



Severe acute maternal morbidity and associated deaths in conflict and post-conflict settings in Africa

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<http://dx.doi.org/10.5588/pha.12.0036>

Setting: Five hospitals in four conflict and post-conflict countries (Democratic Republic of Congo, Somaliland, Sierra Leone and Burundi).

Objectives: To report among hospital deliveries: 1) the proportion of severe acute maternal morbidity (SAMM), 2) the pattern of SAMM, and 3) maternal deaths according to type of SAMM.

Methods: An audit of data from a standardised database implemented in all the sites in the study.

Results: Of the 18 675 deliveries, there were 6314 (34%) known SAMM cases with 63 associated deaths, implying that for every 100 SAMM cases there was one maternal death. In descending order, the death-to-SAMM ratios per 1000 deliveries were: 1:7 for sepsis, 6 for haemorrhage 1:70 for hypertensive disorder and 1:398 for obstructed labour. A substantial proportion of deaths (38%) that occurred in hospitals could not be categorised into the standardised SAMM conditions available in the database.

Conclusion: As this is the first study using multi-centre data from conflict and post-conflict countries, these findings are relevant to improving maternal health in such settings. Findings, implications and possible ways forward in addressing various challenges are discussed.

It is estimated that every day, 800 women die due to pregnancy complications and childbirth.¹ These deaths are associated with what is known as 'severe acute maternal morbidity' (SAMM).²⁻⁴

SAMM, also termed 'maternal near-miss' (narrowly averted death), refers to 'a very ill pregnant or recently delivered woman who would have died, had it not been that luck or good care were on her side'.⁵ The ratio of maternal deaths to SAMM cases—overall and cause-specific—is used as an indicator for the overall quality of obstetric and surgical management.^{2,4} Low rates suggest high levels of care, implying that patients with severe morbidity are unlikely to die as a consequence of their condition. Conversely, high rates suggest gaps in maternal care.

Médecins Sans Frontières (MSF) works in a number of conflict and post-conflict countries in Africa (Burundi, Democratic Republic of Congo, Sierra Leone and Somaliland) with the aim of improving obstetric care. This is done through hospital-based interventions and ambulance transfers for referrals. These settings are characterised by infrastructure breakdown, poor transport networks and a lack of qualified medical personnel. A standardised database system has

been implemented in each of these countries, providing data for multi-centre data reviews. There is no published information on the standard of emergency obstetric care in such circumstances, despite the fact that this is critical for achieving the United Nations Millennium Development Goal (MDG) Target 5⁶ and for reducing maternal mortality by 75% by 2015.

Among hospital deliveries, in five hospitals and in four conflict and post-conflict countries in Africa, we report the following: 1) the proportion of SAMM, 2) the pattern of SAMM, and 3) maternal deaths according to type of SAMM.

METHODS

Study design

This was a retrospective analysis of routine programme data.

Study setting and population

Data from five hospital projects in the Democratic Republic of Congo (DRC), Burundi, Sierra Leone and Somaliland were included in the study from January 2009 to July 2011. The hospitals in Sierra Leone and Burundi were tertiary care referral hospitals, while the others were local hospitals offering normal delivery care. In each of these five hospitals (Table 1), MSF offers a standard package of comprehensive emergency obstetric and newborn care (CEmONC),⁷ as recommended by the World Health Organization (WHO).⁸ The components of the package are shown in Table 2. Additional human resources, including general surgeons (or obstetricians), anaesthetists and midwives, are part of the team providing this package. Ambulance referral is also included. All services are offered free of charge, and the study included all the women delivering in the five hospitals.

Data and analysis

Data on type of delivery (normal or complicated) and type of SAMM were collected on a weekly basis from maternity registers and patient cards. These were then entered into a standardised Epicentre data tool (Epicentre, Paris, France), and included specific categories divided into four groups: 1) haemorrhage, 2) obstructed labour, 3) hypertensive disorders (pre-eclampsia/eclampsia), and 4) sepsis. Other conditions were classified into a fifth group termed 'other'. Severe morbidity and related maternal deaths were standardised per 1000 deliveries.

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ACKNOWLEDGEMENTS

This research was supported through an operational research course jointly developed and run by the Centre for Operational Research, International Union Against Tuberculosis and Lung Disease, Paris, France, and the Operational Research Unit, Médecins Sans Frontières (MSF), Brussels-Luxembourg. Additional support for running the course was provided by the Centre for International Health, University of Bergen, Norway. Funding for publication was provided by MSF-Luxembourg. Conflict of interest: none declared.

