Original Research Article

Study of the cases of severe acute maternal morbidity at a tertiary care centre

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ABSTRACT

Background: Reduction in the maternal morbidity has been the key strategy towards achievement of Millennium Development Goal. Despite exhaustive measures at all levels, the decline has been slow. WHO in 2007 established a technical working group to identify cases of severe acute maternal morbidity. It served dual goals to identify the causes and pointing out delays leading to SAMM. SAMM is now an established superior indicator of surviving women's health and allows uniform comparisons. The present study was conducted with an aim to identify cases of SAMM at our centre. The objective is to determine the frequency of maternal near miss and conduct an epidemiological survey.

Methods: This retrospective study was conducted in the department of Obstetrics and Gynecology and ICU of School of Medical Sciences and Research, Greater Noida, from November 2014 to October 2017. All the cases identified as SAMM, as per WHO 2009 criteria (modified according to the local protocol), were included in the study.

Results: During the study period there were a total of 2252 delivery, out of which 2051 were live births. There were 123 SAMM cases and 47 were excluded out of study. So, study was done on 76 cases of SAMM, and on 11 maternal deaths in the study period. Calculated MNM incidence ratio was 37.05 per 1000 live births. A mortality index of 12.64% was calculated. MNM to maternal death ratio was 6.9:1. Major identifiable cause for SAMM was hypertension (35.5%)), followed by haemorrhage (18.4%). Haematologic system was the commonest organ system involved. 67.8% of the admissions were done in critical condition.

Conclusions: Maternal mortality and SAMM cases shared characteristics, and study of SAMM cases can provide an insight into the causative etiology and give time for early intervention.

Keywords: Epidemiology, Subacute maternal morbidity, Survey

INTRODUCTION

Reduction in the maternal morbidity has been the key strategy towards achievement of Millennium Development Goal.

Despite exhaustive measures at all levels, the decline has been slow, more so in low and middle-income group countries and the targets remain yet unfulfilled.[1] World Health Organisation and others have recommended that all deliveries should be attended by a skilled health care worker.[2] Such a strategy will ensure implementation of effective interventions to reduce complications that arise during pregnancy and child birth. But this seems a far cry in many countries.

Moreover, it can strain the already burdened health care economy, especially in India. So, it became imperative to identify the highest risk group and stratify them for the

level of care they should receive to reduce maternal morbidity and mortality.[3] As maternal mortality shares many pathological and circumstantial events with near miss or severe acute maternal morbidity cases, studying such cases gives a true insight into the prevailing health care standards of the society.[4]

WHO in 2007 established a technical working group to identify cases of severe acute maternal morbidity. It served dual goals to identify the causes and pointing out delays leading to SAMM.

It also encouraged uniform identifying criteria for these cases, which are not only standardised, but also reproducible for making national and international comparisons. SAMM is now an established superior indicator of surviving women's health and allows uniform comparisons.[5]

SAMM is defined as women who nearly died, but survived a complication that occurred during pregnancy, childbirth or within 42 days of the termination of the pregnancy. These near miss cases outnumber the mortality cases; so, it serves as an important complement to evaluate pitfalls in the present health care delivery system at all levels.

The global mortality ratio is 210/100,000 live births and it is around 240/100,000 births in developing countries. Currently in India MMR is 170/100,000 births, Uttar Pradesh recording the second highest numbers, ie, 292/100,000 live births.[6]

As our institute is located in Western part of Uttar Pradesh, we conducted this appraisal to determine the frequency of SAMM, MNM incidence ratio and mortality index at our centre. We also analysed the causative factors and compared the pathology with those of mortality cases.

The Aim was to determine the frequency of maternal near miss and conduct an epidemiological survey. Objectives of the present study were to establish the causes of SAMM at our centre. To calculate MNMIR, MI and MNM: MD ratio and to compare the causes of maternal mortality with that of SAMM.

METHODS

This retrospective study was conducted in the department of Obstetrics and Gynecology and ICU of School of Medical Sciences and Research, Greater Noida. The study period extended from November 2014 to October 2017. All the cases identified as SAMM, as per WHO 2009 criteria (modified according to the local protocol), were included in the study.

Ours is a tertiary care centre, and majority of the cases are referred from adjoining Government as well as Private health care set ups. Hospital has 24 hours blood bank facility and well-equipped ICU set up.

