Severe Acute Maternal Morbidity in a Tertiary Care Centre with Basic Intermediate Respiratory Care Units Setup

Kanan A Yelikar[1], Sonali S Deshpande[2], Shubhangi F Deshmukh[3]

[1]Professor and Head, Department of Obstetrics & Gynaecology, Government Medical College & Hospital, Aurangabad, Maharashtra, India,
[2]Associate Professor, Department of Obstetrics & Gynaecology, Government Medical College & Hospital, Aurangabad, Maharashtra, India,
[3]Assistant Professor, Department of Obstetrics & Gynaecology, Government Medical College & Hospital, Aurangabad, Maharashtra, India

Abstract

Introduction: Severe acute maternal morbidity (SAMM) emerges as a new quality indicator of obstetrical care. The investigation of severe maternal morbidity (SAMM) and associated risk factors is important for the global reduction of maternal mortality.

Aims and Objectives: To study the incidence, demographic factors associated with SAMM, different clinical insults responsible for SAMM, mortality to morbidity ratio, and fetomaternal outcomes in SAMM cases.

Materials and Methods: 416 SAMM cases studied in this prospective observational, analytical cross-sectional study. Data was collected by pre-defined case report format which included maternal age, socio-economic factors, obstetric history, clinical insult responsible for SAMM, complications that prompted intensive care unit admission and required intervention, length of hospital stay, and feto-maternal outcome.

Results: In our study, eclampsia leads to the cause of SAMM followed by obstetric hemorrhage and sepsis. The etiological factor for near miss event is shifting from hemorrhage to hypertensive disorders in pregnancy. In our study, maternal mortality to morbidity ratio was 1:4.95. Mortality to morbidity ratio in these categories was 1:4.6 for eclampsia with organ dysfunction, 1:6.61 for obstetric hemorrhage and 1:2.66 for sepsis respectively. 84.4% cases required blood and blood component therapy while 50% were managed in intermediate respiratory care units. Surgical intervention was required in 23.52% cases. Mortality index of our institution was 16.8% which depends on the factors such as prior health of the mother, the severity of the clinical insult, access to skilled help, and availability of medical care.

Conclusion: Severe obstetric morbidity and its relation to mortality may be more sensitive measures of pregnancy outcome than mortality alone. The lead cause of SAMM in our study is eclampsia, therefore the future demands more research into prediction, prevention, and management of hypertensive disorders in pregnancy.

Key words: Hemorrhage, Maternal mortality, and Pregnancy

INTRODUCTION

Each year nearly 289,000 women die globally due to pregnancy related causes.[1] For each maternal death, nearly 118 women suffer from life threatening event of "severe acute maternal morbidity (SAMM)".[2] In recent World Health Organization systems review of the maternal morbidity and mortality, transfer to an intensive care unit (ICU) was taken as an indicator for assessing the prevalence of SAMM worldwide.[3]

During an international seminar held in Morocco, a SAMM was defined as "any pregnant or recently delivered or aborted woman whose immediate survival is threatened and who survives by chance or because of the hospital care received."[4]

In 2013, maternal mortality in developed country was 16 per one lakh live births and that of developing country was 230 per one lakh live births.[1] Maternal mortality in India

Corresponding Author: Dr. Shubhangi F Deshmukh, Department of Obstetrics & Gynaecology, Government Medical College & Hospital, Aurangabad, Maharashtra, India. Phone: +91-8888974194. E-mail: kshubhangi709@gmail.com

was178 per one lakh live births in 2011-2012.[5] Maternal mortality was used internationally as a measure of quality of obstetric care. Now, the focus is shifted from mortality to morbidity. There are very few case series on SAMM. Keeping this in mind, we are analyzing a series of SAMM cases in order to study the clinical insult responsible for SAMM and mortality to morbidity ratio. This type of study was designed for the first time in our institution and considered as a pilot study, representing this region of Marathwada.

Aim
To know the various causes of SAMM and its prevention.

Objectives
1. To study the demographic factors associated with SAMM cases
2. To study the different clinical insults responsible for SAMM
3. To find out mortality to morbidity ratio
4. To find out feto-maternal outcomes in SAMM cases.

MATERIALS AND METHODS

Study Design
This was prospective observational study carried out in the Department of Obstetrics and Gynaecology, Government Medical College, Aurangabad between the period of September 2011-January 2014. A total of 416 cases was studied. Approval of Ethical Institutional Review Board was taken.

