_____

A Study of Feto Maternal Outcome in Severe Acute Maternal Morbidity (Samm)
Bhavya YR[1], Anusha GK[2], Renukamma H[3], Sunil Kumar P[4*]

[1]Senior Gynecologist, Sri Hasanamba Hospital, K.R. Puram, Hassan, Karnataka,India
[2]Assistant Professor, Department of OBG, Shivamogga Institute of Medical Science, Shivamogga, Karnataka, India
[3]Senior Gynecologist, Chikkaballapur District Hospital, Chikkaballapur, Karnataka,India
[4]Professor, Department of Pediatrics, Adichunchanagiri Institute of Medical Science, Mandya, Karnataka,India

Abstract

Background &Objectives: Severe acute maternal morbidity (SAMM), also known as "near miss", is defined as "A very ill pregnant or recently delivered woman who would have died had it not been that luck and good care was on her side." This concept which is relatively new in maternal care identifies health system failures or priorities in maternal health more rapidly than maternal deaths. This study was undertaken to document the frequency and nature of maternal near miss and to evaluate feto maternal outcome. **Material &Methods:** It is a prospective observational study conducted at Vanivilas hospital attached to BMCRI, Bangalore. All maternal near-miss cases which occurred between January 2013 to June 2014 at or after arrival at Vanivilas Hospital who were admitted to an intensive care unit (ICU) during pregnancy or in the Puerperium which met disease specific inclusion criteria was included in study. **Results:** In the study period 115 maternal near miss cases were admitted at ICU. 73.1% patients were uneducated, 78.3% were 20-29 years age group, 53.9% were from rural area, 88.7% of women belonged to low SES, 89.6% were referred, 67.8% were near miss at arrival, 57.4% were multigravida, 58.7% had delay in seeking care and 47.9% delivered vaginally. Mean duration of ICU stay was 4 days, intensive monitoring with blood transfusion (60.9%) was the most common intervention required at ICU. Hypertensive disorders (47%) followed by hemorrhage (27%) was leading cause for SAMM. Out of 115 SAMM patients 66 were alive babies, 8 were aborted, 19 were still born, and 22 were foetal deaths. **Conclusion:** In the present study it is concluded that illiteracy, low income, late referral, delay in seeking care were nature of SAMM. Hypertensive disorders and severe hemorrhage are the leading causes of SAMM and SAMM severely affects the perinatal outcome. An urgent review of the referral system and the emergency obstetric care is highly recommended to prevent Near miss.
Keywords: Severe acute maternal morbidity; maternal near miss; intensive care.

Introduction

The Millennium Development Goal 5 (MDG 5) aimed for a three-quarter reduction in the maternal mortality ratio between 1990 and 2015. As 2015 approaches, increasing efforts have been made to improve maternal health. Despite a 47% decline in maternal mortality since 1990, it is unlikely that the MDG 5 global target will be met.[1]

The complex issues related to reproductive health such as the acute nature of obstetrics demanding skilled care and operating facilities around the clock, traditional patterns of sex roles, lack of women's empowerment, inadequate political and religious agendas, and infrastructural and economic barriers are all contributing to the slow progress for reaching the target goal number 5.[2]

India and Nigeria together accounted for a third of global maternal deaths.[3] Maternal mortality has been the indicator of measurement of maternal health and health care, and provides a measure of human and social development and of the quality of life of a population. Elevated maternal mortality is associated with other problems such as high maternal morbidity and perinatal and infant mortality.[4]

Strengthened health systems and effective maternal health care particularly to those women experiencing acute pregnancy related complications are considered the key factors for reducing maternal mortality.[5]

Despite therapeutic advances during this century and a growing perception of the safety of child birth, morbidity and mortality continue to occur in obstetric patients.[6] More than one woman dies every minute from such causes; 585,000 women die each year.[7] In addition to maternal death, women experience more than 50 million maternal health problems annually.[8] As many as 300 million women more than one quarter of all adult women living in the developing world currently suffer from short of long term illness and injuries related to pregnancy and child birth.[9] For every maternal death there are many serious life threatening complications of pregnancy. Yet relatively little attention has been given to identifying a general category of morbidity that could be called near-misses.[10]

There are however, widely recognized difficulties in the measurement of maternal mortality, including low number of deaths and large ranges of uncertainties. Furthermore, fear of blame for a women's death can affect the level of cooperation from care providers in both epidemiologic surveillance and in clinical audits. For these reasons, increased attention has been directed towards review of obstetric morbidity.[11-13]Nowadays, maternal mortality in high income countries is too rare to be used as a sensitive marker for the quality of services. Therefore, severe acute maternal morbidity (SAMM) has been introduced.A 'near-miss' used to be thought of as a case where a woman had a near brush with death; she would have died were good fortune and medical care not on her side.