We maintain a register in the department of Obstetrics and Gynecology, in which all the cases of SAMM are entered and a pre-designed case proforma is filled by the admitting doctor.

In order to avoid bias, every case is reviewed by a single doctor so as to check the eligibility as a SAMM case. All the relevant data was collected retrospectively from this register and Medical records department.

The cases for which relevant details were unavailable, and patients who left hospital against medical advice, were excluded from analysis.

The study proforma was designed in accordance with WHO 2009 protocols (some parameters modified, detail being provided in case study proforma) and included a set of clinical, laboratory and management-based information (Table 1).

Table 1: SAMM inclusion criteria (modified WHO 2009).

Parameters	Value
HDP	BP>160/110
Anaemia	Hb <7 gm%
Renal dysfunction	Creatinine>1.2 oliguria dialysis
Hepatic dysfunction	Jaundice bilirubin>6mg/dl
Respiratory dysfunction	Acute cyanosis, tachypnoea (>30) Bradypnoea (<6) Hypoxaemia (O$_2$ saturation <90%) Inubation and mechanical ventilation
Coagulation dysfunction	No clots on bedside test, Platelet<50,000/ml >4 units transfusion of blood and products
Cardiovascular dysfunction	Shock, cardiac arrest, severe acidosis(pH<7.1) Ionotropes use Cardiopulmonary resucitation
Neurologic dysfunction	Coma >12 hours Status epilepticus Paraplegia/hemiplegia, Stroke
Uterine dysfunction	Hysterectomy due to PPH, infections

All the cases of maternal mortality were also analysed and compared with cases of SAMM.

The cases were also studied for demographic characteristics, mode of admission, booking status, gestational age at admission, pregnancy complication, mode of delivery, ICU stay and intervention and neonatal outcome. The study cohort was compared to the non-near miss cases who were admitted at the same time.

The following near miss indices were calculated.

- MNM incidence ratio refers to the number of maternal near miss cases per 1,000 live births (LB). MNM IR = MNM/LB.
- Maternal near miss: mortality ratio: Proportion between maternal near miss cases and maternal deaths. Higher ratio indicates better care. MNM: 1MD.
- Mortality index: Number of maternal deaths divided by the number of women with life threatening conditions, expressed as a percentage.
- The higher the index, more are the women with the life-threatening condition dying (low quality of care), while low index suggests better quality of health care.

RESULTS

During the study period there were a total of 2252 delivery, out of which 2051 were live births. There were 123 SAMM cases and 47 were excluded out of study. So, study was done on 76 cases of SAMM, and on 11 maternal deaths in the study period.

Calculated MNM incidence ratio was 37.05 per 1000 live births. A mortality index of 12.64% was calculated. MNM to maternal death ratio was 6.9:1 (Table 2).

Majority of the cases were in the age group of 20-34 years (53.8%), and maximum near miss events were noted in primiparous females (60.9%).

A wide majority (57.2%) were admitted through emergency as unbooked cases, while referred cases were

26.9%, and rest of the cases were booked patients at our centre. Period of gestation between 29-40 weeks was the gestational age of admission for 15.9% of the total cases, while postpartum cases accounted for 51.6% of the total SAMM cases (Table 3).

Table 2: Comparison of different studies from India.

Indices	Archana et al	Roopa et al	Kalra et al	Sisaket et al	Present study
MNMIR	7.56	17.8	4.18	57.7	37.05
MI	29.07	14.9	-	-	12.64
MNM:MD	3.43:1	5.6:1	2.01:1	-	6.9:1

**Table 3: Comparison of characteristics of Near miss and Non-near miss cases.**

Characteristics	Near miss(n), %	Non-near miss(n) %	Comparison of proportion%	95%CI	P Value
Age (years)					
<19	24 (31.6)	875(42.6)	11		0.0566
20-34	39 (51.3)	1103(53.7)	2.4	-9.44-14.34	0.6804
>35	13 (17.1)	73 (3.5)	13.6	5.87-23.99	<0.0001
Birth Order					
Primi	43(56.6)	976(47.6)	9	-3.06-20.54	0.1231
Multi	33(43.4)	1075(52.4)	9	-3.06-20.55	0.1232
Place					
Rural	57(75)	1713(83.5)	8.5	-0.879-19.86	0.0517
Urban	19(25)	338(16.5)	8.5	-0.879-19.87	0.0512
Gestation(weeks)					
<28	29(38.1)	336(16.4)	21.7	10.66-33.66	<0.0001
28-40	31(40.8)	1688(82.3)	41.5	29.49-52.76	<0.0001
Postpartum	16(20.1)				S

*test of significance: Chi Square test, p value < 0.0001= significant

Amongst the causes studied hypertensive disorders of pregnancy was the leading cause in 33.5% cases, followed by postpartum haemorrhage (20.3%) and ectopic gestation in 16.5% cases.

