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Maternal Intensive Care and 'Near-miss' Mortality in Obstetrics

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OBJECTIVES – To study various causes of near-misses, and their incidence and influence on overall maternal mortality and to search the level of delay. **METHODS** – A 'near-miss' describes a patient with acute organ system dysfunction which if not treated appropriately could result in death. A prospective study was conducted on such cases treated from January 2001 to June 2001. Their sociodemographic features, causes, modes of management and ultimate outcome were evaluated and all maternal deaths during that period were analysed and compared. **RESULTS** – One hundred near-misses and 16 maternal deaths were identified. The commonest reason for near-miss were: severe hypotension (42%), pulmonary edema (23%) and emergency hysterectomy (10%). The most common initiating obstetric conditions were hemorrhage (60%), acute severe hypertension (34%) and sepsis (4%). The primary obstetric factors amongst the maternal death were: hemorrhage (43.75%), maternal disease (25.09%) and hypertension (18.79%). **CONCLUSION** – The definition of near-miss identified nearly six times as many cases as maternal deaths. The review of near-miss mortality helps delineate continuing threats to maternal health and types of support services most commenly required.

Key words : near-miss mortality, maternal mortality, intensive care

Introduction

Study of maternal near-miss cases is an accurate measure of standard of maternal case. These cases may be defined as those women requiring critical care and / or transfer to intensive care unit[1]. A "near-miss" describes a patient with an acute organ system dysfunction, which if not treated appropriately could result in death[2].

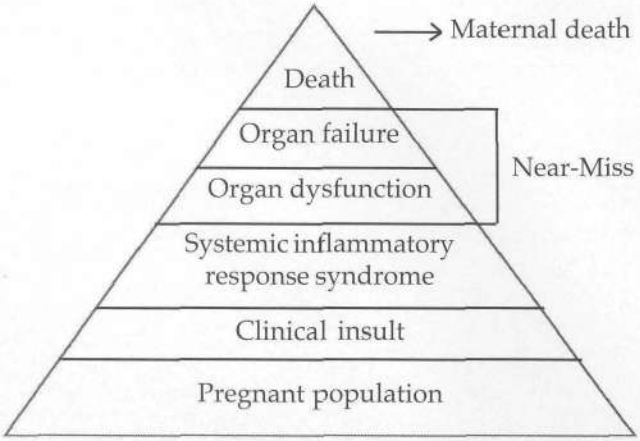

Figure 1

Fig. 1 diagramatically indicates a sequence of events in a population of pregnant women leading from good health to death. The present study was an endeavor to assess the various causes of near-miss and their influence on overall maternal mortality.

Material and Methods

This study was carried out from January 2001 to June 2001. All the cases of near-miss treated during this period were studed. Their sociodemographic featues, causes, modes of management and ultimate outcome were evaluated. All maternal deaths were analysed and compared with these cases.

Proposed clinical criteria for maternal near-miss

Organ System based	*Markers*
Cardiac dysfunction	1. Pulmonary edema necessitating intra-venous frusemide or intubation. 2. Cardiac arrest
Vascular dysfunction	1. Hypovolemia requiring ≥ 5 units whole blood or packed cells for resuscitation.
Immunological dysfunction	1. Intensive care admission for sepsis. 2. Emergency hysterectomy for sepsis.
Respiratory dysfunction	1. Intubation and ventilation for more than 60 minutes for any reason

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	other than for a general anesthesia.
	2. Oxygen saturation, on pulse oximetry, of < 90% lasting more than 60 minutes
	3. The ratio of the partial pressure of oxygen in arterial blood to the percentage of oxygen in inspired air ≤ 3 (i.e.PaO_2/ FiO_2 ≤3).
Renal dysfunction	1. Oliguria, defined as < 400 mL urine in 24 hours which does not respond to either adequate intravenous rehydration or furosemide or dopamine.
	2. Acute deterioration of blood urea to > 15 mmol/ L or of serum creatinine to > 400 mmol / L.
Liver dysfunction	1. Jaundice in the presence of preeclampsia defined as a blood pressure of ≥ 140/90 with ≥ 1 + proteinuria.
Metabolic dysfunction	1. Diabetic keto-acidosis. 2. Thyroid crisis.
Coagulation dysfunction	1. Acute thrombocytopenia requiring a platelet transfusion.
Cerebral dysfunction	1. Coma lasting > 12 hours. 2. Subarachnoid or intracerebral haemorrhage.
Management based	
Intensive care admission	1. For any reason.
Emergency hysterectomy	1. For any reason.
Anesthetic accident	1. Severe hypotension defined as a systolic pressure < 90 mmHg lasting > 60 minutes associated with a spinal or epidural anesthetic.
	2. Failed tracheal intubation requiring anesthetic reversal.

