



REVIEW ARTICLE

CLINICAL PROFILE AND OUTCOMES OF SEVERE ACUTE MATERNAL MORBIDITIES IN A TERTIARY CARE CENTRE, BANGALORE, INDIA: A DESCRIPTIVE STUDY

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ABSTRACT

Background: Many complications can occur during pregnancy, delivery, and immediate postpartum that necessitate admission to the intensive care unit. As maternal mortality is declining in many areas of the developing world, its study alone may not be sufficient to provide information on the quality of care given. So, the emphasis is more on severe acute maternal morbidity (SAMB) or Maternal Near Miss (MNM) which has emerged as a promising alternative to maternal mortality reviews. This approach has an advantage over maternal mortality as it draws attention to the reproductive health of surviving women. **Aim:** To determine the clinical profile, predisposing clinical conditions, and outcomes of severe acute maternal morbidity. **Methods:** A descriptive study was conducted in Bangalore Baptist Hospital, Bangalore from November 2020 to June 2022. In this, data was collected about all the pregnant women and postpartum women up to 42 days of delivery who were admitted in the high-risk labour room, High Dependency Unit (HDU), and Intensive Care Unit (ICU). A total of 191 patients were enrolled and different variables were studied including demographic details, gestational age, comorbidities, Intensive care management, neonatal outcomes. Women with Life Threatening Conditions (WLTC), SAMB, and Maternal deaths (MD) were noted, and using these parameters, Severe Maternal Outcome Ratio (SMOR), Maternal Near Miss Incidence Ratio, and Mortality Index were calculated. **Results:** In 191 women with life-threatening conditions, 187 had SAMB and 4 patients succumbed to death. Most of the cases occurred in the maternal age group of 21-30 years. The majority of SAMB was due to obstetric haemorrhage that was seen in 73 patients (46.2%). This was followed by hypertensive disorders in pregnancy, which was seen in 65 patients (41.1%), and then sepsis, seen in 15 patients (15.24%). Most of them were managed by termination of pregnancy. Among them, 52.4% accounts for cesarean section. Severe Maternal Outcome Ratio was calculated to be 44.05%. Maternal Near Miss Ratio was 43.13% and Maternal Near Miss Mortality Ratio was 46.75: 1. 20.94% mortality index was achieved in the study. Out of 155 births, 128 were live births, 14 were Intrauterine deaths, 10 fresh still births, 3 early neonatal deaths. **Conclusion:** Screening for high-risk pregnancies and timely detection of severe maternal morbidity is an important step toward promoting safe obstetric care. A multidisciplinary team with good ICU care and availability of blood and blood products will decrease maternal mortality.

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INTRODUCTION

SAMB/ MNM is defined by World Health Organisation as "A woman who nearly died but survived a complication that occurred during pregnancy, child birth and within 42 days of termination of pregnancy" (1). But, as per the Definition of SAMB/ MNM even the duration of 42 days after the delivery of the child if the mother falls under medical morbidity as a result of complication arising from the childbirth directly or indirectly is also considered into SAMB (2). Globally, maternal mortality has declined from 2000- 2020 by 34 % from 342 deaths to 223 deaths per 100,000 live births, according to UN inter-agency estimates. This is one-third of the 6.4 per cent annual rate needed to achieve the Sustainable Development Goal (SDG) of 70 maternal deaths per 100,000 live births by 2030 (3). MMR in India has declined to 97 in 2018-2020 from 113 in 2016-18, 122 in 2015-17 and 130 in 2014-2016, according to the Sample Registration System, special bulletin on Maternal Mortality in India 2018-20, the highest

MMR being in Assam (4). Death reviews and inquiry into it is done worldwide to decrease the maternal mortality rate and increase the quality of care.

But there are many morbidities which are not notified as they cause the burden to the patient, family and had to be suffered throughout (5). Obstetric patients will recover when treated early. Good ICU care with monitoring can save a young productive life. In developing countries like India, this care is lacking at many places.

Intensive care units with proper facilities are still lacking. Hence many patients are being referred from different clinics. The cause of Near Miss reflects the causes of maternal death. All these are studied in detail in this study to know the number of cases of SAMM, most common causes, maternal and neonatal outcome.

MATERIALS AND METHODS

A descriptive study was conducted in Bangalore Baptist Hospital, Bangalore, India, which is a tertiary care center from November 2020 to June 2022.