Inclusion Criteria
1. Eclampsia with organ dysfunction
2. Severe obstetric hemorrhage
3. Severe sepsis.

Exclusion Criteria
1. Obstetric cases delivering uneventfully without any morbidity
2. Indirect causes of maternal mortality such as associated medical disorders, road accidents, and burn.

Methodology
The study population was selected from women admitted as an emergency for delivery. After applying inclusion and exclusion criteria, 416 SAMM cases were recruited for the study. A prospective study was performed including those SAMM cases which included:

Eclampsia with organ dysfunction
Eclampsia was defined as convulsions during pregnancy of >28 weeks of gestational age or in the first 10 days postpartum together with the following features within 24 h after convulsion; hypertension ≥170/110 mm of Hg and proteinuria +1, or more on random dip stick method or 0.3 g in 24 h urine analysis.

Eclampsia along with the organ dysfunction such as;
1. Hemolysis elevated liver enzymes low platelet count (HELP) syndrome (abnormal peripheral smear, lactate dehydrogenase >600, gamma glutaryltransferase >70I U/L, aspartate aminotransferase >70 IU/L, platelet count <1 lakh/L requiring platelet transfusion)
2. Pulmonary dysfunction (O_2 saturation <90%, PaO_2/FiO_2 ≤3)
3. Renal failure (oliguria ≤400 ml/24 h that does not respond to fluid infusion or blood urea >15 nmol/L, serumcreatinine >400 mmol/L)
4. Cerebrovascular accident (coma lasting for >12 h, or intracranial hemorrhage)
5. Disseminated intravascular coagulation (DIC) (acute thrombocytopenia, platelet <50,000/L requiring platelet transfusion with bleeding from multiple sites).

Severe obstetric hemorrhage
All cases of obstetric hemorrhage including antepartum and postpartum hemorrhage requiring massive transfusion of four, or more units of blood, or requiring surgical interventions in the form of obstetric hysterectomy, internal iliac artery ligation, and B-lynch brace sutures.

Severe sepsis
It includes the cases of puerperal sepsis, and postabortion sepsis presented with septicemic features. Signs and symptoms of sepsis are;
1. Fever (two or more temperature readings of >38°C)
2. Tachycardia (heart rate >100 beats/min)
3. Hypotension (blood pressure <100/60 mm of Hg)
4. Respiratory rate >20/min
5. White blood cell >17 × 10/L or <4 × 10
6. Bacteremia (positive blood culture or positive swab).

Data were collected which included the maternal age, socio-economic factors, obstetric history, clinical insult responsible for SAMM, and complications that prompted ICU admission and required intervention, length of hospital stay, and feto-maternal outcome. Women having more than one clinical insult were included in the group of primary etiology. e.g., eclampsia with abruption/DIC/hemorrhage was included in eclampsia. Data was collected by pre-defined case report format and results were expressed as numbers, or percentages.

RESULTS

During the study period, there were 35, 564 live births and we recruited 416 SAMM cases. Total number of maternal

deaths was 84, and hence, maternal mortality ratio (MMR) was 236 per lakh births. The incidence of SAMM was 11.69 per 1000 live births. Mortality:morbidity ratio was 1:4.95, this reflects for every maternal death there are 4.95 cases of SAMM. Mortality index was 16.8%.

Table 1 outlines the baseline characteristics of the patients. Mean age at which SAMM cases presented to our institute was 25.5 years. 47.11% of SAMM cases were multipara followed by primipara 41.34%. 76.92% of SAMM cases belonged to rural area, 82.21% cases were unbooked, and 48.07% cases belonged to Class IV of Kuppuswami's classification. 43.26% of SAMM cases were found in gestational age of 28-36 weeks while postpartum group includes 10.57% cases.

Table 2 shows distribution of mortality:morbidity ratio according to the individual cause responsible for SAMM. Mortality:morbidity ratio was least in obstetric hemorrhage group (1:6.61) that of eclampsia with the organ dysfunction was 1:4.6, and sepsis was 1:2.66. The lead cause of SAMM in our study was eclampsia with organ dysfunction (47.11%) followed by obstetric hemorrhage (41.34%) and sepsis (11.53%).

