HEALTH PROFESSIONALS AND MATERNAL HEALTH IN MALAWI

MORTALITY AND MORBIDITY AT DISTRICT LEVEL

JOGCHUM JAN BELTMAN

Health professionals and maternal health in Malawi: mortality and morbidity at district level

-Safe Motherhood-

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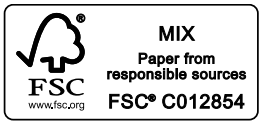

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Health professionals and maternal health in Malawi: mortality and morbidity at district level

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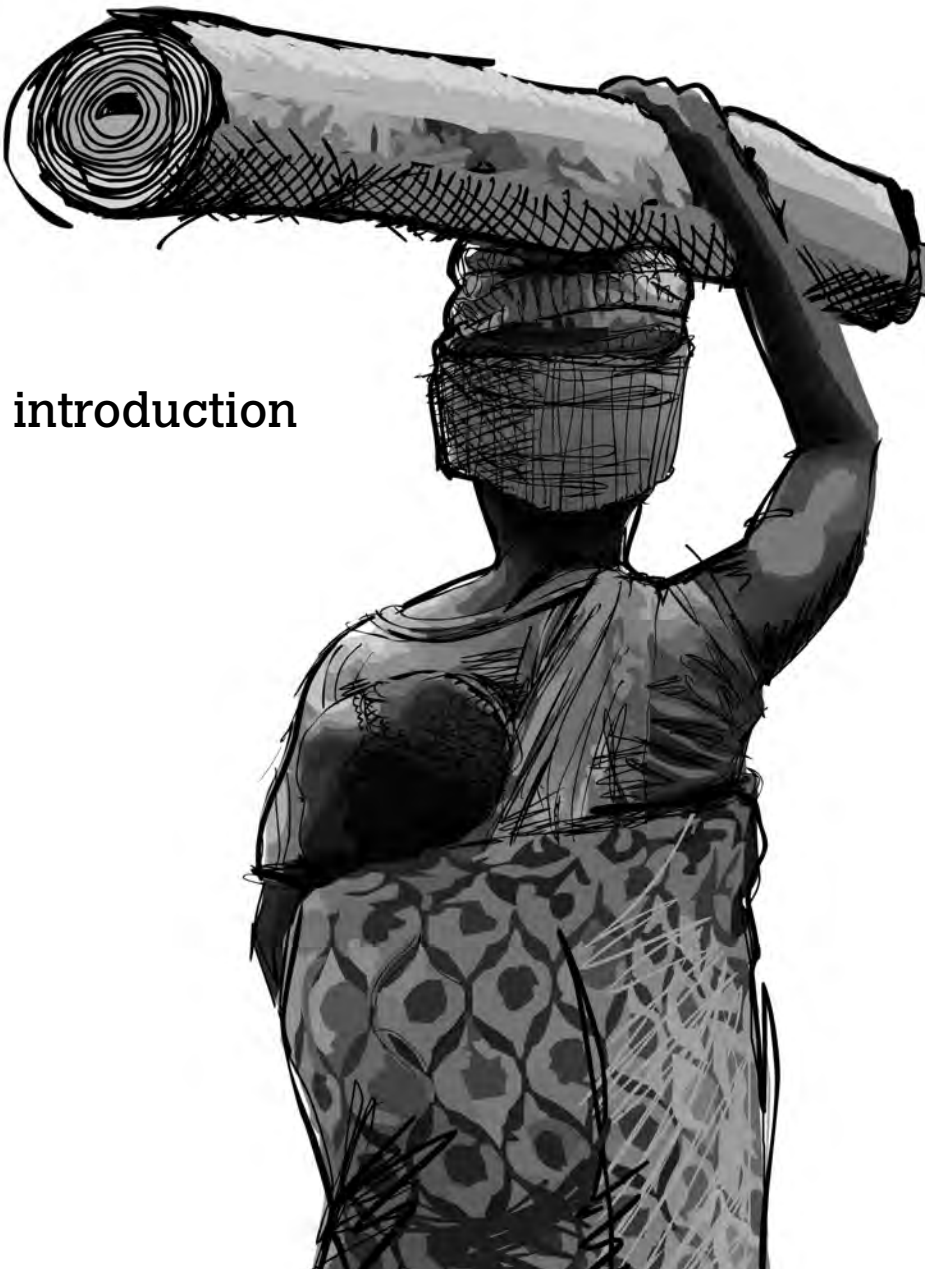
Contents

CHAPTER 1



General introduction

General introduction

1. Justification

Especially in low-income countries, numerous (inter)national initiatives and documents have emerged in the past decades with the objective to address a wide variety of health issues.[1] Most of these plans identify health-related calamities, analyse their determinants, and then suggest actions, including clinical interventions. Some initiatives -despite being well-intended- miss links with local health workers who are responsible for performing the recommended clinical interventions, often under difficult conditions.[2] The sheer number of policy documents and their managerial -rather than clinical- scope, run the risk of creating indifference and apathy among health care workers, when faced with yet another top-down recommendation.[3]

Perhaps a more effective incentive to improve clinical practice occurs when catastrophes acquire a face: a face that shatters the anonymity of the countless numbers concealed in policy documents; a face that makes the necessity for clinical action tangible for health care workers; a face that is fixed in our memory and inspires us to do better.

Such an experience happened to me during the very beginning of my stay as a young physician in Malawi. Different from what one might expect from the scope of this thesis, the case concerned an orthopaedic patient. A 25-year old employee of a tea factory was brought into hospital by his colleagues. The man happened to be a seasonal worker at one of the neighbouring estates, where both his arms got stuck in a tea-leave grinder. I did a primary assessment, provided intravenous fluids and administered analgesics. I found both his arms heavily traumatized, with multiple fractures. Fortunately, his left arm showed adequate neuromuscular function. I heaved a sigh of relief, when the orthopaedic clinical officer assured me that this type of cases occurred frequently, that necessary surgery could take place in-house and that referral to a tertiary hospital was not necessary. I handed over the care for this patient to the clinical officer. The next day, when I visited the patient, I watched in horror the result: both his arms had been amputated. Many times I have asked myself after this incident what would have happened if I had joined the patient into theatre. Would this have led to the same outcome? Or should I have known that technical possibilities for managing a case like this is lacking in resource poor settings and therefore accept such a way of treatment as inevitable? The least I could have done was to accompany the patient during treatment.

Anyhow, as a young doctor at the beginning of his contract in a remote area of a low-income country, this particular case made a tremendous impression on me. Many tragic -often maternal and perinatal- cases would follow, sometimes with even more devastating outcomes. But it was the case of the tea worker that made me realize my obligations as a health care worker. The global health community may develop the noblest policies, superior

protocols and all types of excellent interventions, none of these initiatives will flourish when this crucial link of the chain is missing: the health care workers.

2. Working in Thyolo, Malawi

At Thyolo District Hospital, I had the privilege to work with a diverse team of clinical officers, midwives and nurses from the Ministry of Health and Médecins Sans Frontières Belgium. Together with my wife Debby Ras, also a physician, I was responsible for the general clinical activities in the hospital and the surrounding peripheral health centres. In addition, we were assigned to many other tasks including teaching and managerial activities.

Despite the challenges inherent to working in a resource-poor setting, we were privileged to find excellent counterparts in the District Health Management Team (Dr. Alide and later Dr. Mwagomba), who had similar plans for the hospital.

Thyolo District Hospital is a busy and crowded hospital where obstetrics and gynaecology take a prominent place in daily health care. Gradually, I became involved in maternity care at the hospital and in the wider district, where HIV/AIDS and maternal health seemed to be closely inter-related. This was reflected by a high prevalence of HIV/AIDS upon antenatal intake (21%).[4] When I started working in Thyolo, HIV-care had already been rolled out throughout the district, including a prevention-of-mother-to-child-transmission programme (PMTCT).[5]

3. Aim of this thesis

The aim of the studies described in this thesis was to measure baseline maternal mortality and morbidity at district and facility levels, and reduce these, by: (1) applying obstetric audit, (2) evaluating perceptions of local health care workers, (3) strengthening the link between HIV care and obstetric services, and (4) introducing the concept of human rights in the clinical setting.

The following research questions were studied:

1. What is the burden of maternal mortality and morbidity in Thyolo district, both from an international and a local perspective?
2. How can simple interventions change the uptake of HIV-care among women accessing maternity services?
3. What is the value of reviewing one of the most common types of maternal morbidity: obstetric haemorrhage?
4. May perceptions about obstetric care provision held by local health workers help us to improve maternal health?
5. How a human rights' perspective promotes and improves maternal health in the clinical setting?

4. Outline of this thesis

In this thesis, maternal health was studied at facility and community level. First, the scale of maternal mortality in the district was assessed. We then compared our locally applied maternal mortality and morbidity analysis with the newly suggested WHO criteria for maternal 'near miss'. Secondly, we tried to identify possible means to reduce maternal mortality and morbidity. Testing for HIV, identified as an important cause of mortality and morbidity, was expanded. We also performed audit of maternal morbidity, and obstetric haemorrhage in particular, at facility level. By means of comparing with a high-income setting, we included an assessment of obstetric haemorrhage in the Netherlands. We then studied how low-cost interventions, including an assessment of perceptions of local health workers, may reduce maternal mortality and morbidity. Lastly, we introduced the concept of human rights into maternal health care delivery at the work floor, as a potential tool to enhance this reduction.

This outline is summarized as follows:

Chapter 1. General introduction. This contains a justification for this thesis and describes the study objectives.

Chapter 2. A situational analysis of health services in Thyolo District is described to picture the context in which the studies took place.

Chapter 3. Maternal mortality was calculated at community level using the sisterhood method in order to measure baseline incidence figures. This study helped us to explore the context more extensively and offers a rationale for interventions we did.

Chapter 4. Local maternal morbidity analysis at facility level was compared against the newly suggested WHO criteria for maternal 'near miss'. What would this international 'near miss' approach mean in a Malawian district and what consequences would it have in presenting a reliable picture of the setting?

Chapter 5. Strengthening the link between obstetric services and HIV care in high HIV prevalence settings is paramount. This chapter describes that simple interventions could help to increase uptake of HIV-infected pregnant women in order to improve maternal care and early neonatal treatment.

Chapter 6. This study shows how obstetric haemorrhage as a part of maternal morbidity review may provide insight into important modifiable challenges in the service delivery at facility-level.

Chapter 7. As a comparison with a high-income setting we assessed maternal morbidity resulting from antepartum haemorrhage in the Netherlands.

Chapter 8. Another intervention that might help to reduce maternal morbidity was to analyse health care workers' perspectives on causes of obstetric haemorrhage and formulate them into recommendations.

Chapter 9. This chapter describes how the introduction of a human rights' perspective as an intervention at clinical level could help to improve maternal health.

Chapter 10. General discussion in which the different studies are summarized and discussed.

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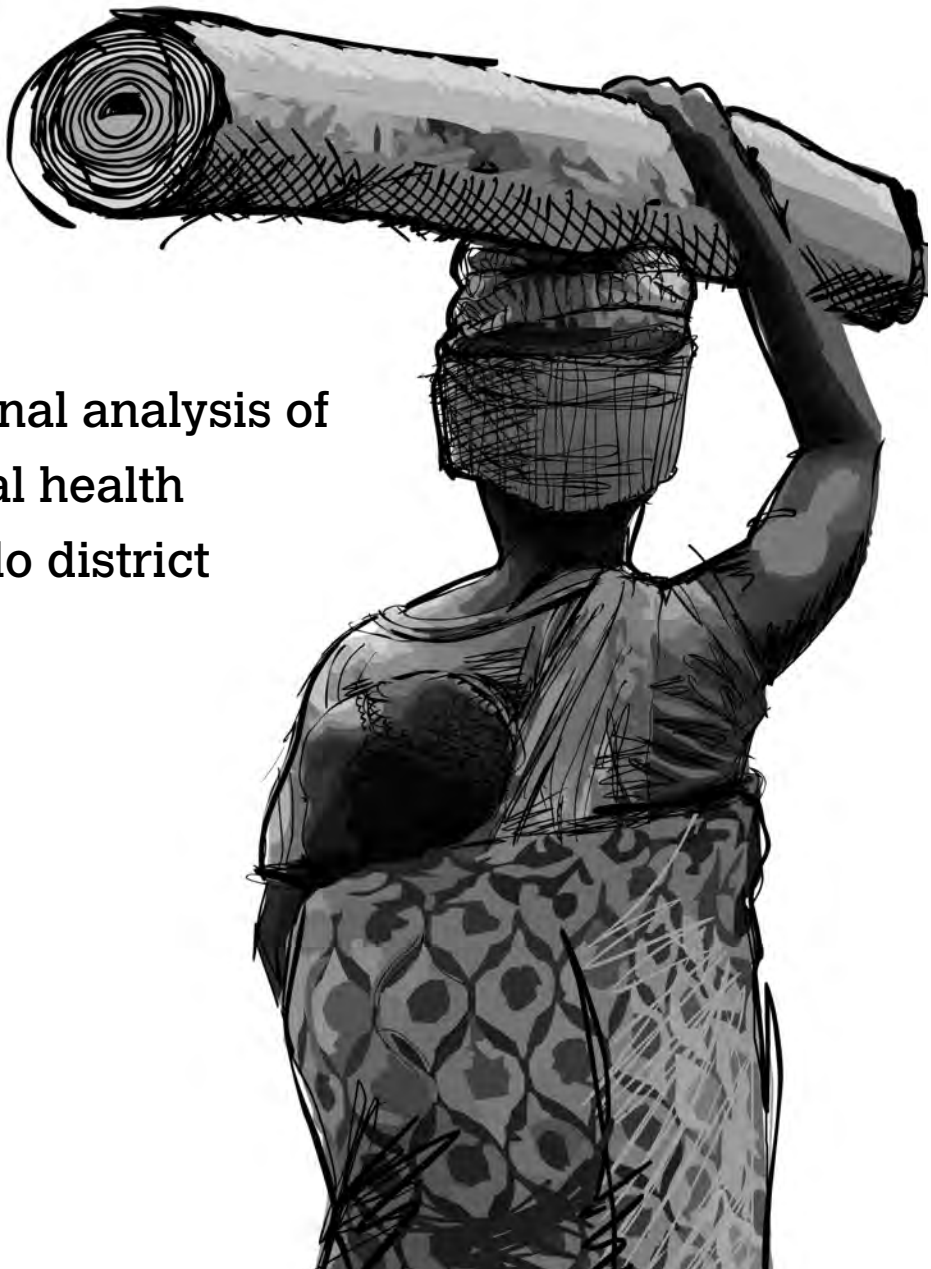
Part one:

Background: maternal mortality and morbidity in Thyolo, Malawi

CHAPTER 2



Situational analysis of maternal health in Thyolo district

1. Background information

1.1 Geography

Malawi is a landlocked country in sub-Sahara Africa, bordered by the United Republic of Tanzania (north and north-east), Mozambique (east and south) and Zambia (west). The country is 900 kilometres long and ranges in width from 80 to 161 kilometres. Its total surface area is around 120.000 square kilometres (almost three times the size of the Netherlands) of which about 80% is land. The 475 kilometres long Lake Malawi stretches along the eastern border with Mozambique and Tanzania.[1]

The country is divided in 3 regions: North, Central and South, comprised of six, nine and twelve districts respectively. Administratively, districts are subdivided into Traditional authorities (TAs), each of which composed of villages that function as the smallest administrative units in the country.

1.2 Demography

The population in Malawi was determined by Census at 13.066.320 people and in Thyolo District at 576.655 in 2008[2] (table 1). The southern part of the country is the most densely populated and relative more increasing in population comparing to other parts of the country. Malawi has a high rate of urbanisation and the government aims to keep people in the rural areas given the lack of formal employment opportunities in the urban sector.[3] The main urban areas in Malawi are the cities Blantyre, Lilongwe, Mzuzu and Zomba, where 12 percent of the total population resides.[2]

Table 1. Projected population growth and selected demographic key indicators of Thyolo district.

Year	2008	2013
Population	576.655	622.636
% of total	4.40	4.07
Rate of growth	-	1.61
Median age	16.3	16.7
Births	23468	25353
Crude birth rate *	40.73	40.66
Deaths	11058	10078
Crude death rate **	19.19	16.16
Expectation of life at birth (years)	45.35	48.87
Total fertility rate	5.55	5.29

(Source: NSO, population and housing census 2008. Population and projections Malawi.)
** crude birth rate is the number of births per 1000 people per year*
*** crude death rate is the total number of deaths per 1000 people per year*

1.3 Socio-economic profile

Malawi is amongst the poorest countries in the world. It ranks among the twenty bottom countries on the human development index (171 of 187 in 2011)[4] (table 2). It has a predominantly agricultural economy. Tobacco, tea and sugar are the major export commodities. There has been an increased incidence of droughts and floods in recent years, resulting in reduced food security. These catastrophes are provoked by soil degradation, farming of marginal land, deforestation and high population growth. Limited access to agricultural fertilizers, low-quality soil and abundance of single cropping, especially maize, also impacted negatively on food production.[5] Eighty percent of the population depends on agriculture for their livelihoods. They are susceptible to famine, especially since infrastructure for irrigation is in place for only 20 percent of cultivated land.[6] In 2005, Malawi was hit by extreme drought that resulted in the worst maize harvest in a decade. More than half of the population became dependent on food assistance.[7]

Table 2. Fact sheet, Malawi.

GDP (current US$) (billions)	5,1
GDP per capita (current US$)	343
GDP growth (annual %)	7,1
Life expectancy at birth, total (years)	52,7
Mortality rate, infant (per 1,000 live births)	58,1
Literacy rate, youth female (% of females ages 15-24)	86,0
Prevalence of HIV, total (% of population ages 15-49)	11,0

Source: Worldbank, 2012[8] *(GDP*) *Gross domestic product*

Malawi relies on considerable economic assistance from the IMF, World Bank and individual donor countries. Donor funding contributed to about 40 percent of Malawi's annual budget[8] in 2012.

