East African Medical Journal Vol. 80 No. 3 March 2003
MATERNAL MORTALITY AND ASSOCIATED NEAR-MISSES AMONG EMERGENCY INTRAPARTUM OBSTETRIC REFERRALS IN MULAGO HOSPITAL, KAMPALA, UGANDA
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ABSTRACT

Background: **Many maternal deaths (as well as related severe morbidity) are of women who do not attend antenatal care in a given health unit but are referred there when they develop life-threatening obstetric complications.**
Objective: **To determine the reproductive characteristics of emergency obstetric referrals, and determine the contribution of emergency obstetric referrals to severe acute maternal morbidity *(near-misses)* and maternal mortality.**
Study Design. **Descriptive cross-sectional study.**
Setting: **Mulago hospital, the National Referral hospital, Kampala, Uganda, from 1st March to August 30th 2000.**
Subjects: **Nine hundred and eighty three consecutive women admitted as emergency obstetric referrals in labour or puerperium.**
Interventions: **Subjects were followed from time of admission to discharge (or death). They were interviewed (or examined) to obtain data on socio-demographic characteristics, reproductive history, obstetric outcome of the index pregnancy, obstetric complications and cause of death. Their records were reviewed to determine evidence of severe acute morbidity from acute organ/system dysfunction, using the definition by Mantel *et al.* These data were analysed using the Epilnfo computer programme in terms of means, frequencies and percentages.**
Main outcome measures: **Socio-demographic characteristics, obstetric complications, cause of deaths, cause and type of near miss mortality and case fatality rates.**
Results: **Of the 983 referrals, over 100 were *near-misses* and 17 died. Using the definition of Mantel *et al* of near-misses enabled identification of six times as many near-misses as maternal deaths. The commonest causes of death were postpartum haemorrhage and eclampsia. Low status was highly associated with both maternal deaths and *near misses*.**
Conclusion: **In developing countries, with poor obstetric services, emergency transfers in labour are very common. These women, who are of low status, contribute significantly to maternal mortality and morbidity.**

INTRODUCTION

Over 585,000 women worldwide die annually as a result of complications of pregnancy or childbirth (1). These deaths are due to, among others, haemorrhage, sepsis, obstructed labour, ruptured uterus and abortion complications(2). Maternal death can be prevented by early recognition of complications and prompt treatment through emergency obstetric care (3). Maternal death is just the tip of the iceberg. Many women survive death but suffer from severe acute morbidity, and are referred to as *near-misses.* There is no standard definition of a *near-miss.* Maine *et al.*(3) describe a near-miss using clinical criteria of morbidity from obstetric complications. Mantel *et al.*(4) proposed a definition of near-misses based on presence of acute organ/system dysfunction. This criteria uses dysfunction in the cardiac, vascular, immunological (sepsis), respiratory, renal, liver, cerebral, metabolic and coagulation organ/systems. Management-based criteria include hysterectomy for any reason and intensive care admission.

For every maternal death, 10 to 15 women suffer from disability (5,6,7). In Uganda, risk factors, causes and characteristics of maternal deaths (8,9) have been studied. Few studies mention near-misses. For most deaths, there is failure to provide prompt quality care. The determinants of maternal death and morbidity are the delay to seek care, delay to reach a health facility and delay to receive care(1,2,3). There were no data on the influence of obstetric transfers on maternal mortality or near-misses in Mulago hospital. The objective of this study was to determine the socio-demographic characteristics of emergency obstetric referrals and the contribution of referrals to n*ear-misses* and maternal mortality.

MATERIALS AND METHODS

The study was a descriptive cross-sectional study done

in Mulago hospital, the 1200-bed national referral hospital, from 1st March 2000 to 30th August 2000. The subjects were women admitted as obstetric emergencies, from home or other facilities (in labour or early puerperium). The data were collected by interview using a pre-coded questionnaire and through review of medical records.

Severe acute maternal morbidity was defined using the criteria by Mantel et al (4) by presence of acute systemic/ organ dysfunction (related to the obstetric complication or its management). According to the definition, a near-miss was a patient admitted with an obstetric complication who had any of the following:

- Cardiovascular complications (pulmonary oedema, right ventricular failure or cardiac arrest, hypovolemic shock requiring treatment with two or more litres of whole blood or more than four litres of intravenous fluids or both).
- Cerebral complications (coma, convulsions, paralysis or other acute neurological lesions).
- Renal complications (acute oliguria uraemia or anuria).
- Respiratory complications (patients requiring intubation, assisted respiration or given oxygen).
- Immunological (patients requiring laparotomy or emergency hysterectomy).
- Any obstetric patient admitted to the intensive care unit for whatever reason.