When contributory factors were analysed, anaemia was found in 87.8% of the cases, out of which 49.6% cases had severe anaemia Figure 1.
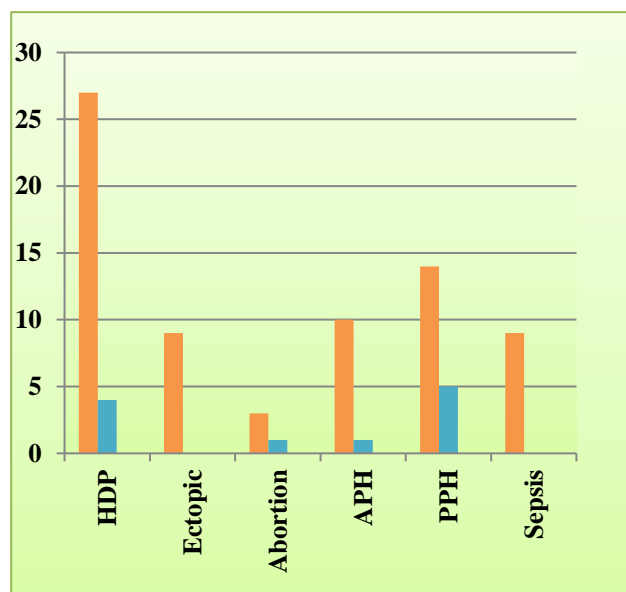
Figure 1: Comparison of the causes of SAMM and Maternal Death.

In accordance with the WHO organ dysfunction criteria, majority of the cases had coagulation/ haematologic dysfunction (29.1%), followed by renal system dysfunction. Respiratory and hepatic system failure shared equal proportions (14.47%). There were four cases of peripartum hysterectomy, two for massive atonic PPH, one for placenta percreta and one for acute uterine inversion.

Neonatal outcome

Out of 62 births in SAMM cases there were a total of 14.5% cases of still births, 60.8% of neonates were admitted to NICU for more than 24 hours.

Maternal deaths

There was a total of eleven maternal deaths during the study period.

DISCUSSION

Severe Acute Maternal Morbidity is now an established superior tool for evaluation of quality of health care provided, as well as an indicator of reproductive health status in that particular population.[5] Application of this concept has led to better understanding of cases of maternal morbidity and mortality in order to modify and improve our efforts for reducing the same.

In the present study the Maternal Near Miss Incidence Ratio was 37.05/1000 live births, which exceeds from the rates of 3-15% ascertained for low and middle-income group countries, in the WHO systematic review of SAMM.[6] Our centre caters to rural population with poor access to health care facilities and we get a lot of cases referred from adjoining health care facilities, thus further possibly explaining a higher incidence.

Studies from different parts of India have reported different incidence rates, as depicted. (Table 2).

The wide range of difference might be observed due to the different inclusion criteria used to classify SAMM cases as well as the study design. The MNMIR reported in the study conducted by Roopa et al is 17.8 per 1000 live births, who incorporated Gellar's five-point scales as their inclusion criteria.[6] Whereas Kalra P S reported 4.18/1000 live births, and they used modified WHO criteria in their study.[7] For a uniform comparison, it is recommended to use WHO criteria.

In the present study, the most common cause of SAMM was hypertensive disorders of pregnancy (severe preeclampsia and eclampsia), accounting for 35.5% of the total cases Figure 1. The result obtained is similar to the study conducted by Wanchai Wianwiset et al, who also applied WHO 2009 criteria for case study, and Jayarathnam et al and they reported PIH as the leading cause of near miss events.[8,9] Our centre receives patients which are referred from adjoining areas and usually there is a delay in transfer of such cases. Poor antenatal care awareness can be a major contributing factor to such cases as majority of such patients were seen for the first time in emergency.