Each case of near-miss was documented with respect to :

1. Marker of severe acute maternal morbidity (SAMM) (why the case was a near-miss).
2. The primary or initiating obstetric event.
3. The organ system involved in her case.
4. Any substandard care or missed opportunities.

During the same period similar information were recorded on all maternal deaths defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of duration and site of pregnancy and from any cause related to or aggrevated by the pregnancy or its management but not from accidental or incidental causes. Data were expressed as percentages and rate per 100,000 live births.

Conversion rate – [Maternal deaths / Severe acute maternal morbidity (SAMM) + maternal deaths] x100. It reflects the proportion of women who present as near-miss and subsequently die. It also gives an indication of how successful the clinician was in treating that particular complication. Low conversion rate indicates successful treatment.

Results

Total number of obstetric admissions during study period was 9064. Out of these, 1329 were categorized as obstetric emergencies and 100 fitted the definition of near-miss. Sixteen maternal deaths occured.

The reasons for those cases being classified as near-misses are given in Table I. Sixty three percent of maternal near-misses and 89.9% of maternal deaths were referred from other centres.

The primary obstetric factors which resulted in a case of near-miss or death are shown in Table II. Organ system dysfunctions are summarized in Table III.

Table IV shows that over all conversion rate was 13.79. High conversion rate was for coagulation and respiratory dysfunction.

The presence of substandard care with respect to health care at peripheral centers from where the cases were refered and missed opportunities by the patient herself are indicated in Table V. Sixty-three percent cases of near-miss and 89.9% (14/16) cases of maternal deaths in the present study were referred. Out of which 71.42% (45/63) cases of near-misses and 64.29% (9/14) cases of maternal deaths were referred by health workers or medical practitioners at periphery with incomplete

Table I. Reasons for Being Classified as a Maternal Near-Miss

Marker	No.
Hypovolemia	42
Pulmonary edema	23
Emergency hysterectomy	10
Jaundice in presence of pre-eclampsia	9
Oliguria	6
Acute deterioration of blood urea to > 15 mmol/L	4
Intensive care admission for sepsis	3
Cardiac arrest	1
Acute thrombocytopenia	1
Anesthetic accident	1
Total	100

Table II. Primary Obstetric Factors in Maternal 'Near-Misses' and Maternal Deaths

	Near -miss cases		Maternal mortality		
Primary obstetric factor	No.	Percent	No.	Percent	Total
Hemorrhage	60	60.00	7	43.75	67
Placenta previa	22	22.00	1	6.25	23
Abruptio placenta	3	3.00	-	-	3
Postpartum hemorrhage	9	9.00	5	31.25	14
Ectopic pregnancy	12	12.00	-	-	12
Ruptured uterus	5	5.00	-	-	5
Retained placenta	3	3.00	-	-	3
Abortion	2	2.00	-	-	2
Vesicular mole	2	2.00	-	-	2
Inversion of uterus	2	2.00	1	6.25	3
Acute severe hypertension	34	34.00	3	18.75	37
Sepsis	4	4.00	2	12.50	6
Maternal medical disease	2	2.00	4	25.09	6

Table III. Organ System Dysfunction or Failure Complicating Maternal 'Near-miss' and Maternal Death

Organ involved	Near Miss		Deaths		Total	
	No.	Percentage	No.	Percentage	No.	Percentage
Vascular dysfunction (hypovolemia)	52	52.00	7	43.75	59	50.86
Cardiac dysfunction (pulmonary edema)	24	24.00	3	18.75	27	23.27
Renal dysfunction	10	10.00	0	0.00	10	8.62
Liver dysfunction	9	9.00	1	6.25	10	8.62
Immunological dysfunction	3	3.00	0	0.00	3	2.59
Coagulation dysfunction	1	1.00	3	18.75	4	3.45
Respiratory dysfunction	1	1.00	2	12.50	3	2.59
Total	100	100.00	16	100.00	116	100.00

Table IV. Comparison of Severe Acute Maternal Morbidity (Near-miss) and Maternal Deaths (Data expressed as rate/100,000 live births)