KEY WORDS

maternal morbidity;
mortality; conflict;
post-conflict; operational
research

Received 10 July 2012
Accepted 4 September 2012
First published online
7 November 2012

PHA 2012; 2(4): 122–125
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TABLE 1 Characteristics of hospitals in Burundi, Sierra Leone, Democratic Republic of Congo, Burundi and Somaliland

Hospital	Kabezi, Burundi	Gondoma, Sierra Leone	Lubutu, DRC	Masisi, DRC	Burao, Somaliland
Level	District second referral hospital for obstetric and gynaecological emergencies	Second referral hospital for paediatrics and obstetric and gynaecological emergencies (only referrals meriting admission, routine out-patient consultation services are not offered)	General district referral hospital with maternity ward (including primary care)	General district referral hospital with maternity ward (including primary)	General district referral hospital with maternity ward (including primary care)
Location	Capital of rural Bujumbura	Second largest city, capital of Bo district, central-south Sierra Leone	Rural, remote North-East DRC	Rural, remote and insecure East DRC	Second largest city, capital of Togdheer Region, east of Somaliland
Bed capacity/ population coverage	66 obstetrics beds serving a general population of 458 000	200 beds with 23 beds for obstetrics and gynaecology wards	140 beds with 34 maternity beds serving a population of 100 000	130 beds with 39 maternity beds, serving a general population of 380 000	140 beds with 29 maternity ward beds, serving a general population of 200 000. MSF started activities here in March 2011
Payment for care	MoH has provided free health care for ANC, PNC and deliveries (including caesarean sections) since 2006	An MSF hospital providing all care for a general population of 600 000	MSF provides free care	MSF provides free care	MSF provides free care
Conflict	Civil war, 1993–2005	Civil war, 1991–2002	Civil war, 1998–2003	Civil war, 1990s to present	Civil war, 1991 to present. The Northern Somaliland region of Somalia declared independence in 1991, but has not been recognised by any country or international organisation as a sovereign nation
GDP (PPP) per capita	US\$614	US\$849	US\$348	US\$348	US\$600
Religion	Christian	Islam or mixture of Islam and traditional religions	Christian	Christian	Islam

DRC = Democratic Republic of Congo; MoH = Ministry of Health; ANC = antenatal care; PNC = postnatal care; MSF = Médecins Sans Frontières; GDP = gross domestic product; PPP = purchasing power parity; DRC = Democratic Republic of Congo.

Case definitions exist for each SAMP condition, and all the hospitals have trained data entry clerks. Training and supervision were offered on a continuing basis, and data were verified at headquarters level.

The study was approved by the Médecins Sans Frontières Ethics Review Board for the analysis of routinely collected programme data.

TABLE 2 Standard World Health Organization package of Comprehensive Emergency Obstetric and Newborn Care (CEmONC)⁸

- 1 Administer parenteral* antibiotics
- 2 Administer uterotonic drugs† (i.e., parenteral oxytocin)
- 3 Administer parenteral anticonvulsants for preeclampsia and eclampsia (i.e., magnesium sulphate)
- 4 Manually remove the placenta
- 5 Remove retained products (e.g., manually removing retained products, manual vacuum)
- 6 Perform assisted vaginal delivery (e.g., vacuum extraction, forceps delivery)
- 7 Perform basic neonatal resuscitation (e.g., with bag and mask)
- 8 Perform surgery (e.g., caesarean section)
- 9 Perform blood transfusion

*Injection or intravenous infusion.

†Uterotonic drugs are administered to prevent and treat postpartum haemorrhage.

RESULTS

Characteristics of deliveries

A total number of 18 675 deliveries took place in the hospitals included in the study. Table 3 shows the proportions per institution of vaginal and instrumental deliveries and caesarean sections. The tertiary care sites have a high proportion of caesarean sections (Burundi 46%, Sierra Leone 47%), while the local hospital sites have a higher proportion of normal vaginal deliveries (DRC 83%, Somaliland 91%).

Severe acute maternal morbidity

Of the 18 675 deliveries, there were 6314 (34%) known SAMP cases, with 63 associated deaths, i.e., for every 100 SAMP cases, there was one maternal death. Table 4 shows the pattern of SAMP and associated deaths in the four countries included in the study. The ratio of deaths to SAMP varied considerably, from 1:342 to 1:79 for haemorrhage, from 1:333 to 1:220 for obstructed labour, from 1:68 to 1:37 for hypertensive disorders, from 1:15 to 1:4 for sepsis and from 1:875 to 1:24 for other complications.