The study was approved by the ethical committee (BBH/IRB/2021/10). After stabilizing the patient informed consent was obtained from the relative or legal representative. All the pregnant women irrespective of their gestational age and up to 42 days after delivery who were critically ill, who had a near-miss event before or after admission to the hospital form the study population.

Sample Size Calculation: Based on a study conducted in Ghana (6), which reported pre- eclampsia as the most common clinical presentation of SAMM (41.5%), a sample size of 191 was calculated, with an error margin of 7%.

Inclusion Criteria: All the pregnant women and postnatal women up to 42 days after delivery who were admitted into High-risk labour room, ICU (Intensive Care Unit), or HDU (High Dependency Unit) were included.

Exclusion Criteria: Brought dead pregnant women and after 42 days of postnatal women were excluded.

Procedure: A total of 191 patients were enrolled and data studied with respect to different variables including demographic details, gestational age, comorbidities, mode of delivery and management, and neonatal outcomes. Women with life-threatening conditions (WLTC), SAMM, and Maternal deaths (MD) were noted, and using these parameters, the following indices were calculated based on these parameters:

- Severe Maternal Outcome Ratio (SMOR)= (SAMM+MD) per 1000 Live births.
- Maternal Near Miss Ratio = SAMM per 1000 Live Births
- Mortality Index = MD/(SAMM+MD).

Data was collected with a semi-structured questionnaire that included information such as name, age, hospital number, booked, un-booked status, and migrated patient status, type of delivery (normal vaginal delivery, elective or emergency cesarean section), need for other surgeries, adverse effects leading to SAMM, duration of hospital stay, maternal and neonatal outcomes.

STATISTICAL ANALYSIS

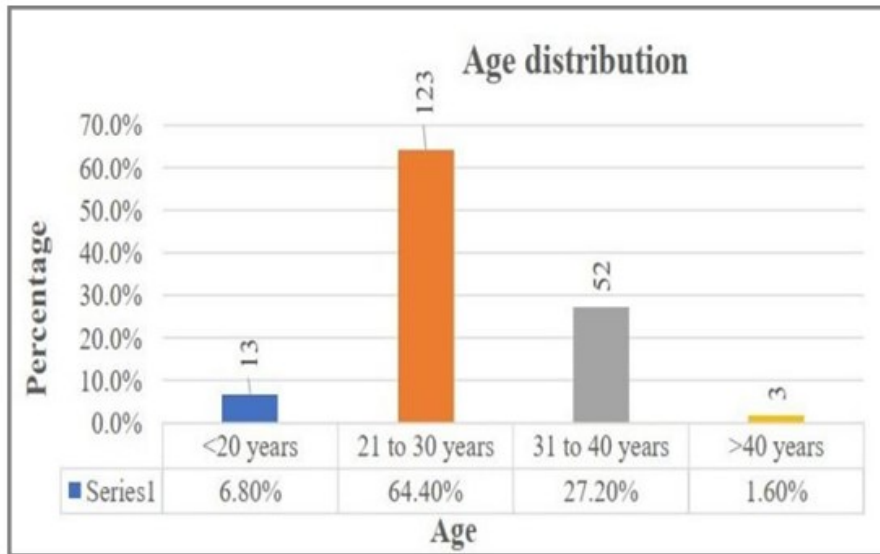
The data were entered into a Microsoft excel data sheet and analyzed using Statistical Package for Social Sciences (SPSS) 22.0 software. Categorical data were represented in the form of frequencies and proportions, while continuous data were presented as mean and standard deviation.

RESULTS

Total of 191 patients were included in the study. The total number of deliveries during the study period was 4167. The total number of live births were 4335. The total number of SAMM/MNM patients were 187 and total number of maternal deaths were four. Out of four deaths, two cases were due to sepsis and its complications, one case was due to Hypertensive disorders in pregnancy, one case was due to severe Coronavirus Disease-2019 (COVID-19) illness.