The HIV/AIDS epidemic in Malawi that started in the eighties and reached a peak around the turn of the millennium has paralyzed the country's economic and social development. The workforce reduced by direct effects of illness and, indirectly, by the care for ill family members. Around 650.000 children were orphaned.[9] The pressure on the workforce also caused shortages among medical personnel.[10] In 2004, the HIV-prevalence among women aged 15 to 24 was more than four times higher than that among males in the same age group (9 versus 2 percent, respectively). The HIV-prevalence in Thyolo was 21% among people aged 15-49 years.[11]

Politics: history and presence

Malawi was inhabitated by migrating tribes of Bantu around the 10th century. In 1891 the area was colonized again, this time by the British after Dr. Livingstone steamed up the Shire

river and discovered lake Ninyessi (Lake of the stars) during his Zambezi Expedition in 1859.[12] In 1953 Malawi, then known as Nyasaland, became part of the semi-independent Central African Federation (CAF). The Federation was dissolved in 1963 and in 1964 Nyasaland gained full independence and was renamed Malawi. Upon gaining independence it became a single-party state under the presidency of Hastings Banda, a medical doctor, who remained president until 1994, when he was ousted from power. The country changed its constitution to provide a multiparty democracy for the first time when president Muluzi was the first elected president. Dr. Bingu wa Mutharika, elected in 2004, governed the country until his death in April 2012.[13] His administration increasingly showed autocratic signs, since a number of controversial laws regarding fundamental freedoms of speech and press were pushed through, compounding frustrations among the population that arose from the bad economic situation.[14] Mutharika was succeeded by Joyce Banda, the first female to take the presidency.

Health services in Malawi

National level

Nearly all health care services in Malawi are provided by three actors. The Ministry of Health (MoH) is responsible for the provision of 62% of health care services; the Christian Health Association of Malawi (CHAM) for 37% and the Ministry of Local Government (MoLG) for 1%.[15] The latter was initiated through the Local Government Act of 1998. Local Governments, also called councils, were established in 34 designated local government areas throughout the country. They intend to improve service delivery to citizens, including health care.[16]

The public health system in Malawi comprises of a three-level network of medical facilities. The first level are a large network of rural health centres, rural hospitals, health posts and outreach clinics. Services are provided free-of-charge.[17] District and CHAM hospitals provide secondary level health care, and tertiary referral centres in the largest cities provide a wider range of surgical and medical interventions.

In 2004 Malawi introduced the health Sector Wide Approach (SWAp), a partnership in which the government of Malawi and development agencies (such as DFID, Worldbank) altered their relationships to enable more transparent government leadership. Focus of this leadership change was the bilateral formulation of a health policy rather than the time-consuming implementation of its details. This led to successful implementation of an Essential Health Package (EHP) of services provided free-of-charge. In the EHP, a set of services focusing on the major causes of death and disease is prioritised, including maternal and child health services. This approach enables greater ownership at district level. An Emergency Human Resources Programme was developed to enhance recruitment, training, retention and deployment of key health cadres.[18]

Despite these policies, health care remains poorly accessible for the rural population. A needs assessment about the availability, utilization and quality of Emergency obstetric care (EmOC) showed low coverage and poor provision of maternal health care in nearly all districts. A set of 'UN process indicators', such as the number of EmOC services, geographical distribution, proportion of all deliveries in EmOC facilities and caesarean section as percentage of all births, were below recommended levels (table 3).[15]

Table 3: The six UN Process indicators and Recommended levels[19]

UN Process Indicator	Definition	Recommended level
1. Amount of EmOC services available	Number of facilities that provide EmOC	Minimum: 1 Comprehensive EmOC facility for every 500,000 people Minimum: 4 Basic EmOC facilities per 500,000 people
2. Geographical distribution of EmOC facilities	Facilities providing EmOC well-distributed at sub-national level[4]	Minimum: 100% of sub-national areas have the minimum acceptable numbers of basic and comprehensive EmOC facilities
3. Proportion of all births in EmOC facilities	Proportion of all births in the population that take place in EmOC facilities	Minimum: 15%
4. Met need for EmOC services	Proportion of women with obstetric complications treated in EmOC facilities	At least 100% [Estimated as 15% of expected births.
5. Cesarean sections as a percentage of all births	Cesarean deliveries as a proportion of all births in the population	Minimum 5% Maximum 15%
6. Case fatality rate	Proportion of women with obstetric complications admitted to a facility who die	Maximum 1%

Human resources

Current medical staffing in Malawi is the lowest in sub-Saharan Africa. Shortages are found across all medical cadres. Malawi has one doctor per 62,000 inhabitants and vacancies for consultant positions range between 71 and 100%. Vacancies among nurses stand at 65%.[20] International migration of health care workers from low-income countries to the West has increased considerably in recent years, thereby jeopardizing the achievement of the Millennium Development Goals. (These include eight international development goals that were officially established following the Millennium Summit of the United Nations in 2000. Improvement of maternal health was declared as fifth millennium goal). Migration, the effects of HIV/AIDS, lack of training and retention are all responsible for the health care personnel deficit.[21]

District level

Due to its relatively high altitude and moderate climate Thyolo District serves as one of the main tea producing areas. Malawi is the second largest tea producing country in Africa (after Kenya) and produces approximately 10 percent of African tea.[22] Thyolo employed more than 30.000 workers in 2004-2005.[23] These (often seasonal) workers live with their families among the native inhabitants of the district. Land available for non-commercial crops is over-utilized. The administrative headquarters and Thyolo District Hospital reside in the main town of the district: Thyolo (also called 'boma').

Thyolo district has one district hospital (Thyolo District Hospital), which is the largest health facility in the district, a CHAM hospital (Malamulo Seventh-Day Adventist Hospital) and a rural hospital (Thekerani) which is situated 60 kilometres from the main town. In addition, the district counts 31 primary care centres, divided into:

A) Government facilities (health centres, maternity centres and dispensaries)
B) Tea estate clinics
C) CHAM health centres

The District Health Officer (DHO) heading the District Health Management Team, is ultimately responsible for health care in the district and cooperates with the different stakeholders in the district.[24]

One of these stakeholders is Médicins Sans Frontières Belgium (MSF-B), which started HIV-related activities in the district in 1997. Prior to the introduction of anti-retroviral drugs (ARVs) for the treatment of HIV/AIDS, MSF focused on prevention and palliative care of HIV/AIDS. In 2003, the organisation started distributing ARVs. Thyolo mission was one of the first program to roll out ARVs in Malawi. Two years later, in 2005, Malawi began a national HIV/AIDS treatment programmes.

Cooperation between MSF and Ministry of Health (MoH) in Thyolo at management level has been intensive for several years and was also notable during the time of the undertaken studies. During this time MSF was criticised for employing health care personnel from the public health care sector and paying them a two- or three fold higher salary compared to the same positions in MoH. Despite MSF policy to correct this inequality by providing MOH staff with monthly incentives, mistrust and envy among staff made cooperation sometimes challenging.

Voluntary Services Overseas (VSO), a non-governmental organisation, provided expatriate staff to Thyolo District Hospital (TDH) to increase the workforce in the hospital and to mitigate the effects of the human resource crisis.

Thyolo District hospital is a 400-bed health facility that was built in 2004 with funds from the European Union. The facility contains a number of specialized clinics (skin diseases,

ophthalmology, diabetes, sexually transmitted infections), which complement the general outpatient department. The maternal and child health department accommodates antenatal (ANC), under-five and family planning clinics. Besides the five common general wards in Malawi (maternity/labour, male, female, paediatric and TB) the hospital has two additional wards: nutrition rehabilitation unit (NRU) for severely malnourished children and a casualty department where emergency cases are treated on a 24-hour basis.
Upon completion of the hospital nearly all medical infrastructure was provided by the donor countries (for instance manual external defibrillator, incubators, surgical instruments, sterilisation equipment). Challenging was it to operate and maintain these devices. Not uncommonly surgical instruments malfunctioned after some time due to improper use or poor maintenance.

Conclusion

The bitter poverty of Malawi has set its country for many difficult challenges. Major health threats are lurking and the human resource crisis is difficult to control. Major challenges at district level correspond to the same extent with those at national level. The author came to work in this hospital from 2005 onwards till beginning 2007 through a contract with VSO, during which he was involved in the studies presented in this thesis.

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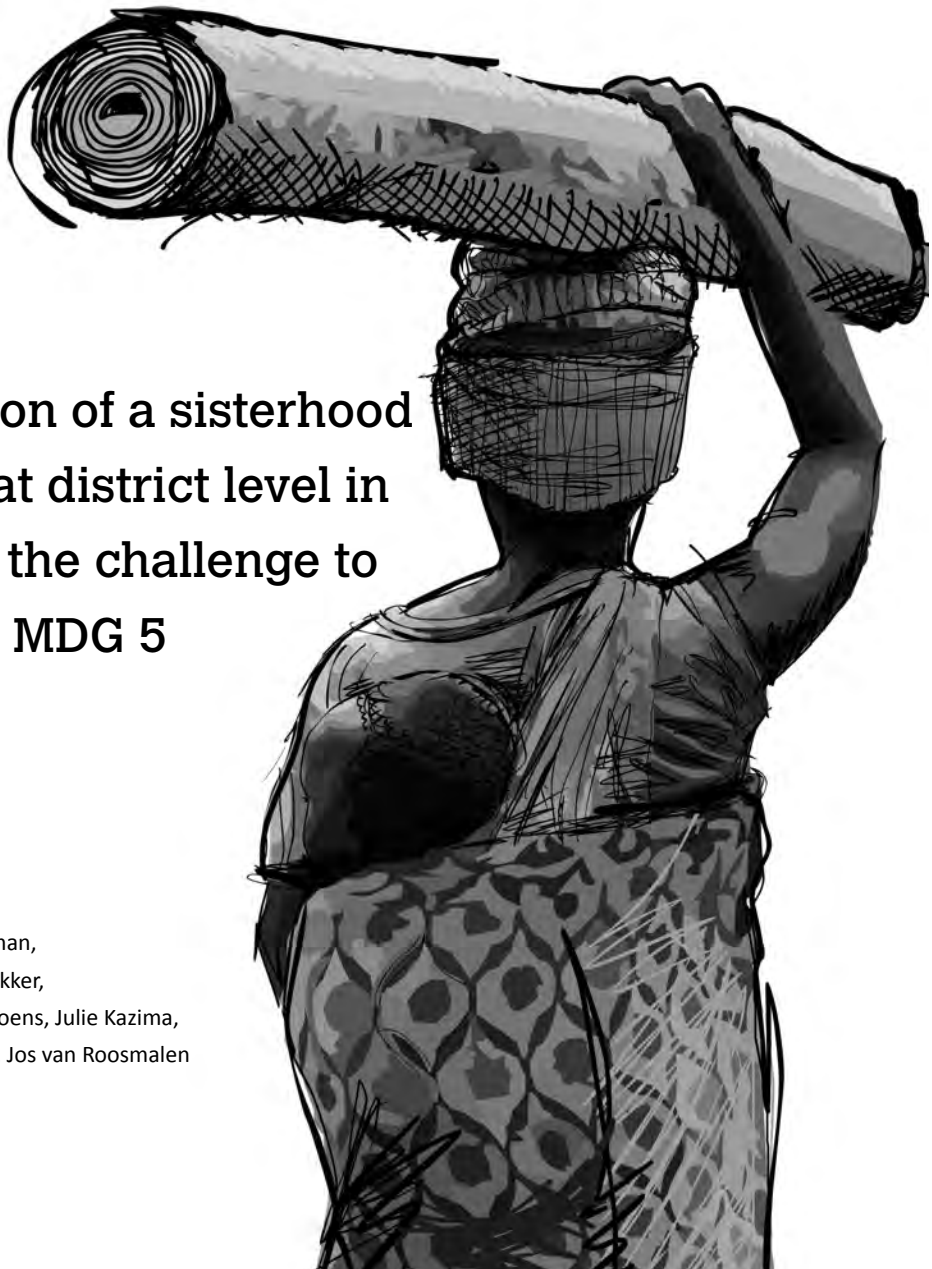
CHAPTER 3



Repetition of a sisterhood survey at district level in Malawi: the challenge to achieve MDG 5

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Moses Massaquoi, Jos van Roosmalen

Abstract

Objective: To evaluate progress made at district level in Malawi towards reaching the 5th Millennium Development Goal, the reduction of maternal mortality.

Methods: In 2006, community-based maternal mortality in Thyolo, Malawi was calculated by applying the 'sisterhood method', a survey that relies on participants responding to basic questions about maternal mortality in their families. Results were compared with a 1989 sisterhood study in the same district. Information on facility-based maternal mortality in 2005 was extracted from district hospital records.

Results: The community-based maternal mortality ratio (MMR) was calculated as 558 per 100 000 live births (95% CI 260 to 820). A comparison with the MMR from the 1989 survey (409 per 100 000 live births) shows that maternal mortality had not declined. The hospital-based MMR was 994 per 100 000 live births in 2005.

Conclusion: Maternal mortality in this district has not reduced and may actually have increased. The threat of failure to achieve Millennium Development Goal 5 increases the moral obligation to improve access to quality health care.

Introduction

Maternal mortality has been high on the global political agenda for years. The 2000 Millennium Summit proclaimed the improvement of maternal health as the fifth Millennium Development Goal (MDG 5). MDG 5 was ratified by 147 world leaders who subscribed to the target of reducing maternal mortality by 75% by 2015 compared to the level in 1990.[1] For countries to meet this target an average decrease in the maternal mortality ratio (MMR) of 5.5% per year is needed.[2]

In order to monitor progress towards reaching MDG 5, it is essential that regions and countries produce accurate maternal mortality estimates. In reality, however, mortality statistics are of variable quality, and local figures are usually not available.[2] In some areas, vital registration data are obtained through civil registration systems.[2,4] However, in resource-poor settings these systems are often not available or of poor quality.[4,5]

Since its introduction in the early 1990s, the sisterhood method has been applied in low-resource settings to estimate maternal mortality.[6] This technique was designed to avoid high costs by overcoming the need for a large sample size.[7,8] The sisterhood method has two forms: (1) the original indirect method by which maternal mortality is derived from respondents' answers to four basic questions, and (2) the direct method which is rather time-consuming and requires a larger sample size, by which respondents are asked to provide more detailed answers to 11 questions pertaining to maternal mortality in their families. In 1989, the indirect sisterhood method was applied in Thyolo District, Malawi. It revealed an MMR of 409 per 100 000 live births.[9]

This present study describes a second indirect sisterhood survey carried out in the same district 17 years later in order to re-calculate community-based maternal mortality. In addition, we determined facility-based MMR at the local district hospital in 2005. We undertook this study in order to evaluate progress towards reaching MDG 5, which has been a national priority in Malawi. Several nationwide initiatives have been launched in the past to reduce maternal mortality, such as the national Safe Motherhood Task Force (1993) to guide programme development and its implementation, the National Strategic Plan of 1995, the Malawi Safe Motherhood Project 2003 and the Malawi National Road Map in 2005 for accelerating the reduction in maternal and newborn mortality.[10-12]

Materials and methods

Setting

Thyolo District is one of 12 districts in the southern region of Malawi, a low-income country in sub-Saharan Africa. It is a rural area that had approximately 570 000 inhabitants in 2004, with an adult HIV prevalence of 21% and a fertility rate of 5.7. In 2005, around half of

the women in Thyolo delivered their babies at a formal health facility.[3] There were 3085 deliveries in 2005 in Thyolo District Hospital, largest public health facility in the district. The proportion of Malawian women delivering in formal health facilities has not noticeably increased in recent decades.[3]

Data collection and analysis

In December 2006, we conducted a household survey applying the indirect sisterhood method. We made use of 30 randomly selected enumeration areas throughout the district. These enumeration areas were determined by the National Statistical Office of Malawi for the national Demographic and Health Survey and were used for logistical reasons.[3 13] Each area had a population of 300-2000 people, living in a maximum of five rural villages. Population data and maps were available to identify relevant communities. This design was similar to that of the 1989 survey that included 4124 randomly selected respondents from different areas in the district.

The interviewers were 10 nurse-midwife students who received dedicated training prior to the survey. All adult males and females aged 15 years or older were asked the following four questions: (1) how many sisters of reproductive age (born to the same mother) they had, (2) how many of these were alive at the time of the survey, (3) how many had died, and (4) how many had passed away during pregnancy, childbirth or within 6 weeks of giving birth.[6] Interviewers were asked to verify that the sum of the answers provided to questions 2 and 3 equalled the outcome of question 1.

For the calculation of the MMR two mathematical adjustments were carried out:

1 A correction made for the fact that respondents under the age of 25 are likely to have more sisters who will reach age 15 or get married in the future. Therefore, the number of respondents in the age group under the age of 25 was multiplied by the average number of sisters of those in the age group above 25. This average was 2.29 (3410/1491), that is each respondent above the age of 25 had 2.29 sisters above 15 years of age.
2 A correction made for the fact that sisters of respondents over 60 years of age may be expected to have undergone a complete lifetime risk of childbirth and sisters of younger respondents only part of this lifetime risk. Therefore the 'sister units of risk exposure', the reported number of sisters who had reached the age of 15, was multiplied by an adjustment factor as defined by Graham *et al*.[6]

Routinely collected hospital data concerning live births, stillbirths, neonatal deaths and maternal deaths in 2005 were extracted from hospital registers.

All data were analysed using Epi-Info 6.04 and SPSS 16 software packages. The significance level was set at 5%.

Outcomes

The indirect sisterhood method gives an estimation of maternal mortality for the 10-12 years prior to the study, which is the median number of years since the death of deceased sisters.[6 14] Restricting the age limit of respondents would reduce this interval but increase the required sample size.[7] Therefore, estimation of the community-based MMR in Thyolo District studied in 2006 relates to the period 1994-1996. The intention was to compare the outcome with the 1989 survey.