In addition, there were 38 deaths in a group of patients categorised as having 'other complications' in the database. We do not have data on their exact morbidity and are thus unable to ascertain whether or not these included SAMP conditions.

TABLE 3 Vaginal, instrumental deliveries and caesarean sections in five hospitals in Burundi, Sierra Leone, Democratic Republic of Congo and Somaliland

Countries	Normal vaginal deliveries <i>n</i> (%)	Instrumental deliveries <i>n</i> (%)	Caesarian sections <i>n</i> (%)	Total <i>n</i>
Burundi	1650 (40)	584 (14)	1911 (46)	4145
Sierra Leone	1029 (34)	396 (13)	1444 (47)	3049
Democratic Republic of Congo	9002 (83)	184 (2)	2450 (23)	10826
Somaliland	597 (91)	11 (2)	47 (7)	655

DISCUSSION

This is the first study using multi-centre data from conflict and post-conflict settings showing that, overall, about three in 10 mothers presenting to these hospitals had SAMM, and that for every 100 cases of SAMM there was one maternal death.

One of the strengths of the study is that it provides unique contextual information, and that the data come from a standardised database implemented in all the hospitals and are likely to reflect the reality in the field. There were also standardised case definitions for the main SAMM conditions. The limitations are that we used clinical criteria (based on the clinical acumen of individual clinicians) to define SAMM^{9,10} in the different hospitals. Depending on the level of training, there is a possibility of misclassification. However, as our data focus on haemorrhage, ob-

TABLE 4 Severe acute maternal morbidity (SAMM) and maternal deaths in five hospitals in Burundi, Sierra Leone, Congo and Somaliland

SAMM, countries	Cases <i>n</i>	Maternal death <i>n</i>	Severe morbidity/ 1000 deliveries	Maternal deaths/ 1000 deliveries	Death-to-morbidity ratio
Haemorrhage					
Burundi	342	1	82.5	0.2	1:342
Sierra Leone	428	18	140.4	5.9	1:24
DRC	157	2	14.5	0.2	1:79
Somaliland	34	0	51.9	0	0
Obstructed labour					
Burundi	1798	0	433.8	0	0
Sierra Leone	601	5	197.1	1.6	1:120
DRC	2328	7	215	0.6	1:333
Somaliland	51	0	77.9	0	0
Hypertensive disorders					
Burundi	44	0	10.6	0	0
Sierra Leone	272	4	89.2	1.3	1:68
DRC	28	0	2.6	0	0
Somaliland	74	2	113	3.1	1:37
Sepsis					
Burundi	29	2	7	0.5	1:15
Sierra Leone	71	20	23.3	6.6	1:4
DRC	47	0	4.3	0	0
Somaliland	10	2	15.3	3.1	1:5
Other morbidity					
Burundi	1750	2	422.2	0.5	1:875
Sierra Leone	1800	29	590.4	9.5	1:62
DRC	1215	5	112.2	0.5	1:243
Somaliland	47	2	71.8	3.1	1:24

DRC = Democratic Republic of Congo.

structed labour, hypertensive disorders and sepsis—all of which are easily identified and for which case definitions are available—the chance of error is likely to be minimal. Although unsafe abortions are included in the definition of SAMM, the data collection system only captured information on incomplete or complete abortions. This, combined with the fact that unsafe abortion remains a delicate matter, with legal consequences in many regions, makes it difficult to gather more specific information on the numbers of unsafe abortions among patients who presented to the hospitals.

There are a number of public health implications in the study findings. First, we observed varying proportions of normal vaginal deliveries being conducted in the hospitals rather than at primary health care level. In Somaliland and DRC, these rates were as high as 91% and 83%. This is likely to be a reflection of the health infrastructure breakdown and health staff shortages at the peripheral primary health care facilities, resulting in drainage towards the hospital level. This compromises the role of the hospital as a secondary referral centre. Maintaining the hospitals' primary role as a referral centre would thus logically require simultaneous involvement and support for maternity services at the peripheral health centres. The trend of referral of patients to the well-functioning MSF hospitals is also likely to have been enhanced due to the availability of free care. Sierra Leone, Burundi and DRC have a referral system from primary level health facilities to the hospitals. However, in Somaliland, a referral system was not yet in place, as it was a new project. This, along with the fact that local culture does not easily accept caesarean sections, and the agreement of the husband or a man in the family is mandatory before any operative procedure, might explain the relatively low rates of caesareans in Somaliland.