Data were collected on socio-demographic characteristics (age, parity, education level, marital status) obstetric complications by obstetric condition and by organ/system dysfunction, antenatal care attendance and pregnancy outcome. These data were analyzed using the EPI/INFO 6.04 programme, in terms of means, frequencies and percentages.

RESULTS

During the five months of the study, 983 women were admitted as emergency peripartum referrals, of whom 150 (15.3%) were self referrals, 108 (11.0%) developed severe acute maternal morbidity and 17 died, giving a case fatality rate of 17.29 per 1,000 cases. Using the criteria by Mantel *et al.*(4) which defines a near-miss according to organ/system dysfunction (Table 1), 104 near-misses were identified. In this study, prolonged labour was the commonest reason for referral and six times as many near misses as maternal deaths were identified. The commonest causes of death were postpartum haemorrhage and eclampsia.

Table 2 shows the socio-demographic characteristics. The majority were primes, with little or no formal education, aged less than 30 years with no formal employment and without any income-generating activity, thus of low status. These are indicators of low status. Such women contributed the majority of maternal deaths and "near-misses".

Table 1

Proposed clinical criteria for a maternal near-miss definition

Organ system-based	Markers
1. Cardiac dysfunction	1. Pulmonary oedema: a clinical diagnosis necessitating Intravenous furosemide or intubation
	II. Cardiac arrest
2. Vascular dysfunction	Hypovolaemia requiring ≥ units of whole blood or packed cells for resuscitation.
3 Immunological dysfunction	I Intensive care admission for sepsis
	II Emergency hysterectomy for sepsis
4. Respiratory dysfunction	I Intubation and ventilation for more than 60 min for any reason other than for a general anaesthetic
	II Oxygen saturation on pulse oximetry <90% lasting more than 60 minutes.
5. Renal dysfunction	I Oliguria (<400 ml of urine) not responding to rehydration or therapy with furosemide or dopamine
	II Acute deterioration of urea to > 15 mmol/l or of Creatinine to 400 mmol/l
6. Liver dysfunction	I Jaundice in the presence of pre-eclampsia
7. Metabolic dysfunction	I Diabetic keto-acidosis
	II Thyroid crisis
8. Coagulation dysfunction	I Acute thrombocytopenia requiring platelet transfusion
9. Cerebral dysfunction	I Coma in a patient lasting more than 12 hours
	II Subarachnoid or intracerebral haemorrhage
Management-based	
1. Intensive care admission	For any reason
2. Emergency dysfunction	For any reason
3. Anaesthetic accidents	I Severe hypertension
	II Failed tracheal intubation requiring anaesthetic reversal

(Reprinted from Mantel *et al. Severe acute maternal morbidity; a pilot study of a definition for a near-miss.* British Journal of Obstetrics and Gynaecology, September 1998, Vol 105, pp 985-990; Blackwell Publications. With kind permission from Elsevier Science).