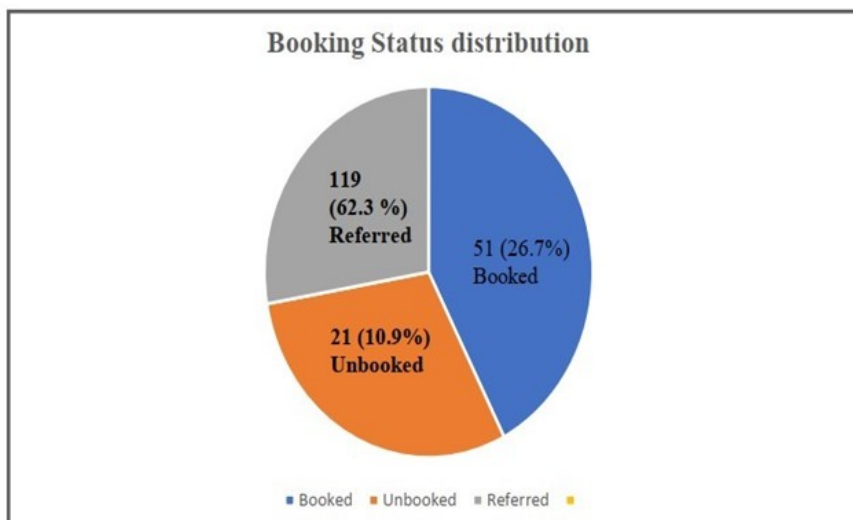
- Severe Maternal Outcome Ratio (SMOR)= (SAMM+MD) per 1000 Live births= 44.05%.
- Maternal Near Miss Incidence Ratio = SAMM per 1000 Live Births= 43.13%.
- Maternal Near Miss Mortality Ratio= 46.75: 1.
- Mortality Index = MD/(SAMM+MD) = 20.94%.

Table/Fig 1 Bar diagram showing Age distribution of subjects



Most of the cases occurred in the maternal age group of 21-30 years. (table 1)

Table/Fig 2 Pie Diagram showing Booking status distribution



Total ANC checkups who were either booked in our hospital or referred from outside hospital were 170. Un-booked patients were 21 (who presented for the first time in our hospital). (table/fig.2)

Table/Fig 3. Gestational age distribution

Gestational Age	Count	%
<12 weeks	30	15.7%
12 weeks to 19+6 weeks	7	3.7%
20 weeks to 27+6 weeks	14	7.3%
28 weeks to 33+6 weeks	41	21.5%
34 weeks to 36+6 weeks	27	14.1%
37 weeks to 41+6 weeks	29	15.2%
Postnatal period	43	22.5%
Total	148 (ANC)+ 43 (PNC)= 191	100%

Among the patients, about 22.5 % are postnatal and 21.5 % of the women are from gestational age of 28 to 33+6 weeks. (table 3)

Table/Fig 4 Obstetric Morbidity among subjects (n =158)

Obstetric Morbidity	Count	%	
Pre-Eclampsia	41	25.95%	
HELLP (Haemolysis, Elevated Liver Enzymes, Low Platelets)	6	3.8%	
Antepartum Eclampsia	10	6.33%	
Postpartum Eclampsia	7	4.43%	
Intrapartum Eclampsia	1	0.63%	
Puerperal Sepsis	7	4.43%	
AFLP (Acute Fatty Liver of Pregnancy)	1	0.63%	
Postpartum Hemorrhage (N =14)	Atonic	9	5.7%
	Traumatic	2	1.27%
	Tissue (Retained products)	3	1.9%
Abnormal placentation(N = 15)	Placenta Previa	11	6.96%
	Accreta	1	0.63%
	Increta	1	0.63%
	Percreta	2	1.27%
Abruptio Placenta	19	12.03%	
Ectopic Pregnancy (N =18)	Ruptured Tubal	13	8.23%
	Unruptured tubal	3	1.9%
	Caesarean Scar Ectopic	2	1.27%
Incomplete abortion	7	4.43%	
Peripartum Cardiomyopathy	4	2.53%	
Postop cesarean complications	3	1.9%	
Molar pregnancy	1	0.63%	
IHCP (Intra Hepatic Cholestasis of Pregnancy)	3	1.9%	
Hyperemesis gravidarum	1	0.63%	
Total	158		

Out of total 158 obstetric morbidities, there are total of 73 obstetric hemorrhages (Postpartum haemorrhage, Abnormal placentation, Abruptio placenta, Ectopic pregnancy, Incomplete abortion) which accounts for 46.2% of causes of obstetric morbidity (Table 4).