Second, in nine hospitals in Benin, Cote d'Ivoire and Morocco, the reported death-to-SAMM ratio was 1:15,^{9,10} compared to an overall ratio of 1:100 in the MSF hospitals. The latter rate is almost seven times better, probably because MSF (with its added resources) is able to provide better infrastructure support, additional human resources, equipment and management expertise. This is likely to have compensated for the meagre resources and contributed to the relatively good outcomes.

Third, the leading causes of SAMM were sepsis and haemorrhage. The possible reasons for this are unknown, but might be related to the mediocre quality of maternal care (in peripheral maternities or traditional birth attendant sites) and undue delays prior to presentation at the hospital level. The hospital in Sierra Leone had a high number of sepsis cases. Potential reasons may include inadequate hygiene at home or in the primary level facility, or delays in transfer to the hospital. Reducing sepsis-related morbidity will require earlier intervention at peripheral health facility level and efficient referrals and transfers to hospitals.

Finally, we observed that 35% of all recorded deaths occurred in patients with conditions termed 'other complications'. It is important to identify the exact nature of the morbidities contained within this group in order to provide adequate remedial measures. Clearly, focusing on data collection and only monitoring the four standardised SAMM conditions is insufficient, and the database needs to be better adapted to local contexts.

To reduce maternal deaths by 75% by 2015 in line with the United Nations MDGs, improvements in maternal health are required, particularly in conflict and post-conflict areas. Our study reveals a number of findings that are relevant in achieving this goal and that could improve the situation in these areas.

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Contexte : Cinq hôpitaux dans quatre pays en conflit ou après conflit (République Démocratique du Congo, Somalie, Sierra Leone et Burundi).

Objectifs : Décrire parmi les accouchements hospitaliers : 1) la proportion à morbidité maternelle aiguë élevée (SAMM) ; 2) le type de SAMM ; et 3) les décès maternels en fonction du type de SAMM.

Méthodes : Examen des données provenant d'une base de données standardisée réalisée dans tous les sites de l'étude.

Résultats : Sur 18 675 accouchements, il y a eu 6314 cas de SAMM connus avec 63 décès associés, ce qui implique que pour chaque centaine de cas de SAMM, il y a eu un décès maternel. Par ordre décroissant, le rapport décès par SAMM pour 1000 accouchements a été de

1/7 par septicémies, de 1/46 par hémorragies, de 1/70 par maladies hypertensives et de 1/398 par un accouchement compliqué. Une proportion substantielle des décès (38%) survenus dans les hôpitaux n'a pas pu être classée dans les conditions standardisées SAMM disponibles dans la base de données.

Conclusions : Il s'agit ici de la première étude utilisant les données multicentriques provenant de pays en guerre ou après-guerre ; les observations sont pertinentes pour améliorer la santé maternelle dans de tels contextes. Les implications de ces données et les moyens possibles d'amélioration visant à répondre aux défis font l'objet de discussions.

Marco de referencia: Cinco hospitales en los siguientes países que se encuentran actualmente en situación de conflicto o que lo superaron en un período reciente: la República Democrática del Congo, Somalia, Sierra Leona y Burundi.

Objetivos: Notificar, con respecto a los partos atendidos en medio hospitalario, la proporción de hospitales donde se observó: 1) una morbilidad materna aguda grave (SAMM); 2) las características de esta SAMM; y 3) la mortalidad materna según el tipo de SAMM.

Métodos: Tras analizar los datos de la base de datos normalizada que opera en todos los centros del estudio se redactó un informe.

Resultados: En los 18 675 partos atendidos se presentaron 6314 casos de SAMM (34%) que causaron 63 defunciones, lo cual corresponde a una defunción por cada 100 casos. En orden descendente,

el cociente entre defunciones y casos de SAMM en 1000 partos fue por sepsis 1/7, por hemorragia 1/46, por trastorno hipertensivo 1/70 y por obstrucción del trabajo de parto 1/398. Una alta proporción de defunciones que ocurrió en los hospitales no se pudo categorizar en el marco de las condiciones normalizadas de la base de datos sobre la SAMM.

Conclusión: El presente artículo representa el primer estudio con base en datos multicéntricos obtenidos en países en situación de conflicto actual o reciente y sus resultados son pertinentes para el mejoramiento de la salud materna en estos contextos. Se analizan las repercusiones de estos resultados en las posibles respuestas que se pueden aportar al problema.