Table 2

Socio-demographic characteristics of the emergency obstetric referrals

Characteristic		All referrals n=980 (%)	Acute maternal morbidity "Near-miss" n= 108 (%)	#Maternal deaths n=14 (%)
Age(years)	Less than 20	353 (36.0)	57 (52.8)	6 (42.9)
	20-29	552 (56.3)	19 (17.6)	2 (14.3)
	30 and more	75 (7.7)	32 (29.6)	4 (28.6)
	Mean Age	23.7	22.3	24.8
Parity	Primes	384 (39.2)	63 (58.3)	2 (14.3)
	1-4	405 (41.3)	24 (22.2)	7 (50.0)
	5 and above	191 (19.3)	21 (2.4)	5 (35.7)
	Mean parity	5.3	3.3	2.7
Education	Primary level or Nil	582 (59.4)	68 (63.0)	3 (21.4)
level	Secondary	260 (26.5)	37 (34.3)	1 (7.1)
	Tertiary	138 (14.1)	3 (2.8)	-
Marital status	Single	560 (57.1)	53 (49.1)	7 (50.0)
	Stable marital union	352 (35.9)	48 (44.4)	2 (14.3)
	Others	68 (6.9)	7 (6.5)	5 (35.7)
Age of spouse	Less than 20	164 (16.7)	76 (70.1)	4 (28.6)
	20-34	453 (46.2)	23 (21.3)	3 (21.4)
	35 and above	363 (37.02)	11 (10.2)	7 (50.0)
Education	Primary or none	210 (21.4)	51 (47.2)	7 (50.0)
level of spouse	Secondary	465 (47.4)	17 (15.7)	4 (28.6)
	Tertiary	155 (15.8)	3 (2.8)	1 (7.1)
	Don't know	150 (15.3)	37 (24.7)	2 (14.3)
Employment	Yes	160 (16.3)	39 (38.0)	3 (21.4)
status	No	820 (83.7)	67 (62.0)	11 (78.6)
Has income	Yes	356 (36.3)	23 (21.3)	4 (28.6)
generating	No	624 (63.7)	85 (78.7)	10 (71.4)
activity				

For three maternal deaths not included here, this information was not available, as they were admitted in coma and died a few hours later.

Table 3 shows the reproductive characteristics of these referrals. The majority of near-misses and maternal deaths had low antenatal care attendance, low contraceptive ever-use and little decision making power over healthcare seeking, while for many pregnancy was unplanned. All these are indicators of low status.

Table 4 shows the complications among the obstetric referrals that led to their transfer in labour or puerperium and eventual death or classification as near-misses and case fatality rates. The commonest reason for referral was prolonged labour without signs of obstruction. Obstructed labour, PROM and pre-eclampsia/eclampsia were the other common indications. Foetal indications (such as mal-presentations, big baby, cord prolapse, cord presentation and foetal distress) led to 11.7% of admissions. The commonest causes of near-miss morbidity were obstructed labour, pre-eclampsia (or eclampsia) and postpartum haemorrhage. There were also the commonest causes of maternal deaths. None of the women referred for a foetal indication became a near-miss morbidity or a maternal death. Postpartum haemorrhage and ruptured uterus had the highest case-fatality rates. The results show that emergency obstetric admissions are a major contributor of maternal deaths and near-misses.

Table 5 shows the causes of near-misses using the criteria by Mantel *et al.* (Table 1) Vascular, cerebral and immunological dysfunction were the commonest cause. The majority of these patients were admitted with ruptured uterus, eclampsia or postpartum haemorrhage. Some had multiple complications, such as PROM with obstructed labour and chorioamnionitis, antepartum haemorrhage with abruptio placenta, eclampsia with renal failure or ruptured uterus and sepsis.

Table 3

Reproductive history of the obstetric referrals

Characteristic	Present or not n=980	All referrals n=108	All "near-misses" deaths n=14	**Maternal
Contraceptive	Yes	641 (65.4)	70 (64.8)	8 (57.1)
ever-use	No	339 (34.6)	38 (35.2)	6 (42.9)
Ever had unwanted	Yes	72 (7.3)	26 (24.1)	11 (78.6)
pregnancy	No	908 (92.7)	82 (75.9)	3 (21.4)
Intended to conceive	Yes	590 (60.2)	35 (32.4)	10 (71.4)
	No	390 (39.8)	73 (67.6)	4 (28.6)
Antenatal care	3 times or less	510 (52.0)	46 (42.6)	2 (14.3)
attendance	4 times or more	214 (21.8)	29 (26.9)	4 (28.6)
	No	256 (26.1)	33 (30.6)	8 (57.1)
Decision-making	Yes	423 (43.2)	22 (20.4)	3 (21.4)
power to seek care	No	557 (56.8)	86 (79.6)	11 (78.6)
when unwell				

* For three women, this information was not obtained as they died before interview.