Table 3 shows the various interventions required and organ dysfunction associated with the SAMM cases. 69.53% of SAMM cases delivered vaginally followed by cesarean section (30.46%). About 83% cases required blood and blood component therapy while 50% cases managed in intermediate respiratory care units. Surgical intervention in the form of stepwise devascularization, B-lynch suture, and obstetric hysterectomy required in 23.07% cases. 62.5% of SAMM cases had hospital stay of 7-14 days. 27.88% cases belonged to HELLP syndrome followed by renal dysfunction (17.30%) and central nervous system dysfunction (14.42%).

48.30% babies were with the mother. 38.50% of neonates required neonatal ICU admission while 13.70% were still born (Table 4).

DISCUSSION

In any setting, women who develops severe acute complication during pregnancy share many pathological and circumstantial factors. While some of these women die, a proportion of them narrowly escape death. By evaluating, these SAMM cases much can be learnt about the processes in place (or lack of them) for the care of pregnant women. Our current results represented a hospital based investigation of SAMM. In our study, eclampsia (47.11%) leads the causes of SAMM followed by obstetric hemorrhage (41.34%) and sepsis (11.53%). Upadhyaya and

Table 1: Distribution of SAMM according to baseline characteristics

Baseline characteristic	Number of patients	Percentage
Age (years) (*n*=416)		
Mean age: 25.5 years		
Range: 18-38 years		
≤19	22	5.28
20-29	202	48.5
≥30	192	46.1
Parity (*n*=416)		
Nullipara (P0)	22	5
Primipara (P1)	172	41.34
Multipara (P2-P4)	196	47.11
Grandmultipara (≥P5)	26	6.25
Resident (*n*=416)		
Rural	320	76.92
Urban	96	23.07
Resistration status (*n*=416)		
Booked	74	17.70
Unbooked	342	82.21
Socioeconomic status (*n*=416)		
Class I	0	0
Class II	10	2.4
Class III	78	18.75
Class IV	200	48.07
Class V	128	30.76
State of pregnancy (*n*=416)		
<20 week	24	5.76
21-28 weeks	96	23.07
29-36 weeks	180	43.26
>36 weeks	72	17.30
Postpartum	44	10.57

SAMM: Severe acute maternal morbidity

Table 2: Distribution of mortality: Morbidity ratio according to individual clinical insults in SAMM

Cause of SAMM	Number of SAMM cases (*n*=416)	Percentage	Number of deaths	Mortality: Morbidity ratio
Eclampsia with organ dysfunction	196	47.11	40	1:4.6
Obstetric haemorrhage	172	41.34	26	1:6.61
Sepsis	48	11.53	18	1:2.66

SAMM: Severe acute maternal morbidity

Chaudhary, Moraes *et al.* and Huseyin *et al.* also reported the hypertensive disorders in pregnancy as leading cause of maternal illness.[6-8]

While Taly *et al.*, Rööst *et al.* and Manandhar *et al.* reported hemorrhage 60%, 48% and 41.66% as most common cause of SAMM respectively.[9-11] In our study, the lead cause for SAMM was eclampsia over hemorrhage, probably due to better care at community level in the form of better antenatal care, increased number of institutional delivery along with the availability of drug like misoprostol. Though there is rampant use of drugs like magnesium sulphate to control eclamptic fit at PHC and RH level, we still need to work on prediction and prevention of hypertensive disorders in pregnancy.

Table 3: Distribution of SAMM according to maternal outcome

Parameters	Number of cases	Percentage
Mode of delivery (*n*=348)*		
Vaginal	182	52.29
Instrumental (forceps/vaccum)	60	17.24
Caesarean section	106	30.46
Intervention required (*n***)		
Intensive monitoring	204	50
Mechanical ventilation	172	41.34
Vasoactive agents	52	12.5
Blood and blood component therapy	344	82.69
Surgical intervention	96	23.07
Hospital stay (*n*=416)		
<7 days	84	20.19
7-14 days	260	62.5
>14 days	72	17.30
Organ dysfunction (*n***)		
HELLP syndrome	116	27.88
Renal dysfunction	72	17.30
CNS dysfunction	60	14.42
Pulmonary dysfunction	14	3.36
DIC	24	5.76

*Mode of delivery was applicable to gestational age >20 weeks and those delivered in our institute, **As single patient had more than one complication and required more than one intervention, so total number is more than actual number of cases, HELLP: Hemolysis elevated liver enzymes low platelet count, CNS: Central nervous system, DIC: Disseminated intravascular coagulation, SAMM: Severe acute maternal morbidity

Table 4: Distribution of SAMM according to neonatal outcome

Neonatal outcome	Number of cases (*n*=348)	Percentage
Shifted with mother	168	48.30
NICU admission	133	38.50
Still birth	47	13.70

SAMM: Severe acute maternal morbidity, NICU: Neonatal intensive care unit

The incidence of SAMM in our study was 11.69 per 1000 live births. Moraes *et al.*, Ps *et al.* and Wianwiset *et al.* reported the incidence of SAMM 15, 17.8 and 57.7 per 1000 live births respectively.[7,12,13] In our study, maternal mortality to morbidity ratio was 1:4.95. This means for every maternal death, there were 4.95 cases of SAMM.

