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Original Research Article

Evaluation of severe acute maternal morbidity and mortality at a tertiary referral center of Uttarakhand, India

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ABSTRACT

Background: Maternal mortality is an area of concern for the Governments across the globe. India is signatory to millennium declaration and is committed to achieving the target of millennium development goals by reducing MMR to 100. Known obstacles to reducing the MMR in developing countries, include lack of material and human resources, as well as difficulties in accessing services due to financial, geographical, and cultural limitations.

Methods: It was a descriptive cross-sectional study conducted at a tertiary care centre in Uttarakhand for a period of one year. WHO's near-miss approach was implemented for evaluation of severe maternal outcomes and to assess the quality of maternal health care.

Results: During the period of this study there were 2243 total antenatal admissions, 1675 deliveries, 1591 live births and 59 near miss cases. Prevalence of SAMM in the present study is 3.52%. Out of every 9-10 women who survived a life-threatening condition 1 died. Mortality Index is 10.17%. Maternal mortality ratio is 377.12 per 1 lakh live births. A total of 43 patients with potentially life-threatening conditions were admitted in ICU out of which 26 were near miss cases. The leading cause of near miss in this tertiary health facility is obstetric haemorrhage (45.8%).

Conclusions: Prompt identification of complications and timed intervention remains the key determinant in making mothers survive a life-threatening complication.

Keywords: Live births, Maternal mortality, SAMM

INTRODUCTION

Maternal mortality is an area of concern for the Governments across the globe. The Millennium Development Goal 5 (MDG 5) target of reducing the (MMR) maternal mortality ratio (target 5A) by three fourths between 1990 and 2015 remains a challenge.

Less than 40% of countries have a complete civil registration system with good attribution of cause of death, which is necessary for the accurate measurement of maternal mortality.^{1,2} In 1990, the estimated MMR was 437 per 10,000 live births.¹ The maternal mortality ratio (MMR) of India was 254 from 2004 to 2006, which was reduced to 200 in the year 2010. Known obstacles to

reducing the MMR in developing countries, include lack of material and human resources, as well as difficulties in accessing services due to financial, geographical, and cultural limitations.³

Recently Sustainable development goal 3: to ensure healthy lives and promote well-being for all at all ages recommends to reduce global maternal mortality ratio to less than 70 per 100,000 live births by the year 2030.⁴

METHODS

A descriptive, cross sectional study was carried out for a period of 1 year from May 2016 to April 2017 at Obstetrics and Gynecology Department of Himalayan

institute of medical sciences SRHU Dehradun. Potentially life-threatening conditions were diagnosed, and those cases which met WHO 2009 criteria for near miss were selected.

Maternal mortality during the same period was also analyzed. Near miss cases from patients presenting in Emergency and IPD of hospital with severe complications of pregnancy during the study period were recruited.

Inclusion criteria

- Women who were pregnant, in labour or who delivered or aborted up to 42 days ago arriving at health facility with any of the listed conditions or those who developed any of those conditions (organ dysfunction criteria) during their stay at the health facility were eligible.
- Cardiovascular dysfunction: Shock, cardiac arrest (absence of pulse/ heart beat and loss of consciousness), use of continuous vasoactive drugs, cardiopulmonary resuscitation, severe hypo perfusion (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 anesthesia, 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 hemorrhage or infection leading to hysterectomy.

Data collection of eligible women was done in the form designed by WHO, which was filled either at the time of admission or when they developed organ dysfunction.

The data were also collected for critical interventions. Using the collected data various maternal near-miss indicators, i.e., maternal near-miss ratio (MNMR), severe maternal outcome ratio (SMOR), maternal near-miss mortality ratio (MNM: 1MD), mortality index (MI) were calculated.

The study was approved by the institutional ethical committee.

Following indices were calculated:

Maternal near-miss ratio is the number of near-miss cases per 1,000 live births. MNMR is the ratio between maternal near-miss cases and maternal deaths. For this indicator, higher ratios indicate better care, meaning more women survived as a near miss rather than becoming maternal deaths.

Mortality index (MI) the number of maternal deaths was divided by the number of women with life-threatening conditions (maternal near-miss and maternal deaths) and was expressed as a percentage.

Higher indices indicate that more women with life-threatening conditions die (low quality of care), whereas lower indices signify better quality of care.

SMOR is the number of women with life threatening conditions per 1,000 live births. This indicator gives an estimation of the amount of care and resources that would be needed in an area or facility.