Table 4

Obstetric complications, cause of death and the case-fatality rates among the obstetric referrals #

Obstetric Complication	Number of referrals n (%)	Severe acute morbidity *"near-misses"* (n=107)	Maternal deaths (n=17)	Case fatality Rate
*Prolonged labour	306 (31.2)	3 (2.8)	-	-
Obstructed labour	197 (20.1)	34 (31.5)	4 (28.6)	0.020
Ruptured uterus	36 (3.7)	14 (3.0)	2 (14.3)	0.056
Antepartum haemorrhage	24 (2.4)	7 (6.5)	1 (7.1)	0.042
Postpartum haemorrhage	39 (3.8)	16 (14.8)	3 (21 4)	0.077
*PROM	133 (13.6)	1 (0.9)	-	-
Pre-eclampsia/eclampsia	87 (8.8)	18 (17.6)	3 (21.4)	0.034
**Puerperal sepsis/				
chorioamnionitis	28 (2.9)	1 (0.9)	1 (7.1)	0.036
Retained placenta	19 (1.9)	3 (2.8)	-	-
Foetal distress	67 (6.8)	-	-	-
Other foetal indications	44 (4.9)	-	-	-

*Twenty six emergency referrals had both prolonged labour and PROM (Premature rupture of membranes) without obstructed labour signs. The majority were self-referrals

**Diagnosis at admission.

Table 5

Organ systems dysfunction or failure complicating near-misses using the criteria by Mantel et al(4).

Marker	Clinical diagnosis in the Near-miss (n=104)		Maternal Deaths n=17
Vascular dysfunction (hypovolemic shock)	1. *Emergency hysterectomy for ruptured uterus	13	3
	2. Transfused more than 4 units of blood		2
Cerebral dysfunction	1. *Eclampsia with recurrent convulsions	15	2
	2. Prolonged comatose state	4	1
Immunological dysfunction	Puerperal sepsis i) Severe sepsis	21	3
	ii) pelvis abscess	7	1
Renal dysfunction	Acute renal failure	5	1
Respiratory dysfunction	Pulmonary embolism	1	1
Cardiac dysfunction	1. Congestive cardiac failure	5	-
	2. With pulmonary oedema	4	-
Coagulation dysfunction	* Abruptio placenta with disseminated coagulopathy	3	2
Admission to intensive care unit	1. Cardiac arrest	4	-
	2. Acute renal failure	2	-
	3. Recurrent convulsions	1	1

*Some patients in these groups died soon after admission, before vital information was obtained.

DISCUSSION

The criteria by Mantel *et al.* (Table 1) enabled identification of six times as many near-misses as maternal deaths (Table 5). The number could have been higher if strict criteria about blood oxygen levels were estimated, or if blood-urea nitrogen was routinely estimated especially in eclampsia. Mantel *et al's* multi-centre study (4) identified 147 *"near-misses"*, which were defined as women with obstetric complications that required admission to the intensive care unit or had severe organ/system dysfunction. These were associated with 30 maternal deaths in a one-year period. In this study, many women (23% of *"near-misses"* and 43% of maternal deaths) had problems (personal, family and community) which led to delay in receiving prompt care. Therefore, Mantel *et al.'s* definition is useful in estimation of the burden of acute maternal morbidity and in identification of near-misses, especially in emergency admissions and is a more effective audit of obstetric care than mortality audit.

Many of the referrals had low socio-economic status. Lack of economic power makes women dependent in decision- making, even for health care. Many have to seek prior consent and/or financial assistance before seeking care(10). Antenatal care often fails to identify women at-risk as risk factors may not be very predictive(11-13) or appropriate intervention is not given in time. Financial constraints, long distances(11,12) limited resources at referral centres, negative provider attitudes and transportation problems(13) are some of the reasons for the delay to access care among referrals with obstetric complications.

The influence of emergency obstetric referrals on maternal mortality is enormous. Thonneau *et al.*(14) found 25 maternal deaths out of 349(7.16%) women transferred as emergencies to their unit in labour, from greater Conakry, Guinea. Other studies prior to this in the region (15,16) found obstetric transfers to be synonymous with maternal deaths, due to the many deaths among this group. This is due to the high incidence of obstetric complications, most of which are life-threatening.

In conclusion, in developing countries, with poor obstetric services, emergency transfers in labour are very common. These women, who are of low socio-economic status, contribute significantly to maternal mortality and morbidity.

ACKNOWLEDGEMENTS

The author is grateful to the Department of Women and Gender Studies, Makerere University, which funded the research on "Influence of Obstetric referrals on Maternal and Perinatal Mortality," from which data for this report were extracted. Thanks to Miss Florence Aziga and BettyNamulema, the nursing officers who assisted with the data collection.

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