Siddiqui *et al.*,[14] Galvão *et al.*[15] and Ps *et al.*[12] reported the maternal mortality to near miss ratio 1:5.8, 1:4.5, and 1:5.6 respectively which is consistent with our study. In the present study, the disease profile for SAMM differed from that of maternal mortality as evident by though the overall incidence of SAMM was high in eclampsia with organ dysfunction however maternal deaths were common in sepsis. Most SAMM occurred within the diagnostic categories of eclampsia with organ dysfunction, obstetric hemorrhage and sepsis. Mortality to morbidity ratio in these categories was 1:4.6 for eclampsia with organ dysfunction, 1:6.61 for obstetric hemorrhage and 1:2.66 for sepsis respectively. This observation is consistent with Rööst *et al.*[10] Fatima aparecida Lotufo *et al.* reported MMR

for institution 51.6/100,000 live births, maternal near miss ratio was 4.4/1000 live births and mortality to morbidity ratio was 8.6.[16] This difference in mortality to morbidity ratio may be due to the difference in inclusion criterias and sociodemographic characteristics. Rööst *et al.* showed MMR of 187/100,000 live births and relatively low mortality index of 3.6%.[10] The mortality index gives a measure of how good the health service was with regard to managing a specific disease process. The lower the mortality index, the better the care. Mortality index of our institution was 16.8%. Galvão *et al.* and Ali *et al.* reported mortality index 18% and 19.5% respectively.[15,17] This high mortality index in our study was due to different factors such as prior health status of the mother, the severity of the clinical insult, access to skilled help, and availability of medical care.

In our study, maternal outcome was studied with respect to mode of delivery, hospital stay, intervention required along with organ dysfunction. The most common intervention was blood and blood component therapy (84.4%) followed by intensive monitoring (50%) and mechanical ventilation (37.25%). Surgical intervention was required in 23.52% cases. Siddiqui *et al.* the mean duration of hospital stay 6.17±0.58 days, and maximum stay up to 50 days.[14] Sepsis (33.33%) is the main reason for secondary morbidities and prolonging the hospital stay. Hemorrhage was the leading cause for the operative intervention. Fatima aparecida Lotufo *et al.* also reported prolonged hospital stay, high incidence blood transfusion and operative intervention in near miss event.[16] Huseyin *et al.* reported transfusion of blood products in 40% and artificial ventilation in 19.5% cases.

In our study, about half of the neonate suffered from mortality and morbidity, with take-home baby rate around 48.27%. Fatima aparecida Lotufo *et al.* also reported similar observation.[16] High perinatal morbidity and mortality were attributed to unbooked cases, preterm birth, and hypoxic insult due to eclampsia, and sepsis.

CONCLUSION

Severe obstetric morbidity and its relation to mortality may be more sensitive measures of pregnancy outcome than mortality alone. Including SAMM in maternal death audit will increase the rapidity with which the health system problem can be identified.

For meaningful comparisons to be made, standardized, simplified definitions need to be designed and agreed on as the benchmark for future research. So there is a clear need to set uniform criterias to classify SAMM. The lead cause of SAMM in our study is eclampsia, which demands more research into prediction, prevention, and management of hypertensive disorders in pregnancy.

To conclude, any pregnant woman can develop life threatening complication with little or no advance warning. All women need to access the quality maternal health services that can diagnose and manage life threatening complications. In developing countries, woman's lower socioeconomic status, poor obstetric services, and lack of emergency transfer contributes significantly to morbidity and mortality. Obstetric ICU setup with team approach consisting of treatment by obstetricians, intensive care specialists, and anesthesiologists are essential to save a maternal life. Our study recommends introduction of SAMM audit in parallel to maternal mortality audit as the causes of maternal death can be very different from the causes of SAMM. This understanding between morbidity and mortality will help in reducing substandard care and the global burden of death and long-term morbidity.

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