Ethics

Local authorities, community leaders and respondents were informed about the purpose of the survey, and verbal consent was requested from each individual respondent. Collected data did not include patient identifiers. The Malawi National Health Science Research Committee provides general oversight and approval for the collection and use of data for monitoring and evaluation purposes, and the Thyolo District Health Office and the Médecins Sans Frontières programme have approval from the committee to publish routine and de-identified programme outcomes such as those used in this study. Separate written approval was not considered necessary.

Results

A total of 2286 respondents (1747 females and 539 males) in 1802 households were interviewed and divided into 5-year age groups (table 1).

The total lifetime risk of maternal death for a woman reaching the age of 15 was 3.2% (84/2641, or 1 in 31). The MMR was 558 per 100 000 live births (95% CI 260 to 820) (MMR is calculated as (total lifetime risk of death/ total fertility rate) × 100 000.)

Table 1. Outcomes of the applied indirect sisterhood method

Age group	Number of respondents	Sisters reaching age 15	Maternal deaths	Adjustment Factor	Sister units of risk exposure
15-19	265	606	5	0.107	65
20-24	530	1212	16	0.206	249
25-29	393	737	16	0.343	253
30-34	297	652	14	0.503	328
35-39	208	559	10	0.664	371
40-44	118	264	6	0.802	212
45-49	94	213	4	0.900	192
50-54	102	252	1	0.958	241
55-59	72	180	7	0.986	177
60+	207	553	5	1.00	553
Total	**2286**	**3410**	**84**		**2641**

In 2005, there were 3085 hospital deliveries with 2858 live births. Twenty-seven maternal deaths were recorded at the hospital in the same year, giving a facility-based MMR of 994 per 100 000 live births.
The 1989 sisterhood survey in Thyolo had revealed an MMR of 409 per 100 000 live births with no confidence intervals specified.[9] Comparing the 1989 and 2006 MMRs, we calculated an OR of 1.4 (95% CI 0.7 to 2.6) indicating no significant difference between the 1989 and 2006 MMRs.

Discussion

Our findings show that the MMR in Thyolo District did not decrease significantly between the 1989 and 2006 surveys. This puts a gloomy light on the possibility to achieve the target set by MDG 5 for 2015. The MMR of 558 per 100 000 live births indicates that maternal health may even have worsened during the 17 years prior to this study.
This is one of the first studies to our knowledge performed at district level echoing the recent figures from Hogan et al. indicating that maternal mortality in Malawi increased substantially during the final 20 years of the last century. This increase was primarily due to a rise in HIV-related mortality.[15] In addition, the deepening of the human resources for health crisis, partly as a result of HIV, may have contributed.[16]
The national MMRs given by Hogan et al. are considerably higher (743, 1662 and 1140 per 100 000 live births in 1990, 2000 and 2008, respectively) than those found in these sisterhood surveys. It has been suggested that the sisterhood technique may lead to under-estimation of maternal mortality as biases causing under-reporting (for instance recollection bias) may outweigh those leading to overestimation.[14] Since our study assessed maternal mortality for the years 1994-1996, it is possible that—in line with the trend described by Hogan et al.—the MMR increased further after 1996.
The MMR of 558 per 100 000 live births is similar to the national MMR in the 2010 intersectional trend report that indicates a downward trend in MMR from 780 to 510 per 100 000 live births corrected for HIV-related mortality, between 1990 and 2008.[17] It is possible that HIV-related deaths are also under-reported in sisterhood surveys since respondents may not recall the pregnancy of a relative who died of AIDS (or any other condition not directly related to pregnancy).
Although the very high hospital-based MMR is influenced by a delay in women seeking and accessing the appropriate level of formal healthcare, health workerrelated substandard care at facility level was previously shown to be the most important contributor to poor maternal outcome.[18] Health worker-related substandard care is compounded by the critical shortage of healthcare personnel and will have to be addressed in order to improve the credibility of formal obstetric services and attract more women to the facility for delivery. Regardless, the facility-based MMR is unacceptably high.

Since the study ended several efforts have been undertaken to improve maternal health in the district. These efforts include: (1) investments in the quality of obstetric care by applying rigorous audit and feedback, (2) increasing access to antiretroviral therapy for those requiring it, including health staff, with district-wide coverage obtained in late 2007, (3) investments in health promotion, infrastructure and training of staff in peripheral sites throughout the district, and (4) the implementation of culturally-sensitive non-monetary incentives to attract women to the facility for delivery alongside the efforts to improve quality.[19-22] These healthcare-related initiatives to help reduce maternal mortality should be complemented by efforts to empower women and relieve poverty.

Another sisterhood survey in 10-12 years is indicated to determine whether the initiatives have been successful in reducing maternal mortality. For the moment, the situation looks grim. The threatening failure to achieve MDG 5 should not lead to complacency. Rather, this failure carries with it the moral obligation to intensify the fight against maternal mortality.

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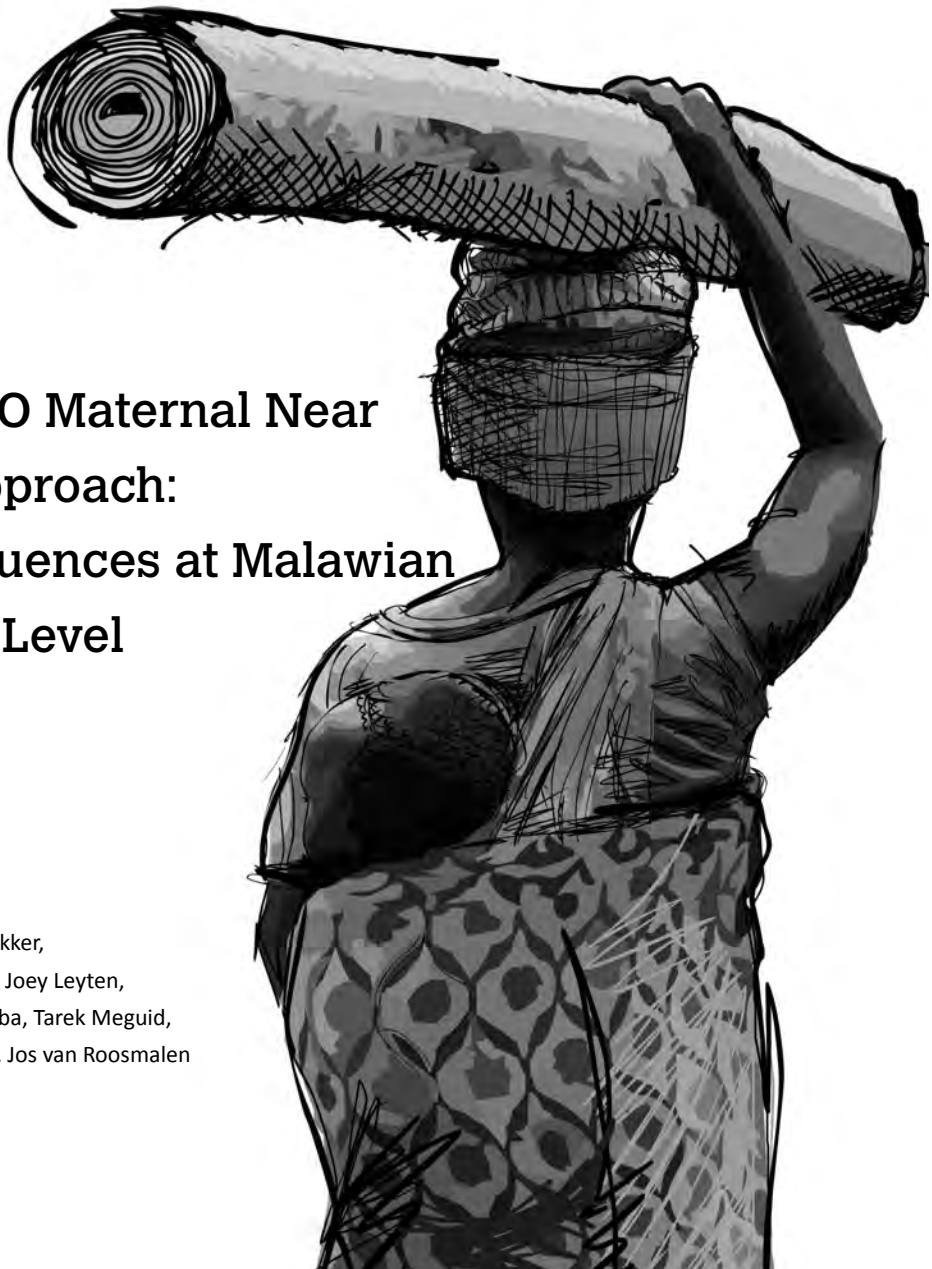
CHAPTER 4



The WHO Maternal Near Miss Approach: Consequences at Malawian District Level

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Abstract

Introduction: WHO proposes a set of organ-failure based criteria for maternal near miss. Our objective was to evaluate what implementation of these criteria would mean for the analysis of a cohort of 386 women in Thyolo District, Malawi, who sustained severe acute maternal morbidity according to *disease*-based criteria.

Methods and Findings: A WHO Maternal Near Miss (MNM) Tool, created to compare disease-, intervention- and organ-failure based criteria for maternal near miss, was completed for each woman, based on a review of all available medical records. Using disease-based criteria developed for the local setting, 341 (88%) of the 386 women fulfilled the WHO disease-based criteria provided by the WHO MNM Tool, 179 (46%) fulfilled the intervention-based criteria, and only 85 (22%) the suggested organ-failure based criteria.

Conclusions: In this low-resource setting, application of these organ-failure based criteria that require relatively sophisticated laboratory and clinical monitoring underestimates the occurrence of maternal near miss. Therefore, these criteria and the suggested WHO approach may not be suited to compare maternal near miss across all settings.

Introduction

Maternal mortality remains one of the major public health problems of our time, and poor quality obstetric services continue to be an important associated factor.[1,2] In order to identify and correct deficiencies in health care delivery, maternal mortality audits are performed in many health facilities throughout the world.[3] However, the absolute number of maternal deaths occurring at the level of health facilities is often low. Therefore, case reviews are increasingly directed at women who *survived* a serious health condition during pregnancy and childbirth, in addition to women who died.[4,5] Peer-review of severe morbidity has the added advantage of being potentially less threatening to the morale of participants compared to mortality audit: 'near misses' may sometimes be presented as 'great saves'.

A pregnant or recently delivered woman who nearly died from a critical condition is often described as a 'near miss' or 'severe acute maternal morbidity'. The WHO working group on maternal mortality and morbidity classifications ('the working group') proposed the term 'maternal near miss' (MNM) which can be defined as 'any woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy'.[6]

In order to advance the use of the MNM concept and compare near miss estimates across settings and over time, the working group set out to arrive at uniform criteria for the identification of MNM. The choice is between three distinct types of criteria that have been used in the past: (A) clinical criteria related to a specific condition, such as eclampsia or hemorrhage ('A-criteria'), (B) intervention-specific criteria such as admission into an intensive care unit or the performance of laparotomy or blood transfusion ('B-criteria'), or (C) a set of criteria whereby organ system dysfunction such as shock or renal dysfunction is identified ('C-criteria').[6]

According to the working group, the 'organ-system dysfunction based approach' is the most promising of the three options and should form the basis for a standardized set of inclusion (type 'C') criteria. Since organ dysfunction may be regarded as a pre-stage to death, identifying organ failure in a woman suffering from pregnancy-related illness could be a way to identify those women at high risk of mortality. In this respect, the WHO working group makes a difference between potentially life-threatening conditions on the one hand (e.g. eclampsia or major hemorrhage) and life-threatening conditions on the other (those that have resulted in organ failure).

To ensure the usefulness of the organ-failure based approach in resource-poor settings, markers that can generally only be diagnosed by intensive care monitoring - which is usually not available in such settings - would need to be supplemented by simpler clinical markers such as gasping, oliguria or jaundice.[6] With the objective of evaluating the implications of an organ-system dysfunction based approach, WHO developed a 'Maternal Near Miss Tool' (WHO-MNM Tool) (Figure S1).

The objective of this study was to examine the implications of applying the WHO-MNM tool to a cohort of women who sustained severe maternal morbidity in an under-resourced district in sub-Saharan Africa, and, in this way, to assess the feasibility of the organ failure based approach in such a setting. In addition, we wanted to compare the feasibility and appropriateness of applying each of the three suggested types of MNM criteria (disease-, intervention- and organ-specific).

Methods

Ethical clearance

This study was a re-analysis of the same cohort that was published in PLoS ONE before[7], and it was performed in full accordance with the guidelines for operational research of the National Research Council and the Health Sciences Research Committee of the Ministry of Health of Malawi[8;9] and with the Helsinki declaration of 1975, as revised in 1983. For the original study, verbal approval had been obtained from the National Health Sciences Research Committee from the Ministry of Health, Malawi, which ruled that formal approval was not necessary for that type of study. In addition, the National Health Sciences Research Committee as well as the District Health Office of the Ministry of Health ruled that written consent was not necessary for this type of operational research, which should in fact be routine practice in any Malawian district hospital in order to monitor clinical performance. Nevertheless, verbal informed consent was obtained from all included women or their relatives (in case of maternal mortality) for the original study before collecting their information into the database. All results were de-identified and none of the information collected in the database could be traced back to any individual patient. The District Health Office of the Ministry of Health took part in the study design and ensured that the study was performed conform national guidelines. This present study used only the de-identified data contained in the original database. For this present type of study, further informed consent was not required.

Setting

Thyolo District is an area that had a population of around 600 000 in 2004, with an adult HIV-prevalence of 21% and a total fertility rate of 5.7.[10] It is located in Southern Malawi, a low-income country in sub-Saharan Africa. Similar to other districts in Malawi and the wider region, the health system is comprised of one large public district hospital and several small peripheral government- and mission-run health facilities. In many districts, non-governmental organizations provide technical and logistic support to the public health system including in Thyolo where Médecins Sans Frontières is present[11]. Care in the public health system is provided free-of-charge.

Participants

A prospective study of maternal mortality and MNM was performed in Thyolo District Hospital over a two-year period from September 2007 to August 2009 (the '4M-Study': study of maternal mortality and maternal morbidity in Thyolo). Forty-six cases of maternal mortality and 340 women with MNM defined according to disease-specific criteria were identified.[7]

The near miss criteria applied in the '4M-study' were: (1) uterine rupture, defined as the occurrence of clinical symptoms (pain, fetal distress, acute loss of contractions, hemorrhage) or intrauterine fetal death that led to laparotomy, at which the diagnosis was confirmed, or laparotomy for uterine rupture after vaginal birth[12]; to this definition we added rupture confirmed by autopsy or clinical symptoms with a high suspicion of rupture in case of death[13]; (2) eclampsia or severe pre-eclampsia with a maternal indication for termination of pregnancy; (3) major obstetric hemorrhage (including hemorrhage from complicated abortions and ectopic pregnancies), defined as a fulfilled need for transfusion of at least two units of 450 ml of whole blood (we adjusted the commonly cited criterion of four units[14] because of scarcity of blood for transfusion in the local setting) or a hemoglobin level below 6 g/dl measured after vaginal bleeding or an estimated blood loss of more than 1 liter; (4) severe obstetric and non-obstetric peripartum infections, defined as all infections for which intravenous antibiotics or intravenous anti-malarials were prescribed or surgical treatment was performed, as well as neoplasms resulting primarily from HIV-infection (e.g. Kaposi's sarcoma and HIV-associated lymphoma); (5) any other complication the clinician considered severe, with the qualification 'severe' confirmed by at least two senior clinicians (a small rest group that turned out to comprise only 5% of the total number of MNM cases).[7] These criteria derived from similar international studies.[14–16]

In the 340 women who sustained MNM, 375 MNM diagnoses were made: 119 infections, 119 major obstetric hemorrhages, 75 cases of (severe pre-)eclampsia, 43 uterine ruptures and 19 other complications. Case fatality rates ranged from 4% in the (pre-)eclampsia group to 16% in the infection group. HIV-infection played a role, with 30% of MNM cases and 50% of maternal deaths occurring in HIV-positive women. Systematic obstetric audit and feedback took place in the same period, during which a significant reduction of maternal complications was found.[7]

Intervention

We revisited the medical records of women included into the 4M-study.[7] Medical records included the admission file, labor graph, antenatal records and audit reports. Obstacles to correctly complete the WHO-MNM tool were identified by studying inter-assessor variance and calculating the intraclass correlation coefficient for each type of criterion (A, B and C). This was done by having subsets of cases assessed by four assessors (TvdA, JL, TM, JS) who independently completed the MNM tool for each case within the subset. Differences between the assessors were discussed and consensus was reached upon how to apply the criteria given in the tool. Based on this consensus, the WHO-MNM tool was completed for each woman by two of the authors (TvdA and JL). Correct completion was then verified by a third investigator (JB). JS and TM are gynecologists-obstetricians with extensive experience in similar settings, JB and TvdA are residents in obstetrics and gynecology and worked in Thyolo District as general practitioners for several years. JL is a medical student with a special interest in obstetrics in low-resource settings.

Data collection and analysis

From all completed MNM tools the following parameters were collected into Microsoft Excel: inclusion diagnoses (A-, B- and C-criteria groups and individual diagnoses A0–A4, B0–B3, C0–C6, see Figure S1), maternal and perinatal mortality, mode of delivery, and contributory conditions (HIV, anemia, previous caesarean section and obstructed labor). All parameters were analyzed using SPSS Version 19.0 software package: proportions of each parameter were calculated with the significance level set at 5%. The intraclass correlation coefficient for each type of criterion (A, B and C) was assessed by first calculating the intraclass correlation coefficient for each separate criterion (A0–A4, B0–B3, C0–C6).

