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A STUDY OF INCIDENCE AND DETERMINANTS OF SEVERE MATERNAL OUTCOME IN A TERTIARY CARE HOSPITAL.

Gynaecology

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ABSTRACT

BACKGROUND: Evaluation of severe maternal morbidity (SMM) and severe maternal outcome (SMO) and the quality of maternal health care using near-miss approach is popularly being used in recent years. The aim of this study was to evaluate severe maternal outcome(SMO) and its determinants using this approach.

METHODS: This was a retrospective study conducted from January 2018 to December 2019 at a tertiary care centre in Delhi. The study population included cases with severe life threatening complications in pregnancy (SMM), maternal near-miss cases(MNM) and all cases of maternal deaths. Near-miss cases were defined based on WHO criteria 2009.

RESULTS: There were a total of 17,368 live births, 216 SMM and 163 SMO (147 maternal near-misses (MNM) and 16 maternal deaths (MD) cases. The SMO ratio was 9.24 per 1000 live births and MNM mortality ratio, mortality index (MI) and maternal mortality ratio (MMR) were 9.18:1, 9.81, 90.7 per 100,000 live births respectively. 26.9% of cases had evidence of organ dysfunction on arrival or within 12 hours of hospitalization. The commonest underlying causes for SMO were obstetric haemorrhage (52.7%) followed by hypertensive disorders (15.95%). The mortality index was maximum for heart disease (50%) followed by septic abortion (33.3%).

CONCLUSION: There is a huge burden of near-miss and unmet need for better reproductive health services. Lack of desired antenatal visits and delays at different levels contribute to the disease burden. Emphasis should be on early identification and referral of women for timely management.

KEYWORDS

Severe Maternal Morbidity, Severe Maternal Outcome, Maternal Near-miss, Maternal Death

INTRODUCTION

Maternal mortality has traditionally been used as a critical measure of maternal health, however it is just the tip of iceberg; there is a huge base in the form of severe acute maternal morbidity (SAMM). For every woman who dies of pregnancy related condition, 20 or 30 others experience acute or chronic morbidity [1]. Pregnant women's health status cannot be reflected by mortality indicators alone hence the concept of severe acute maternal morbidity(SAMM) and severe maternal outcome (SMO) has been studied recently as a complement for maternal mortality and also to evaluate the quality of obstetric care in that health facility.

In life-threatening pregnancy related complication, the women experiences one of the two severe maternal outcome (SMO): she may die (maternal death) or narrowly escape death (maternal near-miss) cases [2].

Maternal death is defined as death of women during the time of pregnancy, labour and delivery or within the first 42 days after delivery/ termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

Maternal near-miss case is defined as "a woman who nearly died, but survived a complication that occurred during pregnancy, childbirth, or within 42 days of termination of pregnancy" [3,4]. Women are considered near-miss when they survive an organ dysfunction [2,5].

Women surviving life-threatening complications (MNM) have many factors in common with those who die of such complications. Most cases of SMM are preventable and can be considered a near miss for maternal mortality because without proper intervention, in some cases these conditions would lead to maternal death. In recent years the near-miss approach for maternal health is being widely used in understanding maternal mortality and morbidity patterns and health system failures in relation to obstetric care [6].

The technique of MNM identification proposed by WHO is a two-step process. First maternal cases with potentially life-threatening conditions, (SMM) which may or may not come under near-miss cases (e.g. specific complications such as severe pre-eclampsia and/ or critical interventions such as blood transfusions and intensive care unit admission) are identified and then identification of near-miss cases based on organ system dysfunction and organ-dysfunction proxies including clinical, laboratory and management criteria is done [7].

This study determines the incidence and determinants of SMM and SMO in our tertiary care hospital, using the WHO near-miss approach.

MATERIAL AND METHODS: -

This retrospective study was conducted in the Department of Obstetrics and Gynaecology in a tertiary care hospital in Delhi for a period of 24 months from January 2018 to December 2019. This hospital serves as a major referral centre for other public and private hospitals within Delhi and its nearby states.