Table/Fig 5 Medical Morbidity among subjects (n= 74)

Medical Morbidities	Count	%
1. Renal (AKI-Acute Kidney Injury on CKD- Chronic Kidney Disease, Lupus Nephritis, Acute Pyelonephritis, Renal Calculi, Urosepsis, End Stage Renal Disease)	9	12.2%
2. Pulmonary (Pulmonary Edema, Acute Respiratory Distress Syndrome, Pneumonia, Pulmonary Thromboembolism)	4	5.4%
3. Cardiac (Eisenmenger's, Stress Induced Cardiomyopathy, Acute Pericarditis, Severe PAH, Rheumatic Heart Disease with Severe MS, AS)	10	13.5%
4. CNS (Acute CVA, CVT, Arnold Chiari, Aseptic Meningitis with Bilateral Papillitis, Brain Tuberculoma, SAH, Status Epilepticus)	10	13.5%
5. Hepatic (Autoimmune Hepatitis, Viral Hepatitis, Hepatic encephalopathy)	3	4.1%
6. Shock-(Septic-8, Haemorrhagic-13, Cardiogenic-1, Anaphylactic-1)	23	31.1%
7. Poisoning (Ingestion of phenol)	1	1.4%
8. Gastrointestinal (Ileocecal Tb, Peritonitis)	2	2.7%
9. AML (Acute Myeloid Leukemia)	1	1.4%
10. Cholera	1	1.4%
11. Coronavirus Disease - 2019 illness	9	12.2%
12. Dengue Haemorrhagic Fever	1	1.4%
Total	74	

Among the medical morbidities, Haemorrhagic shock with complications was the highest accounting for 13 out of 74 cases i.e., 17.6%. (Table/Fig 5).

Table/Fig 6 Mode of delivery and management

Mode of Delivery and Management	Count	%
Emergency LSCS	83	43.5%
Vaginal Delivery (Including Preterm, Instrumental, VBAC)	49	25.7%
Elective LSCS	17	8.9%
Laparotomy for ectopic pregnancy	18	9.4%
Dilatation and curettage	8	4.2%
Medical management (PPCM, Sepsis, Eclampsia, Hyperemesis gravidarum)	8	4.2%
Cesarean Hysterectomy	4	2%
Re-laparotomy	3	1.6%
Suction-evacuation	1	0.5%
Total	191	

As majority of cases were antenatal, most of them were managed by termination of pregnancy. Among them, 52.4% accounts for caesarean section. (Table/Fig 6)

Table/Fig 7. Duration of Hospital Stay distribution

Duration of Hospital Stay	Count	%
< 7 days	139	72.8%
8 to 14 days	39	20.4%
15 to 28 days	8	4.2%
>28 days or 1 month	5	2.6%
Total	191	100%

Among the patients, maximum number of patients (72.8%) stayed in hospital for less than seven days. (Table/Fig 7)

Table/Fig 8 Condition of Mother at Discharge

Condition at discharge	Count	%
Discharge Against Medical Advice (DAMA)	9	4.7 %
Death	4	2.1 %
Stable	178	93.2 %

A total of 93.2% of cases treated in our hospital were stable at the time of discharge and 2.1% were maternal deaths. (table 8)

Table/Fig 9 Neonatal Outcome

Neonatal Outcome	Count	%
Live	128	82.6%
IUD (Intra Uterine Death)	14	9%
FSB (Fresh Still Birth)	10	6.5%
END (Early Neonatal Death)	3	1.9%
Total	155	100%

Out of 191 cases, 36 underwent termination of pregnancy (18 were ectopic, seven were incomplete abortions, four terminations were due to cardiac and renal disease, two were septic abortions, one was a molar pregnancy, and four cases were lost to follow-up after treating the cause, like dengue haemorrhagic fever, cholera, Ingestion of phenol, acute pyelonephritis). Among 155 births, 128 were live births and 14 were Intrauterine deaths. Among three early neonatal deaths, only one was delivered in our hospital, the other 2 babies were delivered elsewhere. (Table/Fig 9)