*Correspondence
Dr.Sunil Kumar P
Professor, Department of Pediatrics, Adichunchanagiri Institute of Medical Science, Mandya, Karnataka,India
E-mail: drpusuku@gmail.com

_____

This characterization was also used for women with severe organ dysfunction or organ failure who survived, that is, with intensive medical intervention, a maternal death was avoided and turned into a survival. However, the term 'near-miss' is no longer used, as the 'near-miss' concept was originally derived from the aviation industry and referred more to risk management than the effect on the woman. In contrast, SAMM refers to the morbidity a woman actually suffers.

Materials and Methods

A Prospective observational study was conducted from the Department of Obstetrics and Gynecology at VaniVilasHospital which is attached to Bangalore Medical College and Research Institute, Bangalore. All maternal near-miss cases which occurred between January 2013 to June 2014 at or after arrival at Vanivilas Hospital, who were admitted to an Intensive Care Unit (ICU) during pregnancy or in the Puerperium, will be included in study. This provides a useful source of data regarding the management of obstetric emergency.

All obstetric patients are triaged at the receiving ward at the time of admission. Normal cases without any medical disorders are taken as low risk cases and admitted to Clean Labor Ward (CLW). High risk obstetric patients with medical disorders and antepartum haemorrhage are admitted to Eclampsia Labor Ward (ECLW) which is similar to High Dependency Unit (HDU). Pregnancies with abortions, referred as any type of post-partum haemorrhage, seropositive and septic cases are admitted to SajjanRao Labor Ward (SRLW). Near miss cases which were shifted to ICU from these labor wards or receiving ward, which met inclusion criteria were included in the study.

Patients were advised for:
1. Admission
2. Detailed history taking
3. Clinical examination
4. Investigations

For each case, we collected data on demographic characteristics including patient's age, area, education, socio economic status, parity, previous deliveries, antenatal details, any delay and gestational age at delivery. We also collected data on the nature of the obstetric complication(s) responsible and where it developed, delivery details, foetal outcomes, ICU admissions including length of stay, any intervention and special procedure carried out during the care of the woman to save the life of mother. The patients were followed up until the time of discharge from the hospital.

Inclusion criteria

1.   Severe preeclampsia

Blood pressure 170/110 mm of Hg on two occasions 4 hours apart or >170/110 mm of Hg once plus ≥0.3 gm proteinuria in 24 hours urine or ≥2+ proteinuria on dipstick.
Or

Diastolic blood pressure >90 mm of Hg plus proteinuria (as above) on one occasion plus one of the following signs / symptoms.
a)   Oliguria (<30 ml/hr for 2 hours)
b)   Visual disturbances (flashing lights or blurred vision)
c)   Epigastric / right upper quadrant pain or tenderness
d)   Thrombocytopenia (<100x10^9/l)
e)   Pulmonary edema

2.   Eclampsia: Convulsions during pregnancy or in the first 10 days post-partum together with atleast two of the following features within 24 hr after the convulsions.
a)   Hypertension (≥170/110 mm of Hg)
b)   Proteinuria (≥2+ on random dipstick analysis or ≥0.3 gm in 24 hr urine)
c)   Thrombocytopenia (<100x10^9/l)
d)   Increased aspartate amino transferase (≥42 units/l)

3.   HELLP syndrome: Hemolysis (abnormal peripheral smear or raised total bilirubin concentration i.e. ≥20.5μmol/l), raised liver enzyme activity i.e. raised aspartate amino transferase (≥70 units/l)) or raised gamma glutamyltransferase (≥70 units/l), and low platelet count (<100x10^9/l).

Severe haemorrhage: Estimated blood loss >1500 ml, Peripartum fall in Hb concentration ≥4 gm/dl or acute transfusion of 4 or more units of blood.