WOMEN WERE GROUPED INTO THREE CATEGORIES:

a) Women with potentially life- threatening complications /severe maternal morbidity (SMM).
b) Women with "near-miss "events
c) Maternal deaths

The identification of severe maternal morbidity was based on diagnostic categories such as obstetrical haemorrhage, hypertensive disorders, sepsis or severe systemic infection, uterine rupture, early pregnancy complications and/or indirect causes.

Maternal Near-Miss cases were identified using WHO clinical, laboratory and/or management criteria for organ dysfunction. In addition, all mothers who died in the hospital while pregnant, during labour and delivery or within 42 days after delivery/termination of pregnancy were included in this study.

SMO – A life threatening condition (i.e., organ dysfunction) including all maternal deaths and maternal near-miss cases.

SMO12-Cases presenting with organ dysfunction or maternal death within 12 hours of hospital stay.

In the present study data was collected retrospectively from the case records in a structured proforma. Over all 216 cases of severe maternal morbidity ,147 cases of near-miss and 16 cases of maternal death were collected. For each near-miss and maternal death sociodemographic characteristics, parity, gestational age, nature of the obstetric complication, presence of organ and /or system dysfunction were collected.

THE FOLLOWING INDICES WERE CALCULATED-

1. Maternal mortality ratio (MMR) calculated per 100,000 live births
2. Severe maternal outcome ratio (SMO) per 1000 live births
3. Maternal near miss incidence ratio (MNMIR) per 1000 live births

4. Maternal near miss: Mortality Ratio-Proportion between maternal near miss cases and maternal death. Higher ratio indicates better care
5. Mortality Index-for each near miss event. It is defined as the number of maternal deaths due to a particular obstetric condition divided by the sum of near-miss morbidities and maternal deaths which resulted from this condition, expressed as a percentage. It reflects the proportion of each life-threatening obstetric condition which ended in maternal death. Higher indices indicate poor obstetric care.
6. SMO12 mortality index

Data was analysed using SPSS software version 17. The study population was characterized using descriptive statistics. The difference between proportion of two groups was analysed using chi square/fisher exact test.

RESULTS

During the study period of 24 months, there were a total of 18,367 deliveries, 17,638 live births, 216 severe maternal morbidity cases (SMM), 147 near-miss cases(MNM) and 16 maternal deaths (MD).

Demographic characteristics of women who had near-miss complications and those who died were comparable as shown in Table-2. Most of the women in each group were within the age group of 21 – 30 years and had gestational age between 29 to >=37 weeks. Most of the patients in both groups were unbooked for antenatal care. As per WHO criteria, a booked case is when the pregnant lady has had a minimum of three visits for antenatal check-ups after registration. There was no significant difference in age, parity, and booking status in the near miss events compared with maternal deaths.

Among women with potentially life-threatening conditions (SMM), haemorrhage (50%) was the most common complication, followed by medical disorders complicating pregnancy (31.3%). Post-partum haemorrhage contributed to 13.8%of all haemorrhage cases. Hypertensive disorders (Severe pre-eclampsia and eclampsia) contributed to (15.7%) amongst medical disorders complicating pregnancy followed by Severe Anaemia (13.8%) Table-3

Among near-miss cases, haemorrhage (53.7%) was the leading cause of morbidity followed by severe preeclampsia and eclampsia (14.9 %). Infection contributed to (16.3%) of cases as shown in Table-3

Most common cause of maternal death was haemorrhage (43.7%) followed by hypertensive disorders of pregnancy (25%) as presented in Table-3

The mortality index was maximum for heart disease (50%) followed by septic abortion (33.3%) Table-3

The nature of organ- system dysfunction/failure and the associated obstetric factors among the near-miss cases and maternal death are shown in Table-4. The two most commonly affected organ-system were vascular and cardiac systems.

Among the near miss- indicators analysed in our study, Severe Maternal Outcome (SMO) was seen in 163 cases, which included 147 near-miss and 16 maternal deaths. Table-5.