Results

General characteristics of the 386 included women are shown in Table 1.

Nineteen cases were assessed during the inter-assessor comparison. Concordance between assessors ranged between two out of three (67%) and eight out of eight (100%) for A-criteria, between one out of five (20%) and five out of five (100%) for B-criteria, and between zero out of three (0%) and two out of three (67%) for C-criteria (Table 2). The intraclass correlation coefficients were calculated at 0.72 for A-criteria, 0.59 for B-criteria and 0.47 for C-criteria.

Table 1. General characteristics of all women assessed (n = 386).

Characteristic	Specified	N	Percentage of total
Mortality	Maternal	46	11.9
	Perinatal	106	27.5
Mode of assisted delivery	Cesarean section	134	34.7
	Vacuum extraction*	17	4.4
HIV-positive		120	31.1
Obstructed labor		81	21.0
Previous caesarean section		37	9.6

*not indicated in WHO tool
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Table 2. Criteria identified by assessors to 19 cases. N/A = not assessed.

Case	Assessor 1	Assessor 2	Assessor 3	Assessor 4
1	A0,A3,B0	N/A	N/A	A0,A3,B0,C0,C6
2	A4,B0,B2	N/A	A4, B2	N/A
3	A4,B2	N/A	N/A	B2
4	A2,C5	N/A	A2	N/A
5	B0	N/A	N/A	A3,B0,B2
6	B0, B2	N/A	B0, B2	N/A
7	A3, B0	N/A	N/A	A3, B0, C4
8	A4,B2	N/A	A4, B2, C6	A4, B0, B2
9	B0	N/A	N/A	B0,B2
10	A2,C5	N/A	N/A	A2
11	N/A	A3	N/A	A3,C1
12	N/A	A3,B0	N/A	N/A
13	N/A	A4, B0, B2, C6	A4, B0, B2, C6	N/A
14	N/A	A3	A3	N/A
15	N/A	A0, B0, C3	B0	B0, B2, C3
16	N/A	A3	N/A	A3, B0, C4
17	N/A	A0,A4,B0,B2,C6	A4, B0, B2, C6	N/A
18	N/A	A1	A1	N/A
19	N/A	A1	A1	N/A

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The most important difficulties to fill in the tools observed by the assessors are shown in Table 3 and the solutions agreed between assessors in Table 4. Assessors agreed unanimously that all of the cases they assessed constituted 'maternal near miss' according to the WHO-definition: 'a woman who nearly died but survived a complication that occurred during pregnancy, child-birth or within 42 days of termination of pregnancy'.

Table 3. Difficulties perceived by assessors.

1.	No A-inclusion criterion for antepartum hemorrhage, despite consensus that all assessed cases of APH constituted MNM.
2.	Not clear whether to include convulsions as part of eclampsia under C5 (neurological dysfunction: uncontrollable fits?).
3.	Ectopic pregnancies and their complications are not part of the disease-specific ('A') criteria.
4.	Unclear which infections can be defined as 'severe systemic infections' (A3).
5.	Unclear whether to include a suspected ruptured uterus under criterion A4 or not.
6.	Unclear whether to include uterine repair (in order to spare the uterus) and hysterectomy for uterine rupture under C6 (uterine dysfunction).
7.	Not clear whether any caesarean section should be included as laparotomy (B2).
8.	Not clear which definition of shock should be used.
9.	Unclear what is meant by C5 (hepatic dysfunction): only in the presence of pre-eclampsia?
10.	Malaria treatment is not part of the process indicators.
11.	Not clear whether blood transfusion as a process indicator should be based on a minimum of units transfused.

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Table 4. Agreed solutions.

1.	Do not include APH-cases under 'A-criteria'.
2.	Do not include convulsions as part of eclampsia under C5, unless they fulfill the criterion 'uncontrollable fits' mentioned in the tool: mortality or continued fits despite administration of anticonvulsants.
3.	Do not include ectopic pregnancies unless cases strictly fulfill any other criteria.
4.	Include all cases for which intravenous antibiotics or intravenous anti-malarials or surgical treatment were used.
5.	Include cases of suspected uterine rupture only if they fulfill the definition used in the 4M-study.
6.	Do not include repair for uterine rupture under C6, but do include hysterectomy for uterine rupture, since the criterion is explicitly described as 'hemorrhage or infection leading to *hysterectomy*'
7.	Do not include caesarean section under B2; only include 'other' laparotomies.
8.	Use the definitions provided by Say et al.: shock is 'a persistent severe hypotension, defined as a systolic blood pressure <90 mmHg for ≥60 minutes with a pulse rate at least 120 despite aggressive fluid replacement (>2l) (6).
9.	Strictly apply definition of hepatic dysfunction as given in MNM tool: only jaundice in presence of pre-eclampsia and severe acute hyperbilirubinemia to be included.
10.	Record cases in which malaria treatment was given separately.
11.	Include all cases in which *any* blood transfusion was given, regardless of the amount.

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Of all 386 women that had initially been included into the 4M-study, 341 (88%) fulfilled one or more of the WHO disease-specific A-criteria. The remaining 45 cases, which did not meet any A-criteria, were: 23 antepartum hemorrhages, six ectopic pregnancies, three abortions complicated by severe hemorrhage, two cases of Kaposi's Sarcoma, two cases of stroke, two cases of very severe anemia during pregnancy, two puerperal psychoses, one sudden cardiac arrest, one obstructed labor with necrosis, one burst abdomen post-caesarean, one vaginal tear due to unsafe abortion, and one maternal death with unknown cause.

Of the 386 women, 179 (46%) fulfilled one or more 'B-criteria'. In total 224 B-events were recorded: 163 cases in which blood transfusion had been given and 61 cases in which laparotomy had been performed. There had been no intensive care admissions or invasive radiological procedures, since neither of these services was available at this facility.

Only 85 women (22%) fulfilled organ failure based C-criteria. In total 90 C-events were recorded. Table 5 shows the number of events recorded in each (sub-) category.

Table 5. Inclusions per (sub-) category in 386 women with 421 critical events.

Category	N	Sub-category	N	Percentage of inclusions per category
A: disease	392	0: PPH	107	27%
		1: Pre-eclampsia	20	5%
		2: Eclampsia	71	18%
		3: Infection	148	38%
		4: Ruptured uterus	46	12%
B: intervention	224	0: Blood products	163	73%
		1: Interventional radiology	0	n/a
		2: Laparotomy	61	27%
		3: Admission into ICU	0	n/a
C: organ failure	90	0: Cardiovascular	29	32%
		1: Respiratory	14	16%
		2: Renal	1	1%
		3: Coagulation/Hematologic	4	4%
		4: Hepatic	13	14%
		5: Neurologic	8	9%
		6: Hysterectomy	21	23%

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Discussion

Our findings have several implications for the approach to finding universal criteria for MNM, especially in resource-poor settings. Firstly, the application of disease-, intervention- and organ failure specific criteria would lead to different proportions of severe acute maternal morbidity being included as maternal near-miss. Disease-specific criteria 'pick up' most of the severe morbidities, while the organ failure criteria as preferred by WHO would lead to a

considerably lower number of 'near-miss' cases identified. At district level in a low-resource setting, the absence of sophisticated laboratory diagnostics and the lack of manpower to perform extensive clinical monitoring clearly prevent inclusion of MNM based on C-criteria. Secondly, the inter-assessor concordance and intraclass corre-lation show that the fulfillment of C-criteria appears to be subject to perceptual differences between assessors, to a larger extent than the fulfillment of A- or B-criteria. This indicates that the use of C-criteria would have to be accompanied by extensive instructions to health workers as to how to apply these criteria in practice.

Thirdly, the B-criteria appear to be relatively straightforward and would lead to inclusion of a considerable proportion of clinical MNM, but these criteria do not allow for a significant differentiation among cases, as only two out of four interventions (blood transfusion and laparotomy) are commonly available at district level in low-income settings. Moreover, those cases that would undoubtedly be considered MNM on clinical grounds but in which neither of these two interventions are performed would not be included as MNM in the WHO Tool. These B-criteria could be relevant in order to identify the severity of some of the conditions classified as A-criteria.

In a recent study from a tertiary intensive care facility in Brazil, the use of organ-failure criteria enabled the researchers to identify most maternal near misses. Out of 673 admissions into this unit, 194 'near misses' and 18 maternal deaths (MD) were identified, giving a 'Mortality Index' (MI = MD/MNM+MD 100%) of 8.5%.[17] In our cohort, this MI, even using disease based criteria, would be (46/340+46 100%) 12%. Using the organ failure criteria, the MI would be (46/90+46*100%) 34%. In other words, even the 'potentially life threatening conditions' in rural Malawi according to the WHO definition would be more deadly than the 'life threatening conditions' in urban Brazil.

We agree with the WHO working group that organ failure is a logical pre-stage to death and that identifying organ failure would be a logical manner to determine the severity of maternal illness. However, this identification is difficult, particularly in the absence of sophisticated diagnostics. Moreover, our goal should be to prevent organ-system dysfunction. One step is then to learn lessons from 'potentially life-threatening conditions', rather than ignoring these. Only when the MI or the case fatality rate of 'potentially life threatening conditions' has fallen below 1%, a level that was previously identified as an indicator of acceptable obstetric care by the Averting Maternal Death and Disability Program[18], the focus may be shifted to organ-system dysfunction, although assessing this type of dysfunction may remain difficult in a resource-poor setting.

Based on these study findings, we do not agree with the recent statement that 'an organ-system dysfunction approach remains as the most epidemiologically sound set of criteria'.[19] We suggest that the disease-specific A-criteria would be the most appropriate MNM criteria in low-resource settings where the MI is higher than 1%. If antepartum hemorrhage and

complications of ectopic pregnancy and abortion would be included under these A-criteria, most of the severe acute morbidity would be included as MNM. We felt that the inclusion of approximately 190 women on a yearly basis, or 16 women per month, made for a manageable workload.[7] We also feel that most of the severe morbidity cases based on modified disease-specific criteria would fulfill the definition of MNM given by WHO.

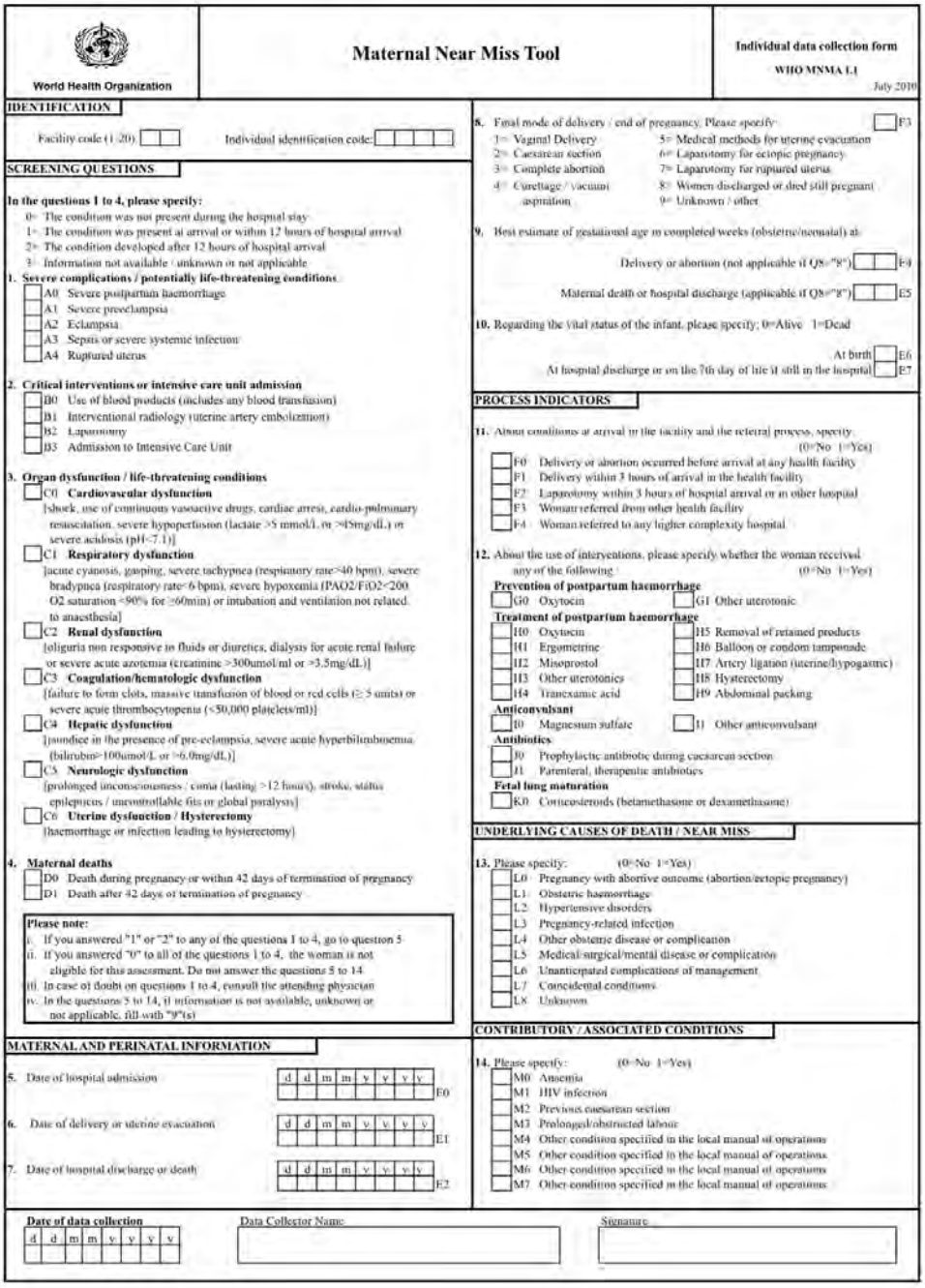
One limitation of our study is that it built on the outcome of a previous study of maternal morbidity and mortality that relied on independent inclusion criteria.[7] These study criteria will account for some underreporting of total maternal morbidity that could be considered MNM. For instance, women who received only one unit for blood transfusion would not have been included into the '4M'-study unless major blood loss would have been recorded or a very low hemoglobin would have been measured, and were therefore not included into the present analysis, although they would have fulfilled the WHO B0-criterion. It is likely that, unless the disease-specific criteria for hemorrhage are adjusted to include 'major' hemorrhage only, over-representation of hemorrhage as MNM would occur. In addition, our application of the 4M-criterion for the inclusion of severe systemic infection (intravenous medication or surgical treatment) could lead to over-reporting. However, our previous finding that even with this relatively 'mild' criterion the case fatality rate for peripartum infections stood at 16% (the highest index of all different morbidities), we do not think that over-reporting played any role of importance.[20] In the study setting, potent intravenous antibiotics are relatively scarce and not as commonly used as in many high-income countries. Therefore, use of this type of medication may be an appropriate indicator for the severity of an infection in low-resource settings.

It must also be noted that the identification of severe maternal morbidity in Thyolo had the specific interest of several staff in the district. Audit of maternal morbidity is considered to be a valuable activity by most health workers in the district.[21] Therefore, the results cannot automatically be expected to be similar in other districts. Moreover, since MSF provided some extra laboratory capacity in Thyolo (creatinine- and bilirubin measurements testing, full blood cell counts) some inclusions, particularly in the C-group, could not happen in districts with less sophisticated readings. In other words, in such districts yet a lower proportion of cases with organ failure would be identified.

Reaching consensus on universal criteria to compare maternal outcome across time and space may be a useful undertaking, provided that these criteria would not underestimate poor maternal outcomes in those areas where these are expected to be highest. We subscribe to the statement made initially by the WHO Working Group that the guiding principle for the development of criteria should be that these are 'feasible for use in any setting regardless of the development status'. Based on the findings of this study, the WHO-MNM approach to use these organ failure based criteria may not fulfill this principle, although these criteria should be tested in similar settings to determine their usefulness.

Supporting Information

Figure S1 WHO Maternal Near Miss Tool.