DISCUSSION

In the present study, the majority (63.4%) of them were aged between 21 to 30 years of age and the mean age of the study subjects was 25.57 years. The study done by Sinha M et al. (7), Mbachu et al. (8), and Vandana et al. (9) also found the age group of maternal morbidity similar to our study findings. Whereas in the study done by Adelaja et al. (10), the mean age of the subjects was 30± 2 years of age, which may be due to differences in social factors. Research from many developing nations indicate that the majority of maternal near-miss incidents had already occurred before the women arrived at the participating hospitals. For instance, in Bolivia (11), Mozambique (12), and Somalia (13), 74%, 70% and 74.2% of near-miss cases, respectively, were in a critical condition upon reaching the medical facilities, highlighting the importance of addressing pre-hospital barriers. In the study done by Kamal et al. (14), the maternal morbidity is much higher than our study findings as 52% were critical on arrival to hospital and 80% were un-booked cases. In the present study nearly 77.5 % of the subjects were from ANC and 22.5% of them were from PNC which is consistent with the findings of the study done by Sinha M et al. (7), where 23% were from PNC and 76% were in ANC at the time of reporting. In a study by Roopa PS, et al. (15), the number of women with near-miss outcome at the gestation age of 28 weeks was 57.2%. Another study by Shrestha et al. (16), reported that pregnant women with near-miss maternal morbidity accounted for 30.5% at gestational age less than 12 weeks, 16.6% at 13-28 weeks and 27.7% at more than 28 weeks, with 25% of cases occurring in the postnatal period. Various studies suggest that near-miss maternal morbidity can occur at any gestational age but the majority are in the group with gestational age greater than 28 weeks.

Table/Fig 10 Comparison between the present study and other studies regarding outcomes of SAMM

Studies	Obstetric hemorrhages	Hypertensive disorders in pregnancy	Sepsis
Present study	46.2%	41.1%	15.24%
Roopa PS et al., (15)	44.2%	23.6%	16.3%
Bibi S, et al., (17)	-	50%	17%
Vandana and Krishnaswamy P (9)	6 %	56%	6.4%
Waterstone et al. (18)	55.6 %	38.09%	2.9%
Zwart et al. (19)	62.9%	8.69%	-
Siddiqui et al. (20)	34.2%	29.1%	35%

In the present study, obstetric hemorrhage was found to be the most common cause of maternal Morbidity followed by hypertension. The causes of SAMM in other studies is outlined in Table/fig.10. In some Indian studies by Khosla et al. (21), the Prevalence of Near Miss was 4.4% and by Chhabra, et al. (1) it was 3.3%. Data of various studies regarding MMR, Mortality Index, MNM to Mortality ratio are outlined in Table/Fig 11.

Table/Fig 11 Comparison of various studies regarding MMR, Mortality Index, MNM to Mortality ratio

Study	Maternal Near Miss to Mortality Ratio	Mortality Index	MMR
Present Study	46.8:1	20.94%	92.3 per 1 lakh live births
Roopa P S, et al. (15)	5.6:1	14.9%	313 per 1 lakh live births
Mbachu et al. (8)	11.4:1	8.8%	1908 per 1 lakh live births
Herklots et al. (22)	1.3:1	6.03%	647 per 1 lakh live births
Roost M et al. (11)	26.7:1	3.6%	187 per 1 lakh live births
Mansuri et al. (23)	3.1:1	24.23%	367 per 1 lakh live births

To enable comparison over time and between nations, inclusion criteria and case assessment techniques should be standardised. Both inadequate prenatal care and a delayed admission to the intensive care unit might impact the outcome. We can better understand the continuum from maternal illness to death by conducting an audit of SAMM patients. Maternal near miss was taken into consideration as the rate decreased in developed countries, and guidelines for choosing a patient under this category were provided by the WHO working group in due course. Evaluating healthcare facilities based on maternal near miss has proven to be equally effective. Consequently, focus has shifted from maternal mortality to maternal near miss (MNM).

Limitations: The influence of sociocultural factors among the subjects were not analysed to know the influence of those on the onset of SAMM. Longer Duration of study spanning over years and multicentric study are required to gain a better understanding of SAMM.

CONCLUSION

Obstetric hemorrhage, hypertensive disorders, and sepsis in pregnancy continue to be the most common causes of SAMM. Hence maternal morbidity and mortality can be reduced by adequate antenatal care, regular antenatal visits, institutional deliveries, postnatal care and follow-up, early detection and intervention, availability of critical care team and multidisciplinary team with good ICU care. Screening for high- risk pregnancies and timely detection of severe maternal morbidity are important steps toward promoting safe obstetric care. Reviewing cases of severe maternal morbidity and mortality can help improve the quality of care.

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Declarations

Conflicts of interest: There are no conflicts of interest.

Ethical Approval: Institutional ethical committee clearance obtained.

Informed Consent: Informed written consent obtained from all participants/ Guardian undergoing the study.

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