The Severe Maternal Outcome Ratio (SMO) was 9.24 with a Maternal Near-Miss incidence Ratio (MNMIR) of 8.33. The Maternal Near-Miss: Mortality Ratio in the study was 9.18:1. The overall Mortality index was 9.81. The SMO12 Mortality index was 9.09

Table 1: - The WHO Near Miss Criteria

Dysfunctional system	Clinical Criteria	Laboratory markers	Management based proxies
Cardiovascular	Shock Cardiac Arrest	pH < 7.1 Lactate>5mEq/ml	Use of continuous vasoactive drugs Cardio-pulmonary resuscitation
Respiratory	Acute cyanosis Gasping Respiratory rate>40 or< 6bpm	Oxygen saturation <90% ≥60 minutes PaO2/FiO2< 200 mm Hg	Intubation and ventilation not related to anaesthesia
Renal	Oliguria non responsive to fluids or diuretics	Creatinine ≥300µmol/l or≥ 3.5 mg/dl or	Dialysis for acute renal failure
Haematologic/ Coagulation	Failure to form clots	Acute severe thrombocytopenia (<50,000 platelets/ml)	Transfusion of ≥ 5 units of blood/redcells
Hepatic	Jaundice in the presence of preclampsia	Bilirubin > 100µ mol/l or >6.0 mg/dl	
Neurologic	Any loss of consciousness lasting >12 hours Stroke Uncontrollable fit/status epilepticus Total paralysis		
Alternative severity proxy			Hysterectomy following infection or haemorhhage

Table-2: - Comparison of demographic characteristic of women with Near- Miss Events and Maternal death

Demographic characteristics	Near miss Event (n=147)	Maternal death (n==16)	P value
Age (years)			0.09
<= 20	11	02	
21-25	65	03	
26-30	53	07	
31-35	16	03	
>35	02	01	
Parity			0.07
0	35	02	
1-2	70	05	
3-4	32	06	
>4	10	03	
Gestational Age			0.06
<=12	18	0	
13-28	23	03	
29-36	69	04	
>=37	13	07	
postpartum	24	02	
Booking status (%)	84	89	

Table-3 Underlying causes of severe maternal morbidity and severe maternal outcome

Event	Severe Maternal Morbidity	Severe Maternal Outcome N=163		Mortality Index
	N= 216 (%)	Maternal near-miss	Maternal deaths N= 16	
				9.81
		N=147 (%)	N= 16 (%)	
HAEMORRHAGE	108 (50.0)	79 (53.7)	07 (43.7)	8.1
Placenta previa	25 (11.5)	20 (13.6)	02 (12.5)	9.09
Abruptio	20 (9.2)	10 (6.8)	01 (6.25)	9.09
Rupture uterus	12 (5.5)	11 (7.4)	02 (12.5)	15.3
PPH	30 (13.8)	22 (14.9)	02 (12.5)	8.3
Rupture ectopic	12 (6.5)	12 (8.1)	0	---
Abortion related	09 (4.1)	04 (2.7)	0	---
MEDICAL DISORDERS	68 (31.4)	44 (29.9)	07 (43.7)	13.7

Severe Anaemia	30 (13.8)	20 (13.6)	01 (6.25)	4.7
Severe Preeclampsia	22 (10.1)	14 (9.5)	03 (18.7)	17.6
Eclampsia	12 (5.5)	08 (5.4)	01 (6.25)	11.1
Heart Disease	04 (1.8)	02 (1.3)	02 (12.5)	50.0
INFECTION	40 (18.5)	24 (16.3)	02 (12.5)	7.6
Maternal infection	20 (9.2)	16 (10.8)	0	---
P. Sepsis	10 (4.6)	04 (2.7)	01 (6.25)	20
Chorioamnionites	04 (1.8)	02 (1.3)	0	---
Septic Abortion	06 (2.7)	02 (1.3)	01 (6.25)	33.3

Table-4 Organ system dysfunction in Near-Miss events and Maternal Death

Organ-System	Near-Miss Event (n=147) %	Obstetric cause	Maternal Death (n=16) %	Obstetric cause
Cardiac (Pulmonary edema)	30 (20.4)	S. Anaemia 20 S. Preclampsia 06 Eclampsia 04	04 (25)	S. Anaemia (1) S. Preeclampsia (1) Cardiomyopathy (1) MI ,Previous H/O angioplasty (1)
Vascular	72 (48.9)	Ruptured ectopic 12 Uterine rupture 12 PPH 48	05 (31.25)	Amniotic fluid embolism (1) PPH (4)
Respiratory	09 (6.1)	Resp tract infection (9)	01 (6.25)	ARDS
Renal	10 (6.8)	P. Sepsis (4) S. Preeclampsia (3) Abruption (2) PPH (1)	02 (12.5)	S. Preclampsia- (1) Sepsis (1)
Coagulation	10 (6.8)	Jaundice (3) PPH (3) S .Thrombocytopenia (4)	04 (25)	S. Preeclampsia (1) PPH (3)
Hepatic	05 (3.4)	Jaundice in S. Preeclampsia (5)	---	
Neurologic	04 (2.7)	Eclampsia (3) TB meningitis (1)	---	
Hysterectomy	07 (4.7)	C hysterectomy (7)	----	