World Health Organization

Maternal Near Miss Tool

Individual data collection form
WHO MNMA 1.1
July 2010

IDENTIFICATION

Facility code (1-20) ☐☐ Individual identification code: ☐☐☐☐

SCREENING QUESTIONS

In the questions 1 to 4, please specify:
0= The condition was not present during the hospital stay
1= The condition was present at arrival or within 12 hours of hospital arrival
2= The condition developed after 12 hours of hospital arrival
3= Information not available / unknown or not applicable

1. Severe complications / potentially life-threatening conditions
☐ A0 Severe postpartum haemorrhage
☐ A1 Severe preeclampsia
☐ A2 Eclampsia
☐ A3 Sepsis or severe systemic infection
☐ A4 Ruptured uterus

2. Critical interventions or intensive care unit admission
☐ B0 Use of blood products (includes any blood transfusion)
☐ B1 Interventional radiology (uterine artery embolization)
☐ B2 Laparotomy
☐ B3 Admission to Intensive Care Unit

3. Organ dysfunction / life-threatening conditions
☐ C0 **Cardiovascular dysfunction**
[shock, use of continuous vasoactive drugs, cardiac arrest, cardio-pulmonary resuscitation, severe hypoperfusion (lactate >5 mmol/L or >45mg/dL) or severe acidosis (pH<7.1)]
☐ C1 **Respiratory dysfunction**
[acute cyanosis, gasping, severe tachypnea (respiratory rate>40 bpm), severe bradypnea (respiratory rate<6 bpm), severe hypoxemia (PAO2/FiO2<200, O2 saturation <90% for ≥60min) or intubation and ventilation not related to anaesthesia]
☐ C2 **Renal dysfunction**
[oliguria non responsive to fluids or diuretics, dialysis for acute renal failure or severe acute azotemia (creatinine >300umol/ml or >3.5mg/dL)]
☐ C3 **Coagulation/hematologic dysfunction**
[failure to form clots, massive transfusion of blood or red cells (≥ 5 units) or severe acute thrombocytopenia (<50,000 platelets/ml)]
☐ C4 **Hepatic dysfunction**
[jaundice in the presence of pre-eclampsia, severe acute hyperbilirubinemia (bilirubin>100umol/L or >6.0mg/dL)]
☐ C5 **Neurologic dysfunction**
[prolonged unconsciousness / coma (lasting >12 hours), stroke, status epilepticus / uncontrollable fits or global paralysis]
☐ C6 **Uterine dysfunction / Hysterectomy**
[haemorrhage or infection leading to hysterectomy]

4. Maternal deaths
☐ D0 Death during pregnancy or within 42 days of termination of pregnancy
☐ D1 Death after 42 days of termination of pregnancy

Please note:
i. If you answered "1" or "2" to any of the questions 1 to 4, go to question 5
ii. If you answered "0" to all of the questions 1 to 4, the woman is not eligible for this assessment. Do not answer the questions 5 to 14
iii. In case of doubt on questions 1 to 4, consult the attending physician
iv. In the questions 5 to 14, if information is not available, unknown or not applicable, fill with "9"(s)

MATERNAL AND PERINATAL INFORMATION

5. Date of hospital admission d d m m y y y y E0
6. Date of delivery or uterine evacuation d d m m y y y y E1
7. Date of hospital discharge or death d d m m y y y y E2

8. Final mode of delivery / end of pregnancy. Please specify: ☐ F3
1= Vaginal Delivery
2= Caesarean section
3= Complete abortion
4= Curettage / Vacuum aspiration
5= Medical methods for uterine evacuation
6= Laparotomy for ectopic pregnancy
7= Laparotomy for ruptured uterus
8= Women discharged or died still pregnant
9= Unknown / other

9. Best estimate of gestational age in completed weeks (obstetric/neonatal) at:
Delivery or abortion (not applicable if Q8="8") ☐☐ F4
Maternal death or hospital discharge (applicable if Q8="8") ☐☐ E5

10. Regarding the vital status of the infant, please specify: 0=Alive 1=Dead
At birth ☐ E6
At hospital discharge or on the 7th day of life if still in the hospital ☐ E7

PROCESS INDICATORS

11. About conditions at arrival in the facility and the referral process, specify: (0=No 1=Yes)
☐ F0 Delivery or abortion occurred before arrival at any health facility
☐ F1 Delivery within 3 hours of arrival in the health facility
☐ F2 Laparotomy within 3 hours of hospital arrival or in other hospital
☐ F3 Woman referred from other health facility
☐ F4 Woman referred to any higher complexity hospital

12. About the use of interventions, please specify whether the woman received any of the following: (0=No 1=Yes)

Prevention of postpartum haemorrhage
☐ G0 Oxytocin ☐ G1 Other uterotonic

Treatment of postpartum haemorrhage
☐ H0 Oxytocin ☐ H5 Removal of retained products
☐ H1 Ergometrine ☐ H6 Balloon or condom tamponade
☐ H2 Misoprostol ☐ H7 Artery ligation (uterine/hypogastric)
☐ H3 Other uterotonics ☐ H8 Hysterectomy
☐ H4 Tranexamic acid ☐ H9 Abdominal packing

Anticonvulsant
☐ I0 Magnesium sulfate ☐ I1 Other anticonvulsant

Antibiotics
☐ J0 Prophylactic antibiotic during caesarean section
☐ J1 Parenteral, therapeutic antibiotics

Fetal lung maturation
☐ K0 Corticosteroids (betamethasone or dexamethasone)

UNDERLYING CAUSES OF DEATH / NEAR MISS

13. Please specify: (0=No 1=Yes)
☐ L0 Pregnancy with abortive outcome (abortion/ectopic pregnancy)
☐ L1 Obstetric haemorrhage
☐ L2 Hypertensive disorders
☐ L3 Pregnancy-related infection
☐ L4 Other obstetric disease or complication
☐ L5 Medical/surgical/mental disease or complication
☐ L6 Unanticipated complications of management
☐ L7 Coincidental conditions
☐ L8 Unknown

CONTRIBUTORY / ASSOCIATED CONDITIONS

14. Please specify: (0=No 1=Yes)
☐ M0 Anaemia
☐ M1 HIV infection
☐ M2 Previous caesarean section
☐ M3 Prolonged/obstructed labour
☐ M4 Other condition specified in the local manual of operations
☐ M5 Other condition specified in the local manual of operations
☐ M6 Other condition specified in the local manual of operations
☐ M7 Other condition specified in the local manual of operations

Date of data collection d d m m y y y y
Data Collector Name:
Signature:

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Part 2:

Actions to reduce maternal mortality and morbidity

CHAPTER 5

Accelerated HIV testing for PMTCT in maternity and labour wards is vital to capture mothers at a critical point in the programme at district level in Malawi

J. J. Beltman, M. Fitzgerald, L. Buhendwa, M. Moens, M. Massaquoi, J. Kazima, N. Alide, J. van Roosmalen

Abstract

Round the clock (24 hours x 7 days) HIV testing is vital to maintain a high prevention of mother to child transmission (PMTCT) coverage for women delivering in district health facilities. PMTCT coverage increases when most of the pregnant women will have their HIV status tested. Therefore routine offering of HIV testing should be integrated and seen as a part of comprehensive antenatal care. For women who miss antenatal care and deliver in a health facility without having had their HIV status tested, the labour and maternity ward could still serve as other entry points.

Introduction

Mother to child transmission (MTCT) of HIV accounts for almost one million newly infected children in sub-Saharan Africa annually. Therefore the prevention of mother to child transmission (PMTCT) programme is a cornerstone in the scaling up of HIV programmes. Like elsewhere in sub-Saharan Africa the major mode of HIV infection in Malawi is by heterosexual intercourse accounting for over 75% of the transmission. MTCT takes a second position accounting for 20-25% of HIV transmission in the country. The Malawi 2005 HIV survey indicates a prevalence in pregnant women of 15%. However, there is a regional disparity. Prevalence rates in pregnant women in the southern region is estimated at 21% as compared to 13% in the north[7]. Over 20,000 infants born to infected mothers in Malawi acquire HIV infection through MTCT each year.[8]

PMTCT is not only the single biomedical intervention with a proven potential to significantly reduce the overall incidence of HIV transmission but it also informs thousands of women and their partners on their status and helps them to get access to treatment and support services.[9] In high-income countries the risk of MTCT can be reduced to under 2% by interventions that include anti-retroviral (ARV), obstetrical interventions and complete avoidance of breastfeeding.[1,2,11] In resource-constrained settings, it is seldom safe for mothers to refrain from breastfeeding. In these settings, the effort to prevent HIV infection in infants initially focus on reducing MTCT around the time of labour and delivery.

The PMTCT programme is usually provided through antenatal clinics (ANC). The majority of pregnant women visit ANC at least once during pregnancy and therefore this programme is an excellent means to reach universal access.

Single dose intrapartum and neonatal nevirapine (NVP) was introduced in 2001 in Malawi. The programme included exclusive breast feeding for six months.

In 2002 Médicins sans Frontières Belgium (MSF-B) started a PMTCT programme in Thyolo District Hospital in southern Malawi. The PMTCT programme included HIV counselling and testing (HCT) as an integrated part of antenatal services done at ANC, provision of NVP to the mother and to the newborn child, as well as postnatal and nutritional support of the infant.

Despite offering HCT at ANC, still many HIV-positive mothers give birth in health facilities without having been offered HCT in the ANC, thereby missing an opportunity for prevention of transmission of infection to her infant and also care for her own health. Missed opportunities for HIV testing in the prenatal maternity and labour wards were previously documented at 63% in our hospital.[6]

Since the start of the programme in 2002 most of the HIV testing was done at the ANC. Since many HIV mothers deliver in our health facility without having had a previous HIV test, we offered routine HIV testing in the maternity and labour ward from June 2005.

The primary objective of this study is to examine the impact HIV testing in the maternity and delivery wards in Thyolo District Hospital for the PMTCT programme. We also tried to investigate the effect of acceleration of HIV testing on the number of deliveries of HIV-positive mothers. We examined if maternity and labour wards could serve as an alternative entry point beside the ANC to enhance PMTCT coverage.

Methods

Setting

The study was conducted in Thyolo District Hospital. This hospital serves as a designated district hospital with a mainly rural population of 570,000. The district has one public hospital, 16 public health centres and four private clinics belonging to tea-estates. The number of people living with HIV/AIDS in the district is estimated at 50,000. HIV prevalence at ANC is approximately 20%. The average number of pregnant women visiting ANC in the hospital is approximately 600 per month and approximately 3000 deliveries annually take place in the hospital.

Design

A one-year consecutive cohort of pregnant women who registered at the hospital was involved in this observational prospective cohort study which started from June 2005 to May 2006.

A programme revision was conducted early 2005. Following this a number of changes were made.[12] The PMTCT programme targeted women who attended for any in-patient care, including high-risk pregnancies, malaria, early labour or pregnancies with history of previous caesarean section. All admissions were offered routine ''opt-out'' testing and counselling. Testing and counselling was done by nurses who were trained to provide these services. Women who tested HIV-positive were offered NVP prophylaxis intrapartum. Their babies received a single dose of NVP within 72 hours after delivery (2 mg/kg).

In addition to this we adopted a ''one stop approach'' to our antenatal services in June 2005 to increase uptake in the PMTCT programme. All mothers received routine HIV and Syphilis tests after a group pre-test education talk (motivation talks) and post counselling at first contact. Opportunistic infection management, co-trimoxazole prophylaxis and anti-retroviral therapy (ART) were offered to HIV-positive mothers twice a week and the services were provided within the PMTCT infrastructure. All mothers received the maximum package of activities on the same day of visit and at the same site and by the same nurse.

This meant that all prevention and care services were integrated in the same clinic, whereas prior to this approach HIV-positive pregnant women went to a separate ART clinic which dealt with all HIV-positive outpatients. These patients usually defaulted or were lost to follow-up before the ''one stop approach'' was introduced.[6] The ''one-stop'' approach was

further accelerated in January 2006, which meant that Ministry of Health (MOH) staff were also involved. The integration and collaboration of MOH staff and MSF staff were paramount to this acceleration. During the acceleration phase uptake rates of 98% were achieved.[5]
We divided the study in two periods. In the first period we started offering HIV testing in maternity and labour ward, where most of the time the HIV testing here was done on indication. [baseline phase] (June 2005-December 2005). During the second period we introduced the acceleration of HIV testing in both wards (January-May 2006). Here active case finding started by trained nurses [intervention phase]. A retrospective review of birth registers was done in January 2006. Prospective monitoring of HIV testing was undertaken for another six months to evaluate the impact of the service changes that took place in January 2006. Data was analysed using Microsoft Excel®, 2003 and Epi-info. For normal distributions, students *t*-test was used. Statistical significance was assumed if $p<0.05$.
The study was approved by the district health management team of the hospital.

Results

During the baseline phase 1704 women delivered. With an overall annual hospital-based HIV prevalence of 20%, at that time a total of 341 deliveries in HIV-positive women were expected. One hundred and ninety-nine deliveries in HIV-positive mothers were documented. This means a missed opportunity for HIV testing of potential HIV deliveries of 42%.
Out of the 199 HIV-positive mothers who delivered in our facility, 169 pregnant women were previously tested HIV-positive in ANC. An additional 30 women were tested HIV-positive in both wards. During the second period of the study (intervention phase) where the accelerated HIV testing was introduced, a more detailed record form was introduced allowing nurses to make a breakdown of testing sites of all hospital deliveries. With a reported 1144 hospital deliveries, a total of 252 HIV-positive mothers were expected to deliver. We documented 182 HIV-positive deliveries (PMTCT deliveries). Missed opportunities for HIV testing accounted now for 28% (Table 1).

Table 1. Outcomes of two periods of the study.

	Total hospital deliveries	Total expected HIV + deliveries	Tested HIV + in both wards	Tested HIV + of all PMTCT deliveries in ANC	Reported HIV + deliveries	Percentage (%) known HIV + deliveries	Percentage (%) missed HIV + deliveries
Baseline phase	1704	341	30	169	199	58	42
Intervention phase	1144	252	63	120	182	72	28

Table 2. Breakdown of testing sites of all hospital deliveries where HIV testing and counselling (HCT) was done.

	June	July	August	September	October	November	December	Total	January	February	March	April	May	Total
Number of hospital deliveries	314	265	162	265	231	205	262	1704	237	185	254	224	244	1144
PMTCT deliveries	28	26	27	27	27	31	33	199	19	36	34	46	47	182
Tested HIV + in maternity/labour ward	2	0	4	4	4	4	3	21	13	12	18	8	12	63
Number tested in maternity/labour ward	5	4	8	10	14	19	17	77	73	93	93	108	112	479
Sites of HCT of all hospital deliveries														
Antenatal clinic	28	26	27	27	27	31	33	199	41	63	99	81	121	405
Maternity	5	4	8	10	14	19	17	77	71	85	80	103	111	450
Labour ward	0	0	0	0	0	0	0	0	2	8	13	5	1	29
Unknown	281	235	127	228	190	155	212	1428	123	29	62	35	11	260

Antenatal clinic (ANC)

Out of the 1144 deliveries during the intervention phase of the study 405 pregnant women were tested in ANC. In the period of one year the number of women getting tested in ANC increased from 12% (199/1704) to 35% (405/1144; $p<0.05$, CI [1.15 1.79]; Table 2). This increase is mainly attributed to the acceleration of the ''one stop approach'' in ANC.

Maternity/labour ward

In the maternity ward a total of 450 women were tested and 29 in labour ward during the intervention phase. The number of women who tested HIV-positive in both wards doubled during the study (from 30 HIV-positive pregnant women during baseline phase to 63 women during intervention phase). Out of 479 women tested in maternity/labour ward 63 women were found to be HIV-positive (13%). The breakdown of the different testing sites of all hospital deliveries allowed us to determine the contribution of each site. 4.5% of all women delivering in the facility received HIV testing in labour and maternity ward during Phase 1 and this proportion increased to 42% in Phase 2 (Table 2). Most of the HIV testing in the maternity ward (73%) was done shortly after delivery or the next 2 days. In the labour ward a very small increase of 3% (29/1144) in testing occurred during the intervention period. Out of the 1144 deliveries, 260 women had an unknown HIV status in this period (Table 2). The number of reported HIV-positive mothers who delivered in the defined period increased from 58% (199/341) to 72% (182/252; $p<0.05$ CI [0.37 0.78]; Table 1).

Discussion

In countries with a high HIV prevalence, such as Malawi, a comprehensive approach of MTCT interventions aims to respond to the wide range of health needs of women and their children. HIV testing and counselling is of major importance in identifying women who can benefit from ART and care immediately or later, or benefit from interventions to prevent HIV infection in their infants. Without PMTCT an estimated 20,000 children become infected every year in Malawi.[8] The success of this kind of programmes depends on the proportion of pregnant women who have their HIV status tested.[14]

In this study we introduced HIV testing in the maternity and labour ward. We also adopted the ''one stop approach'' in ANC. With these relative simple changes we were able to increase significantly the number of pregnant women getting HIV tested in ANC, labour and maternity ward. With the acceleration of HIV testing for PMTCT in our maternity and labour ward and the adoption of the ''one stop approach'' in ANC we were able to reduce the number of missed opportunities for HIV testing from 42 to 28% (Figure 1).

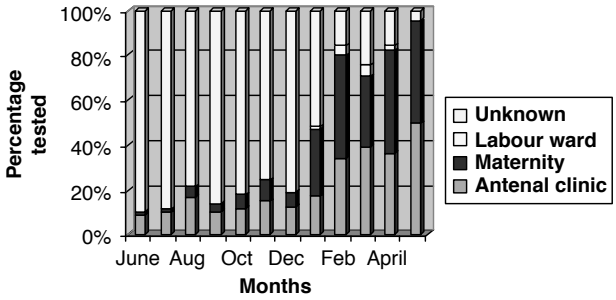

Figure 1. Sites of HIV counselling and testing of all hospital deliveries in Thyolo District Hospital.

Lessons learnt

Round the clock (24 hours x 7 days) HIV testing is vital to maintain a high PMTCT coverage for women delivering in district health facilities. PMTCT coverage increases when most of the pregnant women will have their HIV status tested. Therefore routine offering of HIV testing should be integrated and seen as a part of comprehensive antenatal care. For women who miss antenatal care and deliver in a health facility without having had their HIV status tested, the labour and maternity ward could still serve as other entry points.

Most of the testing was done in the particular wards during the day, whereas testing during the evening remained a challenge. Testing in maternity ward, mostly done after delivery, enabled women to access HIV-related services, in this case getting NVP for the neonate. The contribution of the labour ward in testing pregnant women is low. Although other literature shows high acceptability and feasibility of intrapartum HCT[3] we were not able to detect a similar trend compared to maternity ward in our study. Possible constraints could be hesitation of staff to counsel intrapartum patients with regard to confidentiality issues at the labour ward, understaffing (usually one midwife present) and opting-out for HIV testing. Absence of partner consent could play a role for opting-out.[4] Despite the fact that labour is not an ideal time to make a decision about learning one's serostatus, offering HIV testing during labour is one of the last chances for women who have had no antenatal care or were not given the opportunity to be tested during pregnancy.

This is the dilemma we were facing during this study where increasing HIV testing is desirable to increase entry into PMTCT programmes, but at the same time offers many limitations in terms of quality of services and number of people served. In Malawi, staffing shortages has resulted in examples of being able to test 75% of the mothers at some ANC.[13]

Barriers to mothers' participation and factors that affect implementation of the PMTCT programme are numerous. A recent survey conducted in Thyolo District describes limited resources, especially human resources and lack of male involvement as one of the most challenging aspects of the programme for health care providers to address.[10]

As already stated one of the successes of the PMTCT programme depends on the proportion pregnant women getting HIV tested. Accelerating HIV testing in maternity and labour ward could be one option, but is not enough. It is important to integrate HIV testing and counselling in other programmes that will deal with pregnant women or women of child bearing age, like family planning programmes, sexually transmitted infections (STI) clinics or under five clinics. Our study shows that ANC as the only entry point in preventing MTCT will not capture all pregnant women and more entry points are needed for HIV testing thereby increasing significantly the number of PMTCT care provided deliveries. This could benefit patients by knowing the HIV status in advance and will make early intervention possible.