Postpartum haemorrhage was the second most common underlying event for SAMM, responsible for a significant proportion (18.4%) cases (Figure 1). Obstetric haemorrhage is reported as the commonest factor in many of the previous studies, including the study done by Roopa PS et al and Siddiqui SA et al, although the latter used only disease specific criteria for case identification.[6,10] Severe maternal morbidity due to obstetric haemorrhage can have long term effects on a woman's health and impair psychological well-being too. Major PPH is a test of available resources and organisational efforts to ensure the availability of drugs and effective interventions to stop blood loss.

In a large systematic review done by Maswime and Buchmann, PPH was studied as the leading factor of SAMM, and they reported PPH as a larger contributor than APH in the overall incidence of obstetric haemorrhage.[11] In the present study also, the shared proportion of antepartum haemorrhage is less than postpartum haemorrhage, nonetheless, indicating haemorrhage to be a major killer, time and again.

Maternal characteristics found to be significantly associated with SAMM in our study, were primiparity and gestational age between 28-40 weeks. When compared to non-near miss cases, Majority of the patients

were either unbooked or referred from other health centres. Kalra et al reported the same findings of having maximum patents as unbooked and referred cases.[7] (Table 3). Coagulation/haematologic dysfunction were the primary organ function-based event leading to SAMM in the present study (Figure 2).
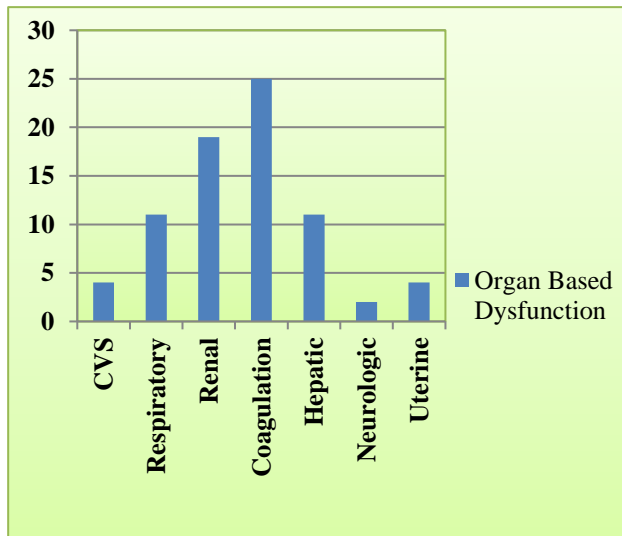
Figure 2: Organ based dysfunction

More than three units of blood and its products were transfused to 64.6% of the cases in the current study. Majority, (67.8%), of the patients were critical at the time of admission and were directly admitted to ICU in our study. These observations are similar to the study reported by Kalra P et al. The delay in diagnosis and referral has been a major contributor to maternal morbidity and mortality.

When complications associated with maternal mortality were studied, postpartum haemorrhage was the leading cause of death, followed by hypertensive disorders and abortion related complications (Figure1). Similar observations have been made by various authors in previous studies. Rathor Archana D also reported haemorrhage and septicaemia as the major contributor to maternal death.[12] In the present study, SAMM had hypertensive disorders as the primary contributor, whereas haemorrhage was the leading event for mortality cases. By and large the causative etiology of SAMM and maternal mortality is interrelated and preventable to some extent. Studying these cases of acute maternal morbidity gives an insight into the prevention of mortality.

Neonatal outcome: Out of total 57 live births in SAMM, there were a total of 16 perinatal deaths and 60.8% neonates had a prolonged NICU admission. Although the cost factor was not studied in the present study, but this definitely poses great economic burden on the parents. For studying the long-term sequel of these neonates, more prospective studies are required.

CONCLUSION

MNMIR was 37.05/1000 live births, mortality index was 12.64% and MNM: MD was 6.9:1 in the present study. Major contributors identified were hypertensive disorders of pregnancy followed by haemorrhage, and primary cause of maternal death was Postpartum Haemorrhage. Majority of the patients presented late and in critical condition, highlighting the delay in referral and poor antenatal care awareness. Delay in seeking care and referral is the bottleneck of turning events for imparting state of the art health care. Study of cases of Severe Acute Maternal Morbidity provides an accurate insight into the causative etiology of maternal death cases. WHO 2009 criteria allow a standardised approach for evaluation of these cases. However, inclusion criteria can be modified according to local protocols.

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