	Vascular Dysfunction	Cardiac dysfunction	Renal dysfunction	Liver dysfunction	Immunological dysfunction	Coagulation dysfunction	Respiratory dysfunction	Total
Total No. (SAMM[a] + MD[b])	1357.25	621.11	230.04	230.04	69.01	92.01	69.01	2668.47
MD[b]	161.03	69.01	0	23.00	0	69.01	46.00	368.06
Conversion Rate i.e. (MD[b] / SAMM[a] + MD[b]) x 100	11.86	11.11%	0	10.00	0	75	66.66	13.79

[a] **SAMM = Severe acute maternal morbidity**
[b] **MD = Maternal death**

Table V. Level of Delay or Avoidable Factors in Near-misses and Maternal Deaths

Level of Delay	Avoidable Factors	Near-Miss		Maternal Death	
		No.	%	No.	%
Patient problems	Money	15	15	4	25
	Ignorance	45	45	8	50
	Patient / Relative reluctance	25	25	6	37.5
Administrative problems	Transport	20	20	4	25
	Lack of blood and blood products	8	8	2	12.5
	Busy operation theatres	1	1	-	-
Substandard care	Initial assessment	3	3	2	12.5
	Problem identification	2	2	1	6.25
	Management plan	10	10	3	18.75
	Follow-up monitoring	-	-	1	6.25
Missing information		45	45	10	62.5

Many women had multiple avaidable factors

information and no records about the severity of illness and treatment received. Only 14.29% (9/63) cases of near-misses and 7.14% (1/14) cases of maternal death were referred by five doctors with full information but that too very late in moribund state. 14.29% (9/63) cases of near-misses and 28.57% (4/14) cases of maternal deaths were handled outside the hospital by unauthorized quacks and untrained dais and were referred in serious condition with no referral note.

Discussion

Near-miss mortality identified nearly six times as many cases as maternal deaths. Different studies show a large variation in Deaths: SAMM ratio viz., 1.5 (Pretoria, South Africa)[2], 1:28, (Scotland from Scottish Assessors for the confidential enquiries into maternal death, 1:19 (France)[3], 1:24 (Nova scotia)[1], 1:118 (London)[4] and 1:6 (present study). Most of the variation in the ratio described is due to different inclusion criteria, with the very high rate of near miss in London being due to a much lower threshold being used for the case definition (e.g. 1500 ml blood loss compared with 2500 ml in Pretoria and present study). Our common reasons for those in being classified as maternal near-miss were comparable with Mantel et al's[2] study.

The most common initiating obstetric conditions leading to maternal near-miss were hemorrhage (60%), acute severe hypertension (34%) and sepsis (4%). The primary obstetric factors amongst maternal deaths were hemorrhage (43.75%), maternal medical disorder (25.09%) and acute severe hypertension (18.79%). The results were in accordance with other studies[1,2,5]. Most of the cases of SAMM and of maternal mortality were preventable. Poor obstetric care and paucity of referral system in our country, ignorance, non-implementation of health care programs and non-ultilization of existing health care facilities are responsible for many deaths.

The reason for identifying the organ system dysfunction or failure in each patient is that, it gives important information with regard to identifying health care resources and skills needed to manage each case effectively.

Out of the total number of obstetrical emergencies, percentage of SAMM cases was 86.20%. Conversion rate for coagulation dysfunction and respiratory dysfunction was very high accounting for 75 and 66.7 respectively (Table IV). A large number of cases with obstetric complication were admitted because of vascular dysfunction or cardiac dysfunction with low conversion rate of 11.86 and 11.11 respectively. Such low conversion rates indicate that although hemodynamic compromise was the most common organ-system dysfunction it was not a common cause of maternal deaths. This was probably due to early and accurate diagnosis, availability of resources, expertise and good transport system. This information is important when allocating scarce resources, particularly while taking the prognosis and possible long-term morbidity into account.

The most common level of delay identified was at the patient level. Ignorance, reluctance on the part of patient/relatives, delay in transferring serious cases to health care center and lack of hard cash were major factors responsible for most of near-misses and mortalities. Missing information was also the major factor leading to delay in management of these patients.

A major advantage of studying near-miss cases is that because the woman survives, she can be interviewed after that event. This allows us proper assessment of missed opportunities, especially with respect to health administration and patient oriented factors, and to develop a maternal care audit system. If both maternal mortality and near-miss mortality are studied together, near-miss cases can act as controls.

Every obstetric unit should be able to provide initial critical care for obstetric emergencies. Management of these emergencies should be a teamwork. Only prompt and appropriate intervention can avert the catastrophy of death. Hence, there is need for an intensive care unit (ICU) in the department of obstetrics and gynecology.

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