Conclusion

In countries with a high HIV prevalence a successful PMTCT programme can only exist when the number of pregnant women who undergo HIV testing are substantial. With relative simple interventions, we managed to perform additional HIV testing in the maternity and labour ward, thereby increasing the number of documented HIV-positive mothers delivering. The number of HIV pregnant women who enrolled in the PMTCT programme almost doubled. Maternity and delivery wards could serve as alternative entry points in capturing HIV pregnant women for the PMTCT programme. This additional PMTCT testing was well accepted by both staff and patients in the hospital.

Note

This study (Accelerated HIV testing for PMTCT in maternity and labour wards is vital to capture mothers at a critical point in the programme at district level in Malawi) has been presented at AIDS 2006, XVI International AIDS Conference, 13-18 August 2006.

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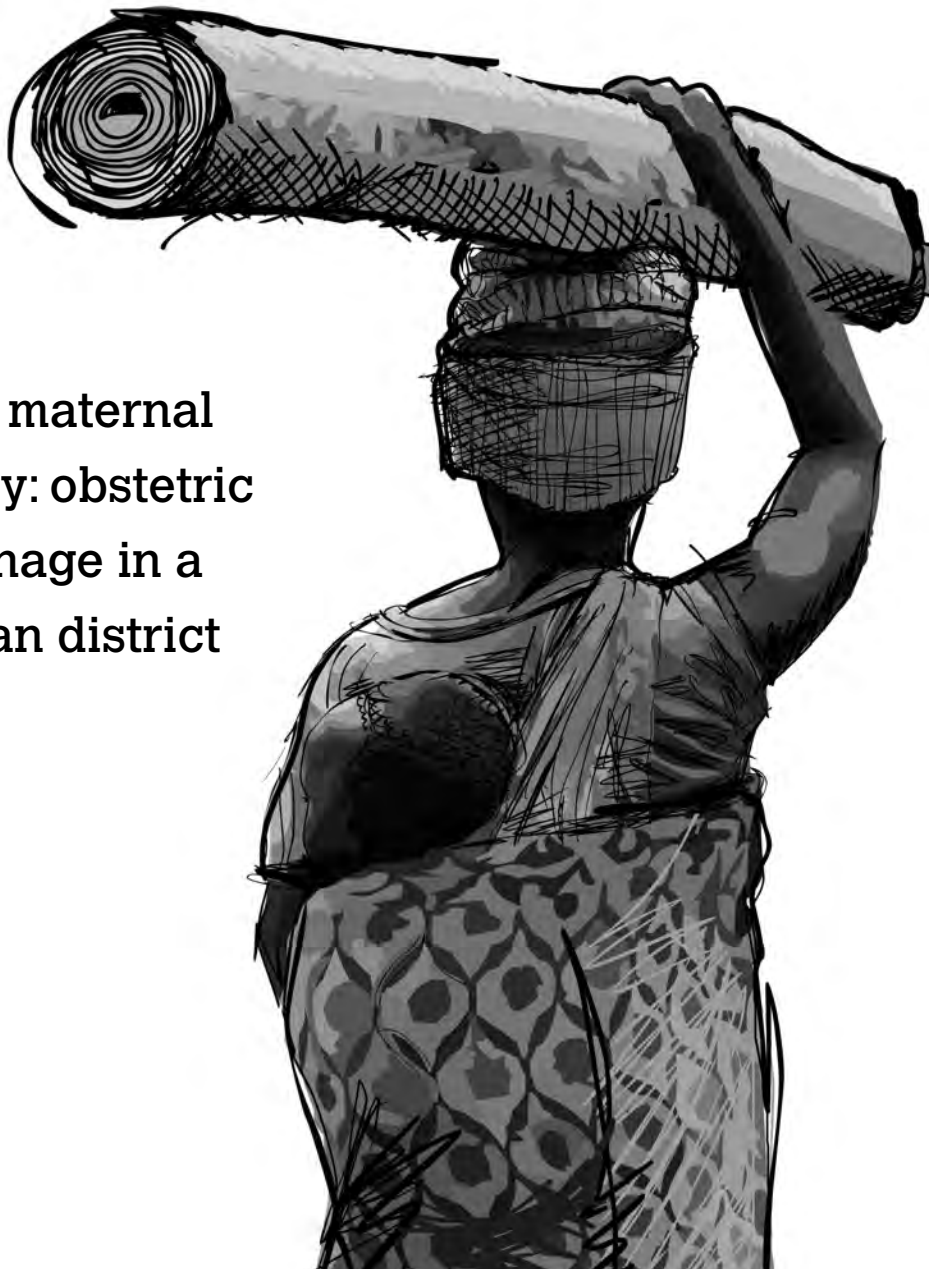
CHAPTER 6



Beyond maternal mortality: obstetric hemorrhage in a Malawian district

Abstract

Objective. To identify substandard care factors in the management of obstetric hemorrhage at district hospital level in rural Malawi.

Design. Retrospective hospital-based cohort study.

Setting. Thyolo District Hospital.

Population. Women who delivered at this facility in 2005.

Methods. All cases of obstetric hemorrhage were included according to the following criteria: any antepartum hemorrhage, postpartum hemorrhage with more than 500ml of blood loss within 24 hours after delivery, uterine rupture, retained placenta and peripartum blood transfusion.

Main Outcome Measures. Incidence of antepartum and postpartum hemorrhage, related maternal and perinatal mortality and mode of delivery.

Results. A total of 133 hemorrhage cases occurred among 3 085 hospital deliveries (43.1 per 1 000 deliveries), six of which resulted in maternal death (case fatality rate 4.5%). Twenty of 95 postpartum hemorrhage cases (21%) were peri-cesarean hemorrhages. Sixteen cesareans delivered lifeless fetuses, where a maternal indication for operative delivery was present in only four. Monitoring of pregnant women was regularly insufficient, including monitoring of women in waiting homes, and the use of uterotonics was often inconsistent.

Conclusions. Morbidity review revealed important substandard care factors, including unnecessary cesarean sections. These factors may be modified against affordable cost, which could make an important improvement in maternal outcome.

Introduction

Despite several initiatives to improve maternal health, the maternal mortality ratio in Malawi increased from 734 per 100 000 live births in 1990 to an estimated 1 140 per 100 000 live births in 2008.[1] A nationwide assessment of emergency obstetric care services in 2006 revealed that the main causes for maternal mortality were hemorrhage (25%), unsafe abortion (13%), eclampsia (12%), sepsis (15%) and obstructed labor (8%).[2]

Also at the global level, obstetric hemorrhage continues to be the main contributor to maternal mortality.[3] In Africa and Asia, where the overwhelming majority of maternal deaths occur, postpartum hemorrhage (PPH) accounts for more than 30% of all maternal deaths. Sub-Saharan Africa has the highest incidence of PPH (approximately 10% of all deliveries.[4] Unfortunately, substandard care factors are still a main underlying cause in most cases of maternal morbidity and mortality.[5]

Traditionally, facility-based maternal mortality is used as the most important indicator of the quality of obstetric care at facility level. Maternal mortality is the most devastating outcome of pregnancy, yet it represents only the tip of the iceberg of all maternal complications. Although maternal mortality remains rampant in resource-poor settings, numbers of maternal deaths at facility level are relatively small compared with the incidence of maternal morbidity. A sole focus on mortality could lead to major problems in healthcare delivery being overlooked. Therefore, maternal morbidity has been suggested as an additional indicator of the quality of obstetric services.[6,7]

Maternal morbidity comprises one stage in the spectrum between uncomplicated pregnancy and pregnancy resulting in maternal mortality. Studies of the clinical management of morbid conditions may enable us to identify modifiable healthcare-related factors and address these, in order to improve the quality of care and 'break the chain' of events leading to a maternal death.[4] The aim of this study was to examine which substandard care factors were present in the management of obstetric hemorrhage at district hospital level in rural Malawi.

Material and methods

This study was conducted in Thyolo, a rural district in southern Malawi with an estimated population of 570 000 in 2005. That same year, the district had one public hospital (Thyolo District Hospital) and 26 smaller government, mission and private health facilities, as well as more than 100 traditional birth attendants operating outside the formal sector.[8] The total number of deliveries in the district was estimated at 28 500 (birth rate 50),[9–11] half of which occurred in for-mal health facilities. At the district hospital, 3 085 deliveries were conducted that year. The cesarean section rate was 13% and the antenatal HIV prevalence 22%.[12]

The hospital maternity waiting home harbored high-risk pregnant women (such as those with a history of cesarean section) or women living far from the hospital. These women received routine antenatal care at the hospital antenatal clinic and were admitted into the hospital labor ward upon the onset of labor.[13] All women with obstetric complications who required more continuous monitoring, such as women with hypertension, pre-eclampsia or intra-uterine growth retardation, were admitted into the inpatient antenatal ward rather than the waiting home. The labor and antenatal wards were staffed by nurse-midwives and non-physician clinicians ('clinical officers'). Common procedures, including cesarean sections, were performed by these clinicians. An expatriate relief medical doctor with experience in more advanced obstetric surgery was available for consultation. Maternity care was mostly provided from the Ministry of Health budget with some external assistance from Médecins Sans Frontières, which runs an HIV program in the district.

All cases of obstetric hemorrhage that occurred in Thyolo District Hospital between 1 January and 31 December 2005 were included. Obstetric hemorrhage was defined as any blood loss before delivery (antepartum hemorrhage; APH) or blood loss of more than 500 ml within 24hours after delivery in all women who delivered vaginally or by cesarean section (PPH). Moreover, all women who received postpartum blood transfusion were included. Taking into account the lack of blood for transfusion in the local context, laboratory records were used to verify whether grouping and cross-matching ordered by the clinician had actually resulted in blood transfusion.

Lastly, women who sustained uterine rupture or retained placenta were included, regardless of the amount of blood loss. Maternal deaths due to obstetric hemorrhage were recorded separately. From the available medical records, the following information was retrieved: (a) primary diagnosis of the cause of bleeding; (b) whether the woman had been referred and, if so, from which facility; (c) mode of delivery; (d) maternal age and parity; (e) multiple gestation; (f) perinatal mortality; (g) peripartum medication; and (h) vital parameters to determine whether a life-threatening hemorrhage had occurred. Hemorrhage occurring in early pregnancy (gestational age less than 16 weeks) was not included. The study received ethical approval from the institutional ethics committee. Data were coded and analyzed using SPSS 17.0 (SPSS Inc., Chicago, IL, USA).

Results

Among 3 085 hospital deliveries, 133 cases of obstetric hemorrhage were identified; an incidence of 43.1 per 1 000 deliveries. Six hemorrhage-related maternal deaths occurred (case fatality rate 1 in 22; 4.5%). Primary diagnoses are listed in Table 1. Included patients had either been hospitalized antenatally (35%), or referred from a health center (55.5%) or the traditional birth attendant (9.5%). Median age was 24 years (range 16–45years) and mean parity 2.8 (range 1–10). Seven twin deliveries were found.

Thirty-seven APH cases accounted for 28% of the hemorrhages (Table 1). Of these, 25 (68%) had been referred from outside the hospital; the other 12 had already been hospitalized before the complication occurred. In 27 women with APH (73%) an emergency cesarean section was performed; the remaining women delivered spontaneously. No instrumental deliveries were counted. More than half of the women with APH received at least one unit of blood.

Ninety-five women (71%) had postpartum hemorrhage (Table 1). Of all PPH cases, 57 (60%) had been referred from peripheral health centers. In 53 (56%), invasive procedures such as manual placenta removal, repair of uterine rupture or hysterectomy were performed. Although active management of the third stage of labor using oxytocin is advised in national guidelines, only eight women had received prophylactic oxytocin immediately after delivery of the child. Fifty women with PPH (53%) had received at least one unit of blood for transfusion.

In 20 women with PPH (21%; mean parity 1.6, range 0–6), hemorrhage occurred during or shortly after operative delivery. The incidence of cesarean-related obstetric hemorrhage was 5.3% (375 sections were done during the study period).

Table 1. Primary diagnoses for obstetric hemorrhage (*n*=133).

Time of hemorrhage	Primary diagnosis	*n*	Percentage of total obstetric hemorrhage	Perinatal death	Maternal death
Antepartum (*n*=37)	Placenta previa	35	26.3	18	2
	Placental abruption	2	1.5	1	0
Postpartum (*n*=95)	Uterine atony	15	11.3	3	2
	Retained placenta	22	16.5	5	0
	Hemorrhage during/following cesarean section	20	15.0	5	0
	Perineal tears/episiotomy	10	7.6	4	0
	Uterine rupture	16	12.0	14	2
	Retained products	12	9.0	2	0
Missing	–	1	0.8		
Total	–	133	100	52	6

Table 2 shows indications for operative delivery; the majority (12; 60%) were due to prolonged labor. In only four of these cases, oxytocin had been given to augment labor.
Sixteen uterine ruptures were identified; five of these had occurred in scarred uteri. In seven cases life-saving hysterectomy had to be performed; in the others the uterus was repaired. Three women who underwent hysterectomy had stayed at the hospital maternity waiting home to await the onset of labor. Two ruptures resulted in maternal mortality.
Six maternal deaths from obstetric hemorrhage were reported: two from APH and four from PPH. All four PPH-related deaths occurred in women who had been referred from peripheral sites. Perinatal mortality showed a trend to be higher among referred cases compared with hospitalized cases: 36 of 81 cases (44%) vs. 13 of 46 cases (28%; relative risk 1.57, 95% confidence interval 0.93–2.65). In six cases no perinatal outcome was reported.
In the APH group the perinatal outcome was particularly poor, with 19 perinatal deaths of 37 cases (51%). Sixteen of these perinatal deaths occurred in pregnancies of women who underwent cesarean delivery, and in all of these cases the death had already been confirmed prior to the start of the operation. Yet in only four women, a life-threatening maternal hemorrhage (low hemoglobin, haemodynamically unstable, need for transfusion before or during theatre) was documented as the reason to perform emergency cesarean section.
In the PPH group, 33 perinatal deaths occurred in 95 cases (35%). Fourteen deaths happened in the uterine rupture group (perinatal mortality rate 88%) and five in the cesarean section-related group (perinatal mortality rate 25%). Of four perinatal deaths that occurred in the latter group, the indication for operation was prolonged labor. Two of these women were primigravid and two were grand multiparous. In three of these cases, fetal heart tones had not been detectable prior to the procedure.
In 55 (28%) of all cases of hemorrhage, the amount of blood loss had not been recorded. In 48% of the remaining cases (38 of 78), more than 500 ml was recorded. The maximum number of units transfused was two.
Management of obstetric hemorrhage included intravenous fluids for resuscitation, hemoglobin monitoring, blood transfusion and emergency surgical intervention. Active management of the third stage of labor with ergometrine and intravenous fluids for resuscitation had been done in practically all patients. During the time of study, the labor ward was equipped with a Hemocue© device for direct hemoglobin measurement. This occurred, however, in only 14% of all cases.

Table 2. Indications for cesarean section (*n*=20).

	Number	Perinatal deaths
Prolonged labor	12	4
Fetal distress	1	0
Cord prolapse	2	1
Eclampsia	2	0
Two previous cesarean sections	2	0
Malpresentation	1	0
Total	20	5

In one case of obstructed labor, hysterectomy was performed due to severe peritonitis following cesarean section.

Discussion

We found an incidence of hospital-based obstetric hemorrhage of 43.1 per 1 000 deliveries, with a case fatality rate of 4.5%. This is far higher than the maximum acceptable rate of 1% according to the World Health Organization (WHO).[14] These findings show important operational deficiencies in the provision of obstetric care at district hospital level in rural Malawi.

It is questionable that a considerable number of cesarean sections were done in women who sustained intra-uterine fetal deaths following APH. Operative delivery is usually only indicated in the case of a life-threatening situation for the mother.[15] In our study, only four of 37 pregnant women with APH (11%) were sectioned because of a life-threatening hemorrhage. In the remaining 23 women who underwent cesarean section, the presence of a life-threatening situation, such as major placenta previa, was not excluded by proper diagnostic methods, such as an examination under anesthesia that can be performed in absence of reliable ultrasound scanning. Examination under anesthesia can aid a decision to rupture the membranes artificially, in order to safely continue vaginal delivery in case of marginal or minor placenta previa in a hemodynamically uncompromised woman.[15,16]

In a setting such as the one described here, it may not always be easy to determine the indication for operative delivery: the amount of blood loss is often poorly recorded, especially during transport in the case of referral, vaginal examination to determine cervical dilatation is generally not considered prudent, and assessment of fetal distress may be difficult due to poor access to ultrasound scanning and absence of fetal blood sampling. In such a situation, vital parameters of the mother will prevail against those of the fetus.

Our findings suggest that induction or augmentation of labor was not considered often enough in hemodynamically stable women. This could have prevented unnecessary emergency operative deliveries that represent health risks to women in these and future pregnancies, particularly in the local setting.[17] The finding that cesarean section-related

hemorrhage was common leads us to promote the use of craniotomy in the case of intra-uterine death and obstructed labor. It is a cause for concern that no instrumental deliveries were done. This emphasizes the need for quality basic emergency obstetric care.[18]

Although oxytocin is part of the essential drug list according to the World Health Organization,[19] it is still common in rural areas that, due to unavailability or inexperience with the use of this drug, augmentation of labor may be delayed. In our study, only four women received oxytocin for augmentation of labor and only eight received prophylactic oxytocin for management of the third stage. Added to the common hesitation to perform artificial rupture of membranes out of fear of vertical HIV transmission,[20] failure to use oxytocin may lead to unnecessary cesarean sections.