Severe sepsis: Sepsis is systemic response to infection manifested by 2 or more of the following.
a)   Temperature >38^0c or <36^0c
b)   Heart rate >100 beats/ min
c)   Respiratory rate >20 cycles/min or PaCo$_2$<32 mm of Hg
d)   White cell count >17x10^9/l or <4x10^9/l or >10% immature forms
e)   Plus bacteraemia(i.e. positive blood cultures) Or positive swab culture

Severe sepsis is sepsis associated with one of the following.
a)   Organ dysfunction – for example, acute renal failure
b)   Hypoperfusion - for example, lactic acidosis, oliguria or acute alteration in mental state
c)   Hypotension i.e. systolic blood pressure <90 mm of Hg or drop of ≥40 mm of Hg in the absence of other causes of hypotension

Uterine rupture: Acute dehiscence of the uterus leading to the emergency delivery of the infant.

Exclusion criteria: Pregnant women not willing to give consent.

Data analysis: Statistical analysis was performed using SPSS version 22 software. Results were expressed as number, percentages and Mean±SD.

Results

A total of 115 study subjects were selected for the purpose of the study after fulfilling the inclusion criteria.

Table 1: Socio Demographic Profile of the study subjects

Social Profile		Frequency	Percentage
Age Group	<19 yrs	07	6.1
	20 to 29 yrs	90	78.3
	30 to 39 yrs	17	14.8
	>40 yrs	01	0.9
Education	Uneducated	50	43.5
	Primary	34	29.6
	Higher Primary	13	11.3
	Secondary	18	15.6
Residence	Rural	62	53.9
	Urban	53	46.1
Socio Economic Status	Lower Class	102	88.7
	Middle Class	13	11.3
Parity	Primigravida	49	42.6
	Multi gravida	66	57.4

In the present study 7 patients (6.1%) were less than 19 yrs, 90 patients (78.3%) were in between 20 to 29 yrs, 17 patients (14.8%) were in between 30 to 39 yrs and 1 patient (0.9%) was more than 40 yrs. Out of 115 SAMM patients, 50 patients (43.5%) were uneducated, 34 patients (29.6%) had studied till primary, 13 patients (11.3%) had studied till higher primary and 18 patients (15.6%) had studied till secondary. 62 patients were from rural area which constitutes 53.9%. And rest 53 patients were from urban area which constitutes 46.1%. The Present study shows that 102 patients were of lower class which constitutes 88.7% and the rest 13 patients were of middle class i.e. 11.3%. But none of the patients were from upper class. Out of 115 patients, 66 patients (57.4%) were multi gravida and the rest 49 patients (42.6%) were primigravida.

Table 2: Distribution of study subjects based on SAAM Characteristics

		No of Patients	Percent
Type of Admission	Near miss after arrival	37	32.2
	Near miss at arrival	78	67.8
Referal	No	12	10.4
	Yes	103	89.6
Delay	No Delay	41	35.7
	Delay in seeking care	56	48.7
	Delay in seeking care and Transport	02	1.7
	Delay in seeking care and receiving Treatment	02	1.7
	Delay in Transport	01	0.9
	Delay in Transport and Treatment	01	0.9
	Delay in receiving Treatment	12	10.4
Causes of SAMM	Eclampsia	18	15.7
	HELLP syndrome	17	14.8
	More than one disease	04	3.5
	Rupture Uterus	16	13.9
	Severe Haemorrhage	31	27.0
	Severe Preeclampsia	19	16.5
	Severe Sepsis	10	8.7

It is observed that 78 patients had near miss before arrival to the hospital i.e. 67.8% and 37 patients had gone for near miss after arrival to the hospital i.e. 32.2%. 89.6% patients were referred from other hospital i.e. 103 patients and the rest 10.4% patients were from our hospital i.e. 12 patients. In the Present study shows 41 patients (35.7%) had no delay in seeking care, but rest 74 patients had delay. In that 56 patients (48.7%) had only delay in seeking care, 2 patients (1.7%) had delay in both seeking care and transport. 2 patients (1.7%) had delay in both seeking care and receiving treatment, 1 patient (0.9%) had delay in only transport, 1 patient (0.9%) had delay in transport and treatment and the rest 12 patients (10.4%) had delay in treatment. severe haemorrhage was seen in 31 patients (27%), followed by severe preeclampsia seen in 19 patients (16.5%), and then by eclampsia seen in 18 patients (15.7%). HELLP syndrome in 17 patients (14.8%), Rupture uterus is seen in 16 patients (13.9%), severe sepsis in 10 patients (8.7%) and 4 patients (3.5%) had more than one disease.

Table 3: Distribution of study subjects based on the intervention for SAMM and outcome

		No of Patients	Percent
Duration of ICU Stay	0 to 5 days	94	81.7
	6 to 10 days	19	16.5
	11 to 15 days	01	0.9
	>15 days	01	0.9
Intervention Required at ICU	Intensive monitoring	15	13.0
	Intensive monitoring and blood transfusion	70	60.9
	Intensive monitoring and inotrope support	05	4.3
	Intensive monitoring and MgSO4	16	13.9
	Intensive monitoring and ventilator support	05	4.3
	Intensive monitoring, ventilator support and blood transfusion	01	0.9
	Intensive monitoring, ventilator support and MgSO4	03	2.6
Mode of Delivery/ Termination	Caesarean Section	36	31.3
	Abortion	07	6.1
	Forceps	04	3.5
	Laparotomy	17	14.8
	Vacuum	01	0.9
	Vaginal Delivery	50	43.5
Foetal outcome	Abortion	08	7.0
	Alive	66	57.4
	Intra Uterine Death	22	19.1
	Still Birth	19	16.5

Bhavya YR *et al*   International Journal of Health and Clinical Research, 2021; 4(12):273-278
www.ijhcr.com
275

_____

94 patients (81.7%) required ICU admission for less than 5 days, 19 patients (16.5%) required ICU admission for 6 to 10 days, 1 patient (0.9%) for 11 to 15 days and 1 patient (0.9%) for more than 15 days. Out of 115 SAMM patients, 15 patients (13%) required intensive monitoring (IM), 70 patients (60.9%) required both intensive monitoring and blood transfusion (BT), 5 patients (4.3%) required both intensive monitoring and inotrope support (IS), 16 patients (13.9%) required both intensive monitoring and MgSO4, 5 patients (4.3%) required both intensive monitoring and ventilator support (VS), 1 patient required (0.9%) intensive monitoring, ventilator support and blood transfusion and 3 patients (2.6%) required intensive monitoring, ventilator support and MgSO4 at ICU. It is observed that 50 patients (43.5%) had vaginal delivery, 36 patients (31.3%) had caesarean section, 17 patients (14.8%) had laparotomy, 7 patients (6.1%) had abortion, 4 patients (3.5%) had forceps and 1 patient (0.9%) had vacuum delivery as mode of termination.66 babies (57.4%) are alive, 22 babies (19.1%) were intra uterine death, 19 babies (16.5%) were still birth and 8 babies (7%) were aborted.

Table 4: Complications in SAMM

Complications	No of Patients	Percent
Abruption	01	0.9
Acute Kidney Injury	04	3.5
Bowel &Bladder Injury	01	0.9
Bladder Atony	01	0.9
Disseminated Intravascular Coagulation	01	0.9
Peripartum Hysterectomy (Loss of Fertility)	10	7.8%
No Residual Morbidity	90	79.1
Pneumonia	01	0.9
Post-Partum Psychosis	03	2.6
Peripartum Cardiomyopathy	01	0.9
Vocal Cord Paeresis	01	0.9
Wound Gape	01	0.9
Total	115	100.0

In the present study, out of 115 patients, 90 patients (79.1%) had no residual morbidity and 24 had complications. Among 24, 1 had abruption (0.9%), 4 had acute kidney injury (3.5%), 1 had bowel and bladder injury (0.9%), 1 had bladder atony (0.9%), 1 had Disseminated Intravascular Coagulation (DIC) (0.9%), 10 had Peripartum hysterectomy (7.8%), 1 had pneumonia (0.9%), 3 had postpartum psychosis (2.6%), 1 had Peripartum cardiomyopathy (0.9%), 1 had Vocal cord paeresis (0.9%) and 1 patient had wound gape (0.9%).

Table 5: Maternal Indices in our study

Maternal outcome	Present study
No of Deliveries	17,780
Total number of Maternal Near Miss Cases	115
Total number of Maternal Deaths	69
Maternal Mortality Ratio	387
Maternal Near Miss Incidents Ratio	6.4
Maternal Near Miss to Mortality Ratio	1.667:1
Mortality Index	37.5%

During the study period, no of deliveries were 17,780. The total number of maternal deaths was 69.

Discussion

In our study the disease specific criteria with 6 conditions namely severe preeclampsia, eclampsia, HELLP syndrome,severe haemorrhage, uterine rupture, sepsis were chosen as inclusion criteria because firstly they are the leading causes of maternal mortality and secondly because they can be easily diagnosed without sophisticated equipment.[14] Studies using disease specific criteria reported a higher percentage of near miss cases and a wider range of estimates compared with other criteria (0.6-14.98%).[15]In a study by Say L et al showed prevalence rates of 0.8%-8.23% in studies using disease specific criteria, 0.38%-1.09% in organ system based criteria and 0.01%-2.99% using management based criteria.[16] Hence near miss cases which met disease specific criteria admitted to ICU were chosen to increase the specificity.

In our study majority of study group were uneducated or had only fundamental education. Study by Lori JR et al showed majority of women had no Education (56.5%) in Liberia, West Africa.[17] Study by Souza JP et al on Maternal morbidity and near miss in the community: findings from the 2006 Brazilian demographic survey showed a significantly increased risk of maternal near miss among women with low level of education.[18]

In our study majority of SAMM patients were in between 20 to 29 yrs and mean age is 26.9 years. On average in women with severe morbidity in a study by Zhang WH et al had higher mean age 29.1 years and higher proportion of women aged 35 years and older**.**[14]Study by Lori JR et al showed a mean age 25 years with greatest number between 20 and 24 years (29.4%).[17] Study by Souza JP et al showed a significantly increased risk of maternal near miss among women with age> 40 yrs.[18] Our study findings pertaining to is close to Lori JR et al and Zhang WH et al study.

A study by Bibi S et al showed that 73% of SAMM patients belonged to rural areas.[19] In our study place of residence did not affect outcome of study and did not correlate with other study findings.

A study by WaterstoneM et al showed that main predictors of severe maternal morbidity were poor housing, low income, living alone, unbooked, unwanted pregnancy, drug or alcohol dependency.[20] Therefore our study finding of majority of women from low socioeconomic status is a main predictor of SAMM. In a study by Khan T et alof near miss cases at ICU at New Delhi 70% were low SES.[21] Our study correlates with the study done by WaterstoneM et al[20] and Khan T et al.[21]

_____

_____

In a study by Supraja Sharma has shown that a major reason that Tamil Nadu has a lower maternal mortality rate is because of the relatively higher autonomy of women in the state. Education and empowerment lead women to be more proactive about their own health and the health of their children. It should be a main priority of the government to get womento be more proactive and feel comfortable using government resources.[22]

The majority of women with near miss arrived at critical condition further underscores the significance of prehospital barriers even in this setting with its availability of free maternal health care. A study by Almerie Y et al showed that majority of women with near miss morbidity (93%) arrived at hospital in critical condition.[23] In a study by Khan T et al of near miss cases at ICU 72% had near miss on arrival, 28% had near miss after arrival.[21] Our findings were comparable to above study.

The majority of women experiencing near miss event (85%) were in critical condition upon arrival at hospital suggesting important delays were encountered in reaching the facility. Our findings of types of delay are comparable with above mentioned study. According to Souza JP et al the factors most related to a delay in seeking healthcare have been reported as economic status, distance to a facility, and educational level.[18]

Study by Amaral E et al showed that 48% of patients were referred, no delay was incurred in 60% cases.[24] 34.2% had delay of which majority had delay in receiving care (20%) followed by delay in seeking care (14.5%), delay in reaching institute (4.4%) and unknown. Delay in receiving care is because a particular protocol had not been adopted by that institution.

Study by Lawton B et al on preventability of SAMM showed that 75.5% of cases assessed were potentially preventable or needed improvement in care.[25] Provider factors were identified as the most frequent potentially preventable factors. The most common were diagnosis (inappropriate or delay in diagnosis or failure to recognize high risk patient) & treatment (inappropriate, delay or failure to treat).In our study vaginal delivery was the most common mode of termination in SAMM patients. And it is comparable to study done by Almerie Y et al which has vaginal delivery in 45.7% cases and caesarean section in 54.3%.[23] But the study done by Khan T et al has vaginal delivery in 21% cases and caesarean section in 70% cases.[21] The relatively short period of ICU stay compared with clinical/surgical ICU may result mainly from the transitory nature of obstetric complications which generally resolve following pregnancy. In a study by Almerie Y et al two hundred and forty five women with near-miss (27%) were admitted to ICU, with a mean stay of 3.5 days.[23] Study done by Khan T et al[21] and Oliveira AF et al[26] showed duration of ICU stay of 3.95 days and 5 days respectively. Our study is similar to the above studies.

Study by Almerie Y et al showed hypertensive disorders (52%) and hemorrhage (34%) are common causes for SAMM.[23] Similarly Roopa PS et al concluded hemorrhage (44.2%) and hypertensive disorders (23.6%) are the causes for SAMM.[27] Oliveira N et al showed that hypertensive disorders (72.7%) and hemorrhage (20.8%) are the causes of SAMM.[26]In our study majority of the babies are term appropriate for gestational age. Total 13 NICU admissions, deaths were seen in only 2 babies and it constitutes 3%. In a study by Ali AA et al stillbirths were 23.7% and early neonatal deaths were 5.9% among 152 cases of near miss woman in a rural hospital in Sudan.[28] In a study by Olivaria LC et al 19.5% were still births and 7.7% were neonatal death.[26] Souza JP et al showed an almost four times higher risk of fetal death among patients with maternal near miss when compared to women without near miss.[18] He also concluded that the babies of these patients were small for gestational age, more often required neonatal ICU admission, and had a higher risk of perinatal death.

According to Global causes of maternal death: a WHO systematic analysis by Say L et al hemorrhage followed by hypertension and sepsis are the leading causes of maternal mortality worldwide.[3]

With regard to clinical implications, we find that, despite established interventions to prevent and treat postpartum haemorrhage (eg, active management of the third stage of labor), haemorrhage remains the leading individual cause of death. With available data, it is not possible to establish whether the persistence of haemorrhage as the leading cause of death despite effective interventions is the result of a failure to implement such interventions, whether there is a shift towards antepartum haemorrhageor a shift in delivery practice such as increasing rates of caesarean sections, or whether misclassifications with regard to abortion and obstructed labor are erroneouslyincreasing the haemorrhage category. Study by Khosla AH et al showed that hypertensive disorders and sepsis were leading causes of both maternal near miss and maternal mortality.[29] Study by Roopa PS et al showed sepsis as leading cause of mortality followed by hemorrhage.[27] Our study and study by Say L et al[3] showed hemorrhage as the leading cause of maternal mortality.

Conclusion

In the present study it is concluded that illiteracy, low income, late referral, delay in seeking care were nature of SAMM. Hypertensive disorders and severe haemorrhage are the leading causes of SAMM. And SAMM severely affects the perinatal outcome.

Maternal Near Miss Analysis Provide information about obstacles leading to maternal near miss (3 Delays) and uncovering these barriers would be a beginning step to address reducing maternal morbidity and mortality. An audit of maternal near miss events should be done at regular intervals for continuing vigilance of obstetric care. Near miss analysis is worth presenting in national indices as it indicates quality of health care.

References

1. Mbizvo MT, Say L. Global progress and potentially effective policy responses to reduce maternal mortality. Int J Gynaecol Obstet. 2012;119:S9-12.
2. Women Deliver. Lancet Themed Issue, 2010.
3. Say L, Chou D, Gemmill A, Tuncalp O, Moller A, Daniels J et al. Global causes of maternal death: a WHO systematic analysis. The Lancet Global Health. 2014;2(6):323-33.
4. Magalhaes Mda C, Bustamante-Teixeira MT. Severe acute maternal morbidity: use of the Brazilian Hospital Information System. Rev Saude Publica. 2012;46(3):472-8.
5. Maine D. Detours and shortcuts on the road to maternal mortality reduction. Lancet. 2007;370:1380-2.
6. Atrash HK, Alexander S, Berg CJ. Maternal mortality in developed countries: not just a concern of the past. Obstet Gynaecol.1995;86:700-5.
7. World Health Organization/United Nations Children's Fund. Revised 1990 Estimates of Maternal Mortality: A new Approach by WHO and UNICEF. Geneva: WHO, 1996.
8. Tsui AO, Wasserheit JN,Haaga JG, eds. "Healthy pregnancy and childbearing" in Reproductive Health in Developing countries: Expanding Dimensions, Building solutions. Washington DC: National Academy Press, 1997.
9. The progress of Nations. UNICEF, New York, 1996.
10. Geller SE, Rosenberg D, Cox SM, Kilpatrick S. Defining a conceptual framework for near-miss maternal morbidity. J Am Med WomensAssoc. 2002;57(3):135-9.
11. Brace V, Penney G. Learning from adverse outcomes: a system for identification and assessment of severe maternal morbidity. Fetal Matern Med Rev. 2007;18:121-44.
12. Ronsmans C, Filippi V. In: Beyond the numbers reviewing maternal deaths and complications to make pregnancy safer. Lewis G, editor. Geneva, Switzerland: World Health Organization. Reviewing severe maternal morbidity: learning from women who survive life threatening complications, 2004, 103-23.
13. Pattinson RC, Hall M. Near-misses: a useful adjunct to maternal death enquiries. Br Med Bull. 2003;67:231-43.

_____

_____

14. Zhang WH, Alexander S,Bouvier-Colle MH, Macfarlane A. MOMS-B Group. Incidence of severe pre-eclampsia, postpartum haemorrhage and sepsis as a surrogate marker for severe maternal morbidity in a European population-based study: the MOMS-B survey. BJOG. 2005;112:89-96.

15. Tuncalp O, Hindin MJ, Souza JP, Chou D, Say L. The prevalence of maternal near miss: a systematic review. BJOG. 2012; 119(6):653-61.

16. Say L, Souza JP, Pattinson RC. WHO working group on Maternal Mortality and Morbidity classifications. Maternal near miss towards a standard tool for monitoring quality of maternal health care. Best Pract Res Clin Obstet Gynaecol. 2009;23 (3):287-96.

17. Lori JR, Starke AE. A critical analysis of maternal morbidity and mortality in Liberia, West Africa. Midwifery. 2012; 28(1):67-72.

18. Souza JP, Cecatti JG, Parpinelli MA, Sousa MH, Lago TG, Pacagnella RC et al. Maternal morbidity and near miss in the community: findings from the 2006 Brazilian Demographic Health Survey. Br J Obstet Gynaecol. 2010;117:1586-92.

19. Bibi S, Memon A, Sheikh JM, Qureshi AH. Severe acute maternal morbidity and intensive care in a public sector university hospital of Pakistan. J Ayub Med Coll Abbottabad. 2008;20(1):387-91.

20. Waterstone M, Bewley S, Wolfe C. Incidence and predictors of severe obstetric morbidity: case-control study. BMJ. 2001; 322:1089-93.

21. Khan T, Laul P, Ramzan M, Bhasin S. Clinical profile of obstetric near miss in an intensive care unit in New Delhi, India. International Journal of Gynecology and Obstetrics. 2012;119(Suppl 3):S611-12.

22. Sharma, Supraja. "Maternal Mortality in Tamil Nadu, India" 2011. Honors Theses. Paper 37.

23. Almerie Y, Almerie MQ, Matar HE, Shahrour Y, Al Chamat AA, Abdulsalam A. Obstetric near-miss and maternal mortality in maternity university hospital, Damascus, Syria: a retrospective study. BMC Pregnancy Childbirth. 2010;10:65.

24. Amaral E, Souza JP, Surita F, Luz AG, Sousa MH, Cecatti JG, Campbell O. A population-bases surveillance study on severe acute maternal morbidity (near-miss) and adverse perinatal outcomes in Campinas, Brazil: The VigimomaProject.BMC Pregnancy and Childbirth. 2011;11:9.

25. Lawton B, MacDonald EJ, Brown SA, Wilson L, Stanley J, Tait JD et al. Preventability of severe acute maternal morbidity. Am J ObstetGynecol. 2014;210(6):557.

26. Oliveira Neto AF, Parpinelli MA, Cecatti JG, Souza JP, Sousa MH. Factors associated with maternal death in women admitted to an intensive care unit with severe maternal morbidity. Int J GynaecolObstet. 2009;105:252-6.

27. Roopa PS, Verma S, Rai L, Kumar P, Pai MV, Shetty J. "Near Miss" Obstetric Events and Maternal Death in a Tertiary Care Hospital: An Audit. J Pregnancy. 2013;2013:393758.

28. Ali AA, Khojali A, Okud A, Adam GK, Adam I. Maternal near-miss in a rural hospital in Sudan.BMC Pregnancy Childbirth. 2011;11:48.

29. Khosla AH, Dahiya K, Sangwana K. Maternal mortality and 'near-miss' in rural north India. International Journal of Gynecology & Obstetrics. 2000;68:163-4.

Conflict of Interest: Nil
Source of support:Nil

_____

Bhavya YR *et al*   International Journal of Health and Clinical Research, 2021; 4(12):273-278
www.ijhcr.com
278