Table-5 Indicators of severe maternal morbidity, severe maternal out come and Near- Miss

Characteristics	Severe maternal outcome indicators
Total No. of deliveries	18,367
Total No. of live births	17,368
Women with severe maternal morbidity	216
Near- Miss	147
Maternal Deaths	16
Maternal deaths within 12 hours	04
Severe maternal outcome (Near Miss + Maternal Deaths)	163
Severe maternal morbidity Ratio (per 1000 live births)	12.4
Severe maternal outcome Ratio (per 1000 live births)	9.24
Maternal Near –Miss Incidence Ratio (MNMIR) (per 1000 live births)	8.33
Maternal Near –Miss: Mortality Ratio	9.18 : 1
Mortality Index	9.81
Maternal Mortality Ratio(per 100,000 live births)	90.7
Hospital access indicators	
SMO12	40
Proportion of SMO12 cases among all SMO cases	24.5
Maternal death among SMO12	04
SMO12 Mortality index	9.09

Mortality index: $\frac{MD}{MNM + MD}$ expressed as a percentage

SMO12: Cases presenting with organ dysfunction or maternal death within 12 h of hospital stay

DISCUSSION

Maternal mortality was used as an indicator to assess the quality of obstetric care. This indicator is vulnerable to many flaws. Maternal near-miss and maternal deaths share many characteristics and pathological features [8]. The advantage of assessing near-miss cases is that they are more frequent relative to maternal deaths and looking into the similarities, the differences and the relationship between women who died and those who survived provide more complete assessment of quality of maternal health care. In 2008, WHO recommended investigating near-miss as a benchmark tool for monitoring maternal health care and has standardised clinical, laboratory and management based criteria for diagnosis.

In the present study, maternal mortality to near miss ratio was 1:9.1. This indicates that for every 9 women who survived life threatening complications, one died. This is similar to those of other developing countries where the range is 5-12: 1 [9,10]. In contrast studies carried in Europe revealed a ratio of 1 :117-223 [11,12]. This ratio indicates the standard of obstetric care.

Our study showed the ratio of SMO and MNM incidence to be 9.24 and 8.33 per 1000 live births. This is similar to the study by Tallapureddy etal [13].

The most common severe maternal morbidity event and maternal near-miss event was haemorrhage 50% and 53.7% respectively followed by hypertensive disorders 15.7% and 14.9 respectively. The results were in accordance to various studies where haemorrhage was the most common near-miss event [14,15].

The most common cause of maternal mortality was haemorrhage (43.7%) followed by hypertensive disorders (25%).The present study revealed that a vast majority of women in the maternal death group did not receive any antenatal care during pregnancy. Most of the cases presented too late to the hospital and died shortly after admission.

Although the study showed high morbidity due to haemorrhage and anaemia (53.7% and 13.6%) respectively, their mortality index was lower than that of the other events. This is due to presence of trained personnel, 24 hours' availability of blood and blood products and strict adherence to evidence based protocols.

The mortality index was highest for heart disease (50.0) followed by septic abortion (33.3), preeclampsia (17.6) and rupture uterus (15.3).

This requires an increased level of care and early diagnosis and management.

In our study the proportion of SMO12 among all SMO cases was 24.5% (40cases) which shows that a lot of near-miss cases seek health care very late.

CONCLUSION

There is a huge burden of near-miss and unmet need for better reproductive health services. Lack of antenatal care, illiteracy, delay in decision to seek care, lack of access to adequate healthcare, delay in transfer, inadequate resource utilization is some of the causes for the severe maternal outcome in our study.

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