Although there is insufficient evidence to determine the effectiveness of maternity waiting facilities for improving maternal and neonatal outcomes,[13] it is still unacceptable that uterine ruptures occur in women awaiting labor in waiting homes.

Shortages of qualified staff, essential drugs and supplies, administrative delays and clinical mismanagement are likely to have contributed to the identified substandard care.[21] Investments to train and retain well-qualified personnel, improvements in the supply chain and pro-activeness of district authorities are needed. Obstetric audit and feedback may also play an important role in reducing delays at facility level.[22] Some of the substandard care factors we identified can be addressed without a substantial budget increase; reducing unnecessary interventions may cut costs, and oxytocin is an inexpensive drug.

Although we tried to minimize under-reporting, it is possible that some cases of hemorrhage were missed. A prospective study of uterine rupture in the same district found a considerably higher incidence of uterine rupture.[22,23] Therefore, it is necessary to consider our study results as minimum figures.

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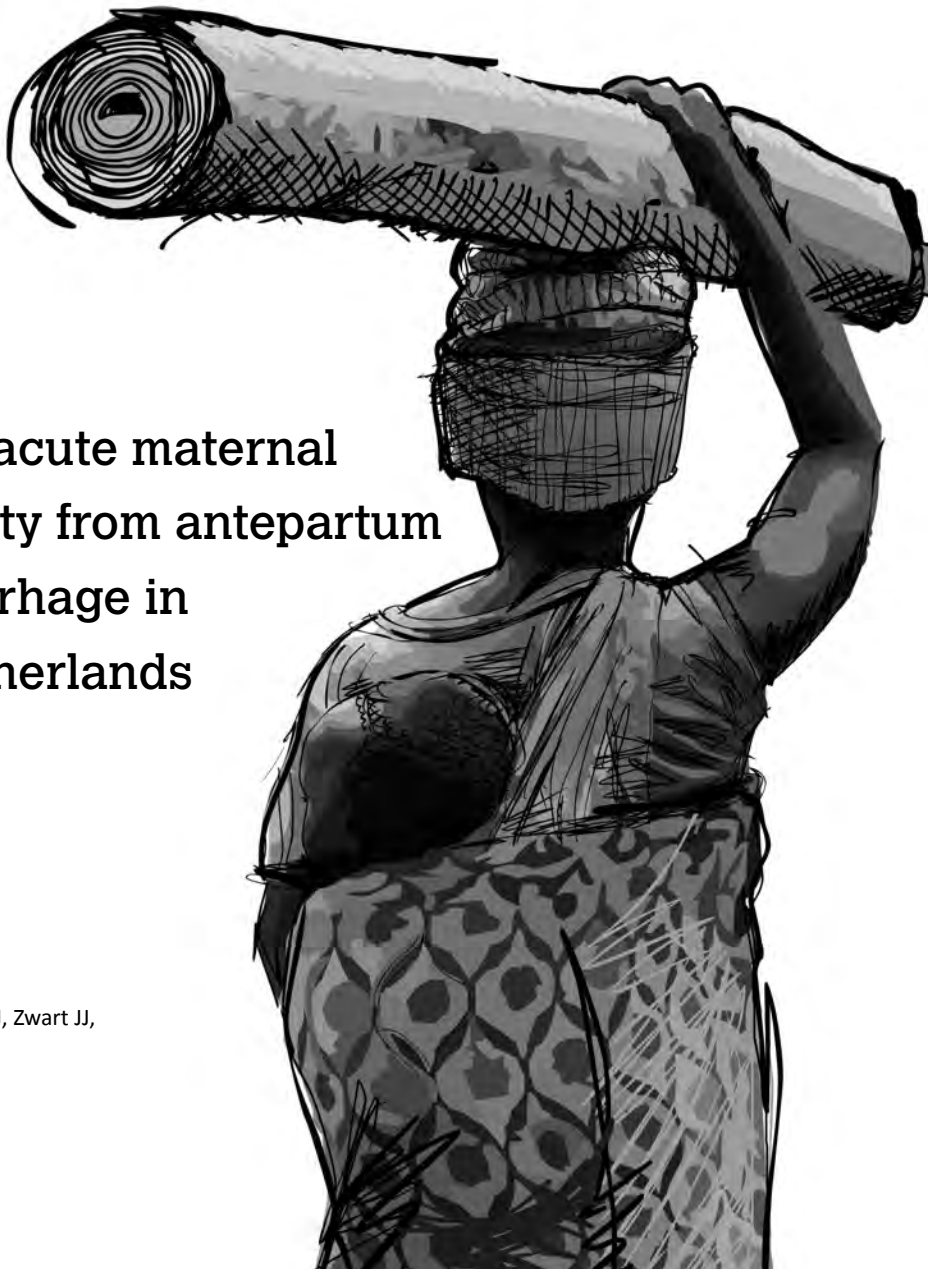
CHAPTER 7



Severe acute maternal morbidity from antepartum haemorrhage in the Netherlands

Dijk PD, Beltman JJ, Zwart JJ,
van Roosmalen J.

Abstract

Objective: To determine the nationwide population-based incidence of Severe Acute Maternal Morbidity (SAMM) due to antepartum haemorrhage (APH), as well as risk factors and maternal and fetal outcomes.

Methods: A population-based cohort study among all women delivering in the Netherlands between August 2004 and August 2006 (n=371,021). Cases of major obstetric haemorrhage (MOH) leading to severe maternal morbidity as defined by disease- and intervention-based criteria were collected during a two-year period as part of a larger nationwide analysis of SAMM. Women with antepartum haemorrhage and a gestational age of at least 24 weeks were included.

Results: APH occurred in 117 out of 1606 women with MOH (7.3%). The incidence of APH as part of MOH was 3.3 per 10,000 deliveries. Maternal case fatality rate was 0.9% (1/117), perinatal mortality rate 27.6% (34/123). Risk factors for APH were pregnancy following artificial reproduction technique [RR 4.8 (CI 2.5-9.2)], high parity [RR 2.2 (CI 1.2-3.9)] and multiple pregnancy [RR 3.7 (CI 1.7-7.9)]. Non-Western immigrants were at increased risk [RR 1.8 (CI 1.2-2.7)]. Postpartum haemorrhage occurred in 73.5% (86/117) of women who sustained APH.

Conclusions: In this nationwide cohort, women who sustained APH were at considerable risk of severe morbidity and perinatal mortality.

Introduction

Major obstetric haemorrhage (MOH) is the most frequent cause of maternal mortality worldwide. In Western countries, however, maternal mortality has become a rare event. Therefore, severe acute maternal morbidity (SAMM) is increasingly used as a quality indicator of obstetric care. In several Western countries, an increased incidence of MOH has been observed in recent years, which may have accounted for an increase of SAMM and long-term morbidity.[1-5] The increased incidence of MOH could be explained by increasing caesarean section and multiple pregnancy rates, and by increasing maternal age.
Women with antepartum haemorrhage (APH) represent a relatively small subgroup of all women with MOH. Since aetiology, management and risk profile for APH differ from postpartum haemorrhage, women sustaining APH deserve specific attention.
A nationwide cohort study (the LEMMoN study), was conducted in the Netherlands to assess incidence, case fatality rates and risk factors for different types of severe maternal morbidity. Inclusions were categorized into five major groups (admission into intensive care unit (ICU), uterine rupture, eclampsia/HELLP syndrome, major obstetric haemorrhage and miscellaneous). Major obstetric haemorrhage comprised 51.1% of all SAMM.[6] The main objectives of this study were to determine the incidence of SAMM due to APH in the Netherlands, as well as risk factors and maternal and fetal outcomes.

Materials and Methods

Women were included from 1st August 2004 until 1st August 2006. All 98 hospitals (100%) with a maternity unit in the Netherlands participated. In each hospital a local coordinator reported cases using a monthly standardized web-based form. To reduce underreporting, the monthly form also had to be completed in case no events had occurred. Cases were identified through clinical databases, labour ward diaries, staff reports, ICU admission registers, blood transfusion registers, discharge data and personal communication.
A total of 1606 women were included into the LEMMoN study. MOH was defined as: at least four units of blood transfused, or peripartum hysterectomy, or arterial embolisation performed for haemorrhage. From this cohort, all women with antepartum onset of haemorrhage and gestational age of at least 24 weeks were extracted.
All subclassifications of placenta praevia (complete, partial, marginal and low-lying) were included, as well as women with placental abruption. The following characteristics were recorded: age, body mass index, ethnicity, single household, smoking, obstetric history, data about pregnancy and delivery, maternal and fetal outcome, and APH-specific data (amount of blood loss, causes, surgical interventions, ICU admission, blood products received and medication administered, haemoglobin levels, clotting parameters).

Body mass index was calculated using pre-pregnancy weight or a first trimester measurement. Incidence was calculated using the total number of births in the Netherlands during the study period as denominator, obtained from Statistics Netherlands (CBS).[7] This denominator was corrected for stillbirths beyond 24 weeks and multiple pregnancies. Relative risks (RR) with 95% confidence intervals (CI) and absolute risks were calculated if national reference data were available. National reference values for possible risk factors were obtained from Statistics Netherlands and the Netherlands Perinatal Registry (LVR).[8]
Blood loss postpartum was analyzed in order to calculate the rate of PPH among women with APH. Delivery of the child constituted the turning point between APH and PPH. PPH was defined, according to national guidelines, as a postpartum blood loss of more than 1000 millilitres. Statistical analysis was performed using the SPSS statistical package 17.0 (SPSS Inc., Chicago, IL, USA). The LEMMoN study was approved by the Institutional Review Board of Leiden University Medical Centre.

Results

During the study period, there were 371,021 deliveries in the Netherlands. All 98 hospitals with an obstetric ward in the country participated (100%). A maximum of 2352 (98 x 24) 'hospital-months' could be reported. Mainly due to some hospitals enrolling late into the study, 2275 of the 2352 (97%) monthly forms were actually returned. During these 2275 hospital months, 358,874 deliveries were conducted.
There were 117 cases of APH, giving an incidence of 3.3 per 10,000 deliveries as part of MOH. Of these 60 women sustained placental abruption (1.6 per 10,000) and 49 had placenta previa (1.4 per 10,000) (Table 1). APH cases constituted 7.3 % (117/1606) of all cases of MOH reported to LEMMoN. The maternal case fatality rate was 0.9% (1/117). This woman died of pulmonary bleeding following disseminated intravascular coagulation after placental abruption at 28 weeks and three days of gestation. Overall perinatal mortality rate was 27.6% (34/123, including six twins). Only one case of fetal death resulted from placenta praevia (1/49 = 2.0%), the other 33 fetal deaths occurred in women with placental abruption, resulting in a fetal mortality rate of 52.4% (33/64; including 4 twin pregnancies).

Table 1: primary diagnoses of antepartum haemorrhage

Diagnosis	n = 117	(%)
Placental abruption	60	(51.3%)
Placenta praevia	49	(41.9%)
Placenta accrete/percreta	2	(1.7%)
Miscellaneous*	3	(2.6%)
Unknown	3	(2.6%)

* one vasa praevia and two marginal vein bleedings.

Possible risk factors for APH are listed in Table 2, with reference to national data, including absolute risks. Median gestational age at hospital admission was 34 weeks and six days for placental abruption and 35 weeks for placenta praevia. Median gestational age at delivery was 35 weeks and 5 days for women with placenta praevia and 35 weeks for women with placental abruption.

In 86 women with APH, PPH followed after delivery of the child (86/117=73.5%). This happened more frequently in women with placenta praevia (41/49=83.7%) compared to women with placental abruption (38/60=63.3%). The median number of packed cells transfused was 5 [range 4-22] in placental abruption and a median of 5 packed cells [range 4-30] in placenta praevia. The largest amount of blood loss in our series was 16 litres in a patient with placenta praevia. Eleven patients with placenta praevia (22.4%) and 23 women with placental abruption (38.3%) were admitted into ICU. Four women with placenta praevia underwent hysterectomy, two arterial embolisation and two women had both procedures (16.3% altogether). In women with placental abruption one had a hysterectomy and two women underwent arterial embolization (5.0%). More than half of all women were delivered by pre-labour caesarean section (53.8%). Relative risk for caesarean delivery was 7.8 (RR 5.4-11.2). Caesarean section was performed in 46 women with placenta praevia (93.9%); three women with low-lying placentas delivered vaginally. Emergency CS was performed in 29 women with placental abruption (48.3%) with a fetal mortality rate of 10.3% (3/29), 30 women (50.0%) delivered vaginally with a fetal mortality rate of 90.0% (27/30), and one woman died undelivered, shortly after fetal death was diagnosed. One woman experienced placental abruption during home delivery with fetal death and subsequent MOH that was managed in hospital.

Mean age was 30.2 years for women with placental abruption and 32.8 years for women with placenta praevia. Women above 35 years were over-represented in the group with placenta praevia (RR 1.49; 95% CI 1.03-2.15) as compared to the background population.

Table 2. Possible risk factors for antepartum hemorrhage (APH)

	APH (n=117)	*Netherlands (n=358,874)*	*RR (95% CI)*	*Absolute risk (overall 1 in 3067)*
patient				
age ≥ 35	26.5%	24.7%[a]	1.1 (0.7-1.6)	1 in 2788
smoking	6.0%	n/a		
use of cocaine	0.9%	n/a		
BMI < 18.5 (underweight)	3.4%	3.1%[a]	1.1 (0.4-3.0)	1 in 2763
BMI ≥ 25 (overweight)	18.8%	31.7%[a]	0.5 (0.3-0.8)	1 in 6134
BMI ≥ 30 (obese)	1.7%	9.8%[a]	0.2 (0.0-0.7)	1 in 19169
hypertension	13.7%	n/a		
non-Western immigrant	26.5%	16.8%[a]	1.8 (1.2-2.7)	1 in 1723
pregnancy				
initial care by obstetrician	43.6%	14.3%[a]	4.6 (3.2-6.7)	1 in 662
prior caesarean delivery	14.5%	10.1%	1.5 (0.9-2.5)	1 in 2031
nulliparity	33.3%	45.2%[a]	0.6 (0.4-0.9)	1 in 5028
parity ≥3	10.3%	5.0%[a]	2.2 (1.2-3.9)	1 in 1413
multiple pregnancy	6.0%	1.7%[a]	3.7 (1.7-7.9)	1 in 833
artif. reproduction techniques: IVF/ICSI/IUI	8.5%	1.9%[c]	4.8 (2.5-9.2)	1 in 636

National reference values from [a] Statistics Netherlands (exact study period), [b]The Netherlands Perinatal Registry 2005 and [c]Dutch Society of Obstetricians and Gynaecologists (NVOG); n/a: not available.

Discussion

The LEMMoN study constitutes the first nationwide survey of MOH in the Netherlands, comprising of 1606 cases (4.5 per 1000 deliveries).[6] According to the international literature risk factors for APH include maternal hypertension, pre-eclampsia, artificial reproduction techniques, multiparity and smoking.[9-19] In addition, a history of caesarean section and increased maternal age were noted to be associated with placenta praevia.[20-22] Since some of these risk factors are increasing among high-income populations (artificial reproduction techniques, maternal hypertension, maternal age over 35, and increasing number of caesarean sections),[23] it is likely that the incidence of APH will also increase.

It is of great concern that non-Western immigrants have an increased incidence of APH. This may be explained by the fact that several barriers (such as language deficiencies and poor knowledge of the healthcare system) may prevent this group from receiving appropriate medical care. Effort must be made to reduce this inequity.

Artificial reproduction techniques (ART) are on the increase, mostly because women tend to postpone reproduction despite declining fertility with maternal age. Among ART-pregnancies, normal placentation may be impaired, leading to a higher incidence of placenta praevia. A Norwegian nationwide population based study performed between 1988 and 2002 showed a six-fold increased risk for placenta praevia in women who became pregnant by ART.[24] Our study supports this finding with a RR of 4.8 (95%CI 2.5-9.2).

The incidence of hypertension, also a known risk factor for APH, increases with age and is a known risk factor for placental abruption.[24] The relative risk for APH in women with hypertensive disorders could not be calculated for our cohort, since national incidence data for hypertension are absent. With an incidence of 13.7 % one might suspect an increased risk for APH in our cohort.

The increased global caesarean section rate is likely to result in an increased incidence of both placenta praevia and placental abruption.[11,19,22] The relative risk for APH among women with a prior c-section in our study approached significance. Clinicians must realise that APH is partly iatrogenic and critical appraisal of medical practice, including performing (particularly the first) caesarean section, is necessary to reduce the risk of APH-related SAMM.

Women who were initially cared for by an obstetrician, as opposed to a midwife, have an increased relative risk for developing APH [4.6 (95% CI 3.2-6.7)]. This might be partially explained by risk selection (women with a previous caesarean section or women with hypertensive disorders receiving obstetrician-led care). Another explanation might be the fact that women tend to stay under the guidance of the obstetrician who provided ART.

Being overweight had a weight-dependent protective effect on APH (RR 0.5; 95% CI 0.3-0.8 for BMI ≥ 25 and RR 0.2; 95% CI 0.0-0.7 for BMI ≥ 30). We are unable to explain this phenomenon, especially since a high BMI may lead to hypertension and reduced fertility. Nulliparity appears to have a protective effect as well (RR 0.6; 95% CI 0.4-0.9), most likely because these women did not have a prior caesarean delivery. Home deliveries are a strong protective factor for APH, due to the risk selection that appears to be functioning well for this indication (RR 0.002; 95% CI 0.00-0.01).

Clinicians should be aware of the increased risk of PPH among women with APH, and take appropriate precautions. In case of vaginal delivery, active management of the third stage of labour is necessary. In case of caesarean section, continuous administration of oxytocics after the baby is delivered may be considered. PPH may be more severe in case of placental abruption causing coagulation disorders.

The main limitation of this study is that individual characteristics of maternities without SAMM are missing. Therefore, we could not adjust relative risks for confounding variables in a logistic regression model. For several associated factors, the condition could be the cause of severe maternal morbidity, but it could also represent the result of it. This bias by indication especially occurs in case of caesarean delivery, which was regularly performed because of (imminent) obstetric haemorrhage. Additionally, both ART and multiple pregnancies are risk factors for APH, as ART leads to more multiple pregnancies.

This study only concerns the severest cases of APH. Unfortunately, the incidence of overall APH during the study period is not registered. Causes and risk factors could well be different in this specific subgroup of severe cases.

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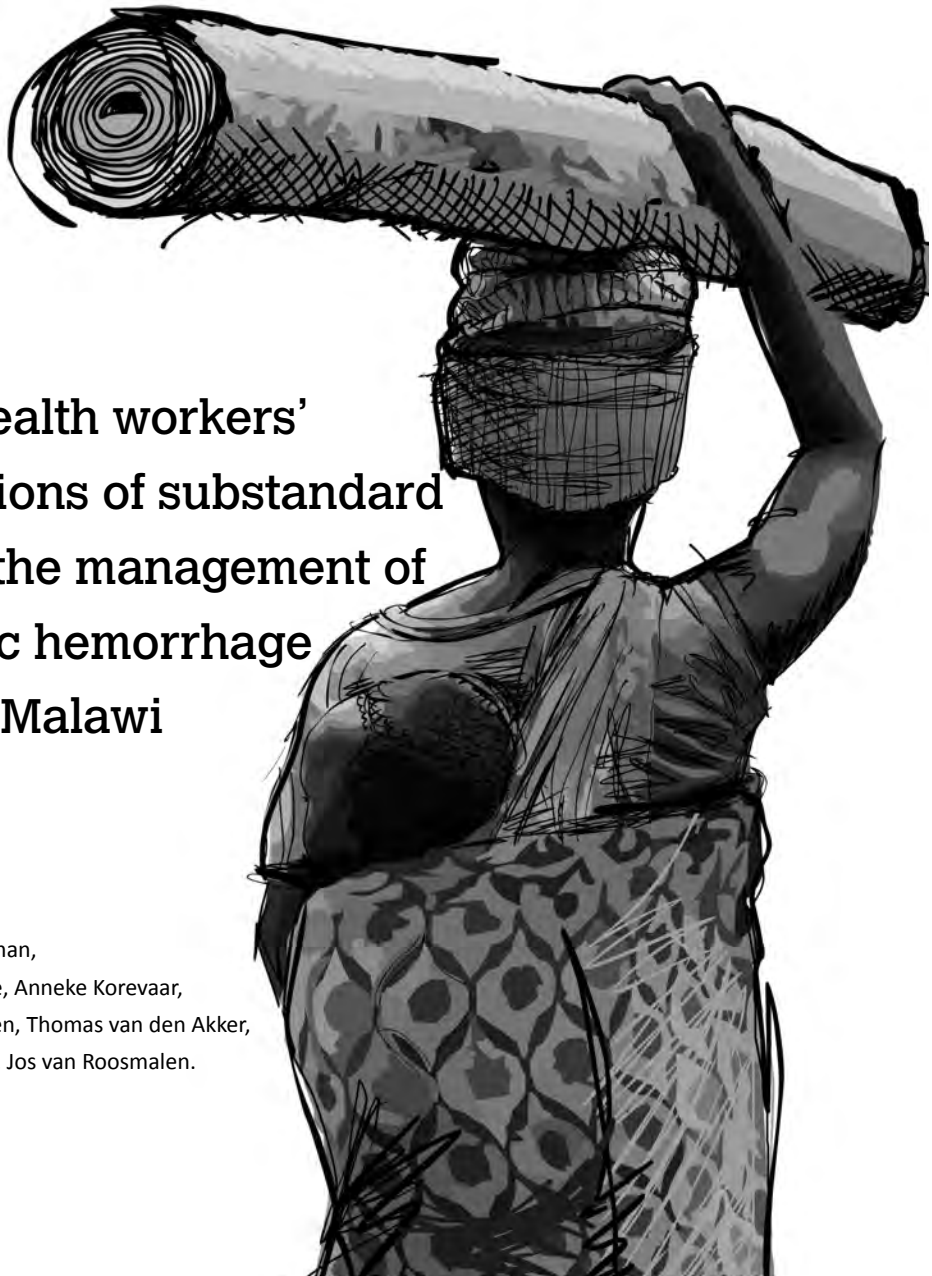
CHAPTER 8



Local health workers' perceptions of substandard care in the management of obstetric hemorrhage in rural Malawi

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Abstract

Background: To identify factors contributing to the high incidence of facility-based obstetric hemorrhage in Thyolo District, Malawi, according to local health workers.

Methods: Three focus group discussions among 29 health workers, including nurse-midwives and non-physician clinicians ('medical assistants' and 'clinical officers').

Results: Factors contributing to facility-based obstetric hemorrhage mentioned by participants were categorized into four major areas: (1) limited availability of basic supplies, (2) lack of human resources, (3) inadequate clinical skills of available health workers and (4) substandard referrals by traditional birth attendants and lack of timely self-referrals of patients.

Conclusion: Health workers in this district mentioned important community, system and provider related factors that need to be addressed in order to reduce the impact of obstetric hemorrhage.

Background

Postpartum hemorrhage (PPH) is one of the main causes of maternal mortality worldwide.[1-3] In Malawi, a low-income country in sub-Saharan Africa with a very high maternal mortality ratio, obstetric hemorrhage accounted for 14% of all maternal deaths in 2001.[4]

A retrospective review of obstetric hemorrhage in Thyolo District, Malawi, revealed 133 cases of hemorrhage among 3085 hospital deliveries (43.1 per 1000 deliveries). Six women died as a result of bleeding leading to a case fatality rate of 4.5%, which is far more than the 1% that is deemed acceptable by the World Health Organization.[5,6] Several substandard care factors in the management of obstetric hemorrhage were identified from medical records. These included insufficient monitoring of pregnant women, performing unnecessary caesarean sections on demised fetuses and inconsistent use of uterotonics.[6]

Because risk factors for hemorrhage such as prolonged labor and grand multiparity are common in many low-resource settings, health workers in these areas face high numbers of obstetric hemorrhages in their clinics. However, they often have limited means to address this burden. It is rare that perceptions about substandard care held by these health workers are included in accounts of the quality of obstetric care.

In recent years, several reports have given recommendations for the improved management of obstetric hemorrhage.[7,8] The conclusions of these reports are often based on the external investigators' point of view, and rarely take into account local capacity. In the present study, we assessed which factors were perceived to be associated with facility-based obstetric hemorrhage by health workers in Thyolo District.

Methods

Study setting and population

This study was conducted in September 2006 in Thyolo, a rural district in southern Malawi, with a population of approximately 570 000 in 2005. Health facilities in the district consisted of a public hospital (Thyolo District Hospital) and 26 smaller government, mission and private health facilities (usually referred to as 'health centers'). Peripartum care at the facility level is provided by nurse-midwives and non-physician clinicians ('medical assistants' and 'clinical officers'), who work independently or with limited supervision of a physician. Medical assistants provide general primary care and are often based in peripheral health centers, while clinical officers also perform secondary level procedures, including caesarean section, and usually work in district hospitals. In addition, more than 100 traditional birth attendants operate outside the formal sector.[9] The total number of deliveries in this district was estimated at 28 500 (birth rate 50‰), half of which occurred in formal health facilities,[10,11] where workload is immense. Up-to-date obstetric protocols are not available. At the district

hospital, 3 085 deliveries took place in 2005. The caesarean section rate was 13% and the antenatal HIV prevalence 22%.[12] A prevention-mother-to-child-prevention (PMTCT) program in Thyolo was run by Medicins sans Frontieres (MSF) Belgium at time of the study.

Focus group discussions

Three separate focus group discussions (FGDs) were carried out with a total of 29 respondents (8 clinical officers, 14 nurse-midwives and 7 medical assistants). Respondents were purposely sampled to source information from health care providers dealing with obstetric care on a routine basis and each group included health care providers from both district hospital and peripheral health centers. Topics that were discussed included causes and clinical management of obstetric hemorrhage, as well as provider- and patient-related factors, with a focus on obstetric care providers' knowledge and skills.

The FGDs were led by a social communicator (who encouraged participants asking questions, exchanging anecdotes and commenting on each other's experiences and points of view) and one medical intern specifically trained for this purpose. Discussions were held at the district hospital and conducted in the English language, which is spoken by most health professionals as a second language. All discussions were audio-recorded and transcribed verbatim. Using the open code technique, a content analysis was done. This technique implies a systematic classification process of coding and identifying themes or patterns or quotes until saturation is reached and no new information is found.[13] Quotes were drawn to indicate similarities and differences between respondents. Consent was sought before participation and all data were depersonalized so that reports could not be traced to individuals.

Results

Four themes were identified: lack of materials (1), lack of human resources (2), inadequate clinical skills among available personnel (3) and inadequate referrals, subdivided into self-referrals, and referrals from TBAs and peripheral clinics (4). Characteristics (age and work experience) of the 29 participants are listed in table 1.

Table 1. Characteristics of respondents

	Mean age (years)	Work experience (years)
Clinical officers (n= 8)	32.6	5.6
Medical assistants (n= 7)	30.8	6.7
Nurse midwives (n= 14)	30.4	6.8

Limited availability of basic supplies was felt to be a major cause of substandard obstetric care in health centers and hospital. *"Sometimes you find that you are lacking the IV fluids" (clinical officer). "Sometimes Pitocin (oxytocin, JB) gets out of stock". "It is another challenge when ergometrine gets out of stock" (nurse-midwife). "Most of the time everything is out of stock. We don't have enough for the whole month" (medical assistant).*

Most participants identified a lack of human resource as a major barrier to improving the quality of obstetric care. *"So we can say, we have problems in managing these hemorrhages, because not all the time people are there to assist you. We assist one another, it is not only a clinician or a nurse who manages PPH, but if there are other complications you also need theatre people. So for those theatre people to come, that is so time consuming" (clinical officer) "Another major cause of maternal death is lack of enough skilled workers in this midwifery practice" (nurse midwife).*

But perhaps more interestingly, many participants highlighted the inadequate clinical skills of available health workers. *"If someone is not well equipped with the knowledge and skills necessary to save lives, then we don't expect that one to perform wonders" (clinical officer).* Most respondents had not attended any refresher training since they started their professional careers (in some cases more than ten years before). Lack of training was seen as a major shortcoming. *"It was a long time ago. It must be, if it is not four years ago, something like that, at that time almost every midwife was trained" (nurse midwife).* Several health workers assigned blame for inadequate clinical skills among the workforce to policy makers whom, they reported, gave low priority to obstetric training. *"I have been working for over ten years and have had a refresher course only once. You can imagine, every time they (policy makers, JB) talk about maternal death instead of giving health workers some more training on PPH. They just talk. I think most of the attention the government spends to management of HIV/AIDS rather than maternal death" (medical assistant).*

Lack of both TBA- or patient-related timely referrals was believed to be an important factor associated with morbidity and mortality from obstetric hemorrhage. There was a widespread belief among respondents that TBAs deliberately kept patients too long within their care without referring them. They were said to use dangerous amounts of traditional herbal oxytocics and to persuade women to deliver outside formal clinics by understating the risk of complications. *"Sometimes TBAs take African medicine to keep the patient, meaning to deliver quickly, not knowing about big baby or transverse lie. And if that medicine makes tonic contraction, it can rupture the uterus" (nurse midwife). "The main challenge is that most of the PPH that I have encountered come from the TBA. The TBA keeps the patient too long for them to get something. After realizing there is PPH, they refer that patient to the health center. But when they refer the patient, it is still too late" (medical assistant). "TBAs are not trained to do vaginal examination. So they do encourage patients to push while the cervix is not fully dilated. So this could be a risk for cervical tear" (nurse midwife).*

Lack of timely self-referral of patients or delay in the decision to seek care (the first phase of delay[14]) was also thought to be an important reason. *"In obstructed labor, they think someone has bewitched her, so that the women do not deliver. So they think if they come to hospital, they still will not deliver."* Women's negative perceptions of the quality of health care in formal facilities and their fear of being stigmatized by health care personnel were recognized by most respondents as contributing factors to a delay in seeking care. *"They are afraid of caesarean section; they say they will die at the theatre table".* Jehovah's witnesses, a prominent religious group in the district, were found to endanger their own health by refusing blood transfusion*. "Another challenge in the management of PPH is the fact that we are people of different denominations. Some of us refuse the replacement of blood".*

Despite the social and cultural importance of child bearing in African society, unwanted pregnancies are a source of problems within the family. This holds true for adolescents who fall pregnant and where resorting to abortion is commonly their only choice to avoid judgment from their family and community*. "Abortions, unwanted pregnancies. Even the young school girls are dying, because of abortions or criminal abortions".*

Delay in health care seeking behavior was thought to sometimes have its origin in health promotion efforts. *"We encourage people to practice family planning, so if people have more than four deliveries, they do not come to health facilities for health services, because they fear they can be influenced and as a result they opt for alternative means of delivery. They deliver at home" (clinical officer).*

Health care worker-related reasons were mainly comprised of attitude problems. Most respondents recognized and rejected unkind behavior towards patients and acknowledged that this may affect care-seeking behavior*. "As a result, women choose probably to be assisted or to deliver at the TBA or at home" (nurse-midwife).*

Many of the respondents blamed this conduct on excessive workload. "*Because of this reduced number of midwives, many of them are exhausted, because there is a lot of work to be done. And they lose their temper in that process, they are unable to control their attitudes and sometimes they talk maybe some words which are not good. Words which can make a woman probably feel belittled. And this can also in turn cause reduced utilization of the facility" (nurse midwife). "How can one midwife fight against ten laboring patients, even more than ten per day. It is very, very tiresome. You lose your temper" (nurse midwife). "Yet if you are calling for help, nobody is coming, so it is difficult for that PPH to be managed as proper as it can be" (nurse midwife).*

Discussion

Our study revealed a number of important community- and provider-related operational and cultural barriers that have resulted in program adaptations such as the introduction of obstetric audit on a regular basis, enhanced provision of on-the-job training, increased ward supervision and improvements in the availability of human and material resources in a number of health clinic.[15,16]

Firstly, the chronic lack of materials and supplies (especially iv-fluids and oxytocin) that is experienced within the district health facilities is not particular for this district. On the contrary; this same picture appeared in a national assessment of emergency obstetric care (EmOC) in Malawi in 2005. It showed low coverage of basic EmOC (intended to be offered by health centers) and therefore poor usage, and poor quality as evidenced by high case fatality rates.[17] Efforts were made with help of Medecins Sans Frontières Belgium, Malawi mission, Thyolo project (MSF) to assist with supplies in case of emergency. This dependence on external support is illustrative of a struggling public health system.

Secondly, referrals of obstetric patients from TBAs seemed to bring about concerns among nearly all participants. Many examples were given of patients that were transferred to health facilities with considerable delays. Reluctance of TBAs to refer in a timely manner and absence of basic skills among TBAs were openly denounced. These findings indicate a sharp contrast between the opinions of health workers about TBAs on the one hand, and the high levels of acceptability and trust among pregnant women on the other. Survey data showed an increase in proportion of deliveries attended by TBAs between 1992 and 2000.[18] During a yearly training for TBAs organized in the district, increased emphasis was put on indications for referral and risk factors for antepartum- and postpartum hemorrhage. TBAs were also provided with necessary items to practice clean and safe deliveries. A similar FGD involving traditional birth attendants was conducted separately.

Patient-related factors such as fear of dying during caesarean section or fear of being influenced by information about family planning were also mentioned as barriers hindering adequate maternal care.

Provider-related factors were also identified. Overbearing attitudes of health care providers towards patients, a poorly functioning transport system with inefficient use of ambulances and delays at the hospital level in assessing emergency cases by clinicians and late arrival of hospital theatre staff for emergency procedures were brought up frequently. Some of these issues were also identified during separate audit sessions and actions were successfully undertaken to address these.[15] For example, the delay in assessing emergency cases by clinicians was reduced by setting up a night station for clinicians in the emergency department, so that they could stay on-site over night.

Thirdly, the persistent lack of human resources plays a major role in managing obstetric hemorrhage. Understaffed health care systems must manage many pressing health problems. Malawian vacancy rates in critical healthcare positions are very high - in 2004, 68 percent of doctors, 58 percent of nurses and 32 percent of clinician positions remained unfilled.[19] With such gross understaffing, inadequate referrals by both providers and patients themselves may be understandable, but should certainly not always be taken for granted and rendered acceptable.

Fourthly, respondents put emphasis on a lack of training in obstetric care. Many of them mentioned the absence of up-to-date protocols in health facilities. Many had not attended any skills training for four or five years. Data from maternal mortality reviews in Malawi indicate a lack of obstetric life-saving skills. Substandard care accounted for 60.5% of all maternal deaths.[20] Obstetric hemorrhage as cause for maternal deaths accounted for 25.6%.[20] From 2006 onwards a selected group of health care workers (around ten persons each year) received the advanced life-support in obstetrics (ALSO) training course, which was facilitated twice a year. Items covered in this course included management of postpartum hemorrhage, shoulder dystocia and vacuum delivery.

Conclusions

In many areas of the world, safe delivery for all women remains an illusion. This study highlights provider/service-related health care deficiencies such as lack of privacy, neglect and improper attitude towards patients. These deficiencies impact on care seeking behaviour of patients and their analysis adds importantly to the concept of substandard care. We therefore think that including the observations of health care workers can be of added value.

Ethical approval

Verbal approