observations

During the study period, there were 1729 deliveries. Out of them, 1567 were live births and 162 were stillbirths. Total number of near miss cases were 66 and there were 17 maternal deaths. Thus there were 83 number of severe maternal outcome (near miss plus maternal death) cases during the study period. The booking status showed that 92% of near miss cases were unbooked while all the death cases were unbooked.

Most common age group affected in the near-miss cases were 15 to 20 years (37.9%). While 39 cases (59%) were primipara; 27 (41%) cases were multipara. On the other hand, 42 cases (72.7%) were in the third trimester or intra partum period indicating that late pregnancy and delivery is the worst affected period. In the mortality group, 47% cases were in age group of 15 to 20 years and 23.1% cases were more than 30 years of age. In this group, 58.8% were primi and the rest were multiparous. Similarly, third trimester pregnancy alongwith labour complications and post natal complications shared equally 41.2% of mortality cases each.

The most common types of near miss events were haemorrhage, eclampsia and severe anaemia (non-haemorrhagic) responsible for 42.4%, 39.4% and 18.2% cases respectively.

Table 1: Showing the age, parity and gestational age distribution of both the groups

Factors		Near-miss (%) (N=66)	Maternal death (%) (N=17)
Age	15-20 yrs	25 (37.9%)	8 (47.1%)
	21-25 yrs	19 (28.8%)	4 (23.1%)
	26- 30 yrs	13 (19.7%)	1 (5.9%)
	>30year	9 (13.6%)	4 (23.1%)
Parity	Primi	39 (59%)	10 (58.8%)
	Multi	27 (41%)	7 (41.2%)
Gestational age	<12 wks	8 (12.1%)	1 (5.9%)
	12 – 28wks	3 (4.1%)	1 (5.9%)
	>28weeks	48 (72.7%)	7 (41.2%)
	Post- natal	8 (12.1%)	7 (41.2%)

Table 2: Showing the percentage of various complications in both the groups

Complications		**Near miss event**	**Maternal death**
Severe hypertension			
	Severe pre-eclampsia	6.0	Nil
	Eclampsia	39.4	29.4
Haemorrhage			
	Early pregnancy		
	Ectopic	9.2	5.9
	Abortion	1.4	Nil
	Late pregnancy		
	APH	7.8	Nil
	PPH	24.0	17.6
Severe anaemia (non-haemorrhagic)		18.2	47.1
Severe infection		Nil	5.9

Table 3: Showing mode of delivery / termination of pregnancy in both the groups in percent

Intervention	**Near- miss**	**Maternal death**
Undelivered	7.6	35.3
Vaginal delivery	54.5	58.8
LSCS	13.6	Nil
Laparotomy for rupture uterus	10.6	Nil
Laparotomy for rupture ectopic	9.1	5.9
Dilatation & evacuation	3.0	Nil

Late pregnancy haemorrhage (APH and PPH) accounted for 31.8% of near miss events. These events caused cardiovascular dysfunction in 22cases(33.3%) ,neurological dysfunction in 16 (24.2%) cases, respiratory dysfunction in 8 cases(12.1%) and uterine dysfunction leading to hysterectomy in 6 cases (9.1%). Thus eclampsia is the single most common complication in the near miss cases. Some cases had combination of more than one of these complications. Eclampsia and anaemia was the common combination with a poor prognosis.

In the mortality group, the most common complications were severe anaemia (non-haemorrhagic), ec-lampsia, post partum haemorrhage and puerperal sepsis responsible for 47.1%, 29.4%, 17.6% and 5.9% cases respectively.

Regarding mode of delivery or end of pregnancy in the near miss cases; most cases (54.5%) had vaginal delivery. On the other hand, 7.6% cases were undelivered. Similarly, 53% cases had live birth, 25.7% cases had still birth and 13.6% cases had abortive outcome. The hospital stay ranged from 3 days to 21 day. 45 cases (68.2%) were discharged between 5 to 10 days while 16 cases (24.2%) had a hospital stay of less than 5 days.

In the mortality group, 58.8% cases had vaginal delivery while 35.3% cases were undelivered when they died. One case died following laparotomy for ruptured ectopic pregnancy with severe anaemia in shock while no patient died following caesarean section. Similarly, 47% cases had live

birth and 11.8% cases had stillbirth. The hospital stay ranged from 30 minutes to 5 days. Most of the cases (64.7%), died within 24 hours of hospital admission indicating late diagnosis and late referral from the peripheral hospitals. No patient died after 5 days of hospital admission.

Maternal near miss indicators

The following are the results of the indicators related to maternal health derived from the study.

1. *Total woman with life threatening complication (WLTC) was 83. Maternal near miss (MNM) was 66 cases and maternal death (MD) was in 17 cases. (WLTC= MNM+MD).*
2. *Total live birth (LB) was 1567.*
3. *Maternal near miss ratio (MNMR) was 42.1/ 1000 live birth. (MNMR = MNM/LB)*
4. *Severe maternal outcome ratio (SMOR) is 52.7/1000 live birth. [SMOR = (MNM +MD) /LB].*
5. *Maternal near miss mortality ratio is 3.9:1, (MNM/MD)*
6. *Mortality index was 20.4%. [MI = MD/ (MNM+MD).*
7. *Maternal mortality rate is 1085/ 1, 00,000 live births.*

Discussion

The analysis of maternal death has long been used for the evaluation of women's health and the quality of obstetric care. The need to assess the quality of obstetric care in any centre is paramount to understand the improvement resulting from investments in its maternity services. A better assessment of obstetric care now includes near-miss cases and provides a useful tool for investigation of maternal mortality. The theory underlying this approach was described by Pattinson. "The sequence from good health to death in a pregnant woman is a clinical insult, followed by a systemic inflammatory response, organ failure and finally death. By viewing pregnancy and its potential outcomes as a continuum, beginning at normal pregnancy and concluding with maternal death, the number which can be studied meaningfully can be increased by examining the group of outcomes closest to death" [3]. Therefore study of maternal near-miss cases is now of growing importance to determine the factors related to maternal death.

The study shows that severe acute maternal outcome occur in a considerable percentage of women in this hospital. Life threatening obstetric conditions including those resulted in death complicated up to 4.8% of all deliveries during the reviewed period. This means one out of every 20 patients attended this hospital suffer from life threatening complication. This is comparable to the study showed by Rozana Mustafa and Haleema Hashmi [4]. In resource poor setting, 4 – 8% of pregnant women experience near misses and in developed world it is 1% [3]. In the study, the near-miss to maternal death ratio is 3.9:1. This indicates that for almost every 4 women who survived life threatening complications, one died. Other studies found that near miss to maternal death ratio was 5:1 and 7:1 respectively [5, 6]. This ratio is indicative of the standard of obstetric care that our hospital provides. This is in contrast to what is observed in developed countries. Studies carried in Europe [3, 7, 8] revealed a ratio of 1:117-223, whereas in Niger [9] it is 1:11 using the same criteria. The study showed that near-miss events occurred in a sizeable percentage of women. This reflects that the community is still unaware of the complications of pregnancy, as 92% of the near miss cases were unbooked. It is much higher than those of developed countries [7, 10]. However similar results were found in another study in Nigeria [5].

It has been observed that 37.9% of near miss cases occurred in the age group of 15- 20 years indicating that early marriage and pregnancy, lack of education, poverty are the root cause of these events. Similarly high incidence (47%) of maternal death also occurred in this group only. Although there is not enough data to support this, one study in Pakistan [11] showed that the mean age affected in both the group was 28 ± 5 yrs. It was observed that primiparous (58%) were equally more affected in the near-miss and mortality events than the multiparaous. This may be due to that primi cases are less aware of the pregnancy complications and seek medical help in late stages only. Moreover eclampsia is more prevalent in the primi cases which alone constituted 39.4% of all the near miss events.

This is contrary to the study shown by Prof Fehmida Shaheen [2], in Pakistan. Regarding gestational age of the affected cases, it was found that most of the complications occurred in the third trimester, intrapartum or in the post natal period. Similar results were also observed by Prof Fehmida Shaheen [2] in her study. Therefore routine antenatal check up from conception till delivery is of utmost important to prevent or detect the complication at an early stage. On the other hand, delivery by a trained person in an approved hospital alongwith timely detection and prompt management of the complication are the key factors to save the life of the patient.

Haemorrhage is the most common cause of maternal morbidity in our study, and majority has severe post partum haemorrhage, similarly reported by Prof Fehmida Shaheen[2] , Rozina Mustafa [4], and Kaye D [11]. This complication is preventable and can be managed successfully provided proper treatment protocol is followed. Maternal death due to PPH implies a poor obstetric care at the periphery level. One must also ensure timely referral of the complicated cases to tertiary care hospital to reduce the number of near miss and maternal mortality. Hypertensive disorder of pregnancy leading to severe pre-eclampsia and eclampsia is the second most leading cause of maternal near – miss and mortality similar to the findings in many previous studies [7, 12, 13]. $MgSO_4$ was used in all these cases for which case fatality rate due to eclampsia is lower than that of severe anaemia (non-haemorrhagic). Contrary to other studies [4], severe anaemia (non-haemorrhagic) leading to congestive cardiac failure and pulmonary oedema was the most common cause (47.1%) of maternal mortality in our study. It was found that the majority of these critical cases lack proper antenatal care and does not take iron- folic acid tablet in the antenatal period. Repeated childbirth, worm infestation and undiagnosed presence of Hb E trait or disease are some other contributory factors leading to severe anaemia.

In our study, maternal morbidity or mortality due to infection was small in number. One case ie. 5.8% maternal death resulted from infection, while in another study it was responsible 10.9% of all cases [14].

Organ system dysfunction was present in 78.8% of the near miss cases and in all mortality cases. Cardiovascular system, the neurological system and uterine rupture were the most common organs involved in the study. This is comparable to a study in Nigeria [5] and another study done by Gandhi [15]. Contrary to the result of these studies, there was no mortality for uterine rupture and all cases were managed successfully in our study. This implies that a good quality treatment is secured to these patients in our hospital.

The high incidence of complication following normal delivery conducted outside proves that there is still a lot to improve the maternity services at the primary level. The community health workers (ASHA), midwives and other health related personnel should do their best to create awareness in the community about pregnancy related complications. In our study, it has been observed that almost equal percentage of women affected in both the groups had vaginal delivery. There is high prevalence of still birth rate in both the groups. The poor foetal outcome implies that either it is due to the complication itself or the foetal distress was not timely diagnosed. The high prevalence of undelivered cases in the mortality group implies that majority of the cases attend the hospital in a very critical stage either in the antenatal or intra-partum period. Similarly, high incidence of mortality cases in the first 24 hours of admission also indicates it. On the other hand; those whose survived, they had a prolonged hospital stay. Although there are not enough studies to compare these events; still it is clear that these events are far more common in our community than the developed countries.

Conclusion

In summary, this study shows that besides 17 cases who died, there were another 66 cases who survived due to the treatment received in our set-up supporting the view that near-miss cases provide a larger sample to assess the threat to the maternal life. However, the overall high incidence of near-miss to maternal mortality indicates that a significant proportion of critically ill patient still die of these complications.

However, the etiological factors for both the groups were almost same. So evaluation of these circumstances surrounding near-miss can give us a lot of tools to know the exact etiology, treat it in its early stage and prevent death. From the findings of the study, attempts to reduce maternal death may be best achieved by following proper protocols for the management of eclampsia, haemorrhage and anaemia. Proper training of the health care personnel to combat these life threatening events at the grass root level and to refer it to higher centre whenever necessary is very crucial in the prevention of maternal death. On the other hand, awareness among the common population regarding importance of the routine antenatal check up is of prime importance. For this, illiteracy and poverty must be eradicated from the society to attain a healthy motherhood as well as a healthy baby.

In the present study 38 (1.9%) women were in the family with per capita income below 1000/month and 49.5% women were in the group of 1000 – 2000 per capita income. Rahman S [15] reported that in his study conducted in urban slum of Guwahati City found that 8.7% were with the per capita income of above 1000 and 70% were with the income of below 900 per capita income per month.

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