RESULTS

During the period of this study (from May 2016 to April 2017) there were 2243 total antenatal admissions and 59 near miss cases. Prevalence of SAMM in the present study is 3.52%.

It was observed that most of the cases, i.e. 45.76% belonged to the age group 26-30 years. The mean age was 28.46 years. Out of the entire study population majority (71.18%) were multipara and grand multipara (8.47%). It was seen that around 76.3% of the patients were referred from other health facilities.

Table 1: Underlying cause of SAMM (near miss and death).

Underlying cause of near miss or death	Near miss (n=59) No. (%)	Maternal death (n=6) No (%)
Pregnancy with abortive out come	12 (20.3)	0
Obstetric haemorrhage	26 (44.1)	3 (50)
Hypertensive disorder of pregnancy	7 (11.9)	0
Other obstetric disease or complication	4 (6.8)	0
Medical diseases associated with pregnancy	7 (11.9)	3 (50)
Unanticipated complications of management	3 (5.1)	0
Total	59 (100)	6 (100)

Out of the total 1675 deliveries there were 168 patients with life threatening conditions out of which 59 patients fulfilled the criteria for SAMM (severe acute maternal morbidity) which included 6 maternal deaths.

Table 1 clearly shows that Obstetric haemorrhage (which included post-partum haemorrhage, antepartum haemorrhage, rupture uterus and early pregnancy haemorrhage) was the cause for maximum number near miss cases (44.1%) and also for 50% of maternal deaths. The maximum frequency of SAMM (near miss + maternal death) was due to severe post-partum haemorrhage (27.1%), followed by 18.6% cases with haemorrhage in first trimester (ectopic and abortion) as shown in Figure 1.

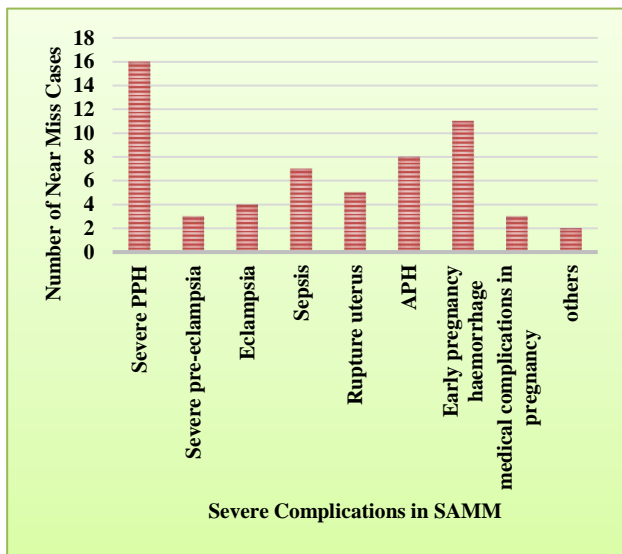


Figure 1: Severe complications in SAMM

Further as shown in Figure 2 maximum number of patients had atonic PPH. It was observed that 18 out of 59 (30.5%) patients had multiple organ involvement. Coagulation/ hematologic dysfunction attributed to maximum number of cases (32/59). Due to massive blood loss blood transfusion was required in 42 patients out of 59 (71.2%) (Figure 3).

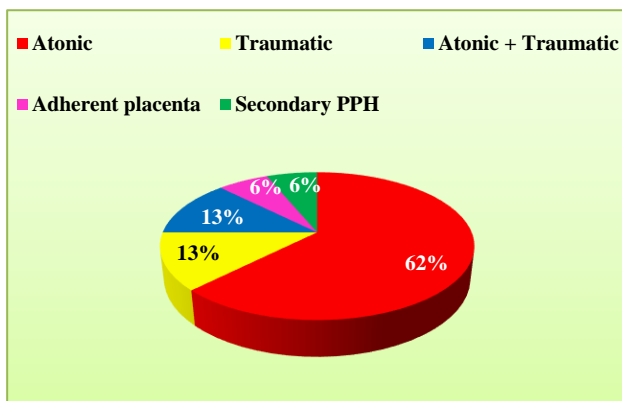


Figure 2: Causes of PPH.

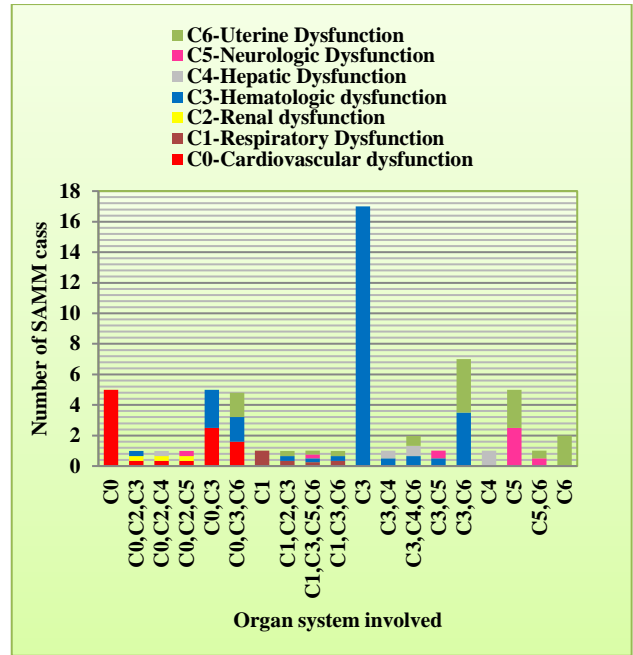


Figure 3: Organ system involvement in SAMM.

Among these 32 (54.2%) patients required massive transfusions (more than 5 units of blood and blood products). It was seen that there was more than one critical intervention required in most of the cases. Laparotomy was done in 28 cases and 19 women required Emergency hysterectomy. The indication for hysterectomy in most cases (10 out of 19) was refractory PPH. Other causes included uterine rupture, uterine perforation, scar pregnancy and cervical pregnancy. Most of the cases with life threatening complications had to stay in hospital for less than 7 days. The mean duration of stay in hospital was 8 days.

Table 2: Distribution of pregnant women by maternal outcomes and near miss indicators.

Total Antenatal admissions from May 2016 to April 2017	2243
Total number of deliveries	1675
Total number of Live births	1591
Total number of Intra uterine deaths	84
Total number of near miss cases	59
Total number of ICU admissions	43
Maternal deaths	6
Maternal near miss incidence ratio	37.08/1000 live births
Maternal near miss- Mortality ratio	9.83
Mortality Index	10.17%
Maternal mortality ratio	377.12/ 100,000 live births

It was observed that 45.8% women with SAMM gave birth to a live baby and maximum births i.e. 44.15% were at term (>36 week 6 days), 13.6% babies required admission to NICU, out of which 2 expired within a week

after birth. There were 6 maternal deaths out of 59 cases of severe maternal morbidity suggesting 1 maternal death for every 9-10 women surviving life threatening complication. Severe PPH was the cause for 50% of maternal deaths (Table 2).

DISCUSSION

Obstetric morbidity and mortality remain a major challenge in developing countries despite substantial efforts. Pregnant women's health status is not reflected by mortality indicators alone.⁵ These indicators and maternal mortality represents the tip of an iceberg; for each death, many other women survive life threatening complications during pregnancy, child birth, and the puerperium that lead to adverse degrees of sequelae.⁶ Hence the concept of severe acute maternal morbidity (SAMM) is apt for the present health providing system.⁷ Hence, new "near miss" criteria took over maternal mortality ratio. WHO criteria, 2009 are unique in considering not only clinical but also laboratory and management-based criteria.⁸ The present study was therefore undertaken to determine the prevalence of SAMM cases and to evaluate obstetrical complications and their antecedent causes which are replicated in maternal death. In this study authors adopted organ dysfunction criteria for enrolment of near miss cases. The mean age of SAMM cases was 28.46 years which was comparable to the mean age reported by Rathod Archana D et al and that stated in a Brazilian study.^{9,10} Searching through published literature, MMR bulletin 2010-12 maximum number of maternal morbidities and maternal mortalities were noted in 20-24-year age group followed closely by 25-29-year age group.¹¹ It was observed in the present study that major population of SAMM was multiparous (71.2%). Multiparity translates into various obstetric complications especially atonic PPH and its sequelae which was apparent in the present study. Souza JP et al. found similar results with around 66% of population of SAMM being multiparous.¹⁰ Whereas predominant (67.55%) population of primiparas was reported by Rathod Archana D et al.⁹ It was seen that around 76.3% of the SAMM cases were referred from other health facilities thus pointing to second delay related to accessing health care due to referral chain between facilities, and sometimes into barriers in the community, which might be physical, cultural, or financial. Remaining 23.7% patients came directly to the present institute but in a moribund state reflecting first delay, which is failure of recognition by women and their families to seek care. This could be attributed to ignorance of the community and economic constraints.¹²

Prevalence of SAMM in the present study is 3.25%. Prevalence of SAMM in other Indian studies as reported by PS Roopa et al and Pandey Amita et al was 1.77% and 9.96% respectively. In another retrospective study Rathod Archana D et al. found prevalence of near miss being 0.73%.^{9,13,14} Souza JP et al reported prevalence of near miss to be 0.94%.¹⁵ Prevalence of near miss stated by

Gupta Sangeeta et al (0.51%) was significantly less when compared to the present study and was comparable to the Brazilian study.¹⁶ Tuncalp O et al, in their systematic review of maternal near miss across 46 countries found prevalence rates of near miss varied between 0.6 and 14.98% which was highest in African countries and lowest in European countries.¹⁷ In the present study leading cause of SAMM was Obstetric hemorrhage and was responsible for 64% of near miss and 50% of maternal deaths. PPH accounted for major proportions of Obstetric hemorrhage. Rathod AD et al. also stated in her study hemorrhage as the leading cause on near miss (26.7%).⁹ In a Nigerian study it was observed that severe hemorrhage accounted for 41.3% of near miss followed by hypertensive disorders in pregnancy (37.3% cases).¹⁸ This is in contrast to a study conducted by Souza JP et al. where hypertensive disorders of pregnancy stood out as the major cause of near miss.¹⁰ Due to severe obstetric haemorrhage Blood transfusion was needed in 71.2% cases and emergency hysterectomy was contemplated in 32% women. Sangeeta Gupta et al. found results similar to present study where 73% patients required blood transfusions and 37% required emergency hysterectomy.¹⁶ Whereas a lower rate of peripartum hysterectomy was reported by Rathod (3.72%) and Souza JP et al (3.2%). Tuncalp O et al. in their systematic review of maternal near miss across 46 countries stated that 0.04-0.26% of near miss were submitted to emergency hysterectomy.¹⁷⁻¹⁹ Authors had higher incidence of peri-partum hysterectomy in the present study which is related to the fact that this institute is located in the outskirts of the city of Dehradun which amounts to delay in transportation of patients. Economic constraints also deter the patients to seek an early health care. The patients are being referred in haemorrhagic shock with variable presentation. Uterine salvage procedures- stepwise pelvic devascularisation, intrauterine packing was contemplated in these patients but due to the severity of presentation hysterectomy was eventually carried out. 44.1% of SAMM cases required admission to Intensive care unit and 47.5% patients required laparotomy for ruptured ectopic pregnancy, rupture uterus and cases of scar and cervical pregnancy. Of all the women admitted in ICU 77% were revived with aggressive management and multidisciplinary approach. A relatively low rate of ICU admission (26.7%) was reported by Rathod Archana D et al. and a much higher rate of ICU admission (62.6%) was reported by PS Roopa. O Tuncalp et al. in their systematic review reported that 0.04-4.54% of near miss were admitted in ICU.^{9,13,18} The Maternal mortality Ratio of this study is 377.12/100,000 live births. Mortality Index is 10.17% and maternal near miss to mortality ratio is 9.83:1. In a study conducted at Kasturba Hospital MMR of 313/100,000 live births and MI of 14.9% and maternal near miss to mortality ratio was 5.6: 1 was reported.¹³ In a Brazilian study by Souza JP et al. it was seen that MMR in the screened population was 170 maternal deaths per 100,000 live births, maternal near miss to mortality ratio was 5.5 and MI was 15.38. Apparently, MMR in present

study may seem high compared to our western counterparts but it is comparable to the figures reported from developing countries. As the lower Mortality index reflects better quality of care, this is seen in present study as well with 9-10 women with severe maternal complications surviving for 1 maternal death. Delayed recognition of the events by the patients, delayed referral, inadequate primary care, inappropriate transfer, inadequate utilization of resources were identifiable factors which contributed to the burden of SAMM in the present study.

CONCLUSION

Prompt identification of complications and timed intervention remains the key determinant in making mothers survive a life-threatening complication. Although facilities like promotion of institutional deliveries, 108 ambulance services, cash incentives are provided by the government but the end users especially the population residing in hilly terrains are yet to derive maximum benefit out of these. Analysis of SAMM cases at this center is an eye opener that lot remains unachieved and public and private sector need to join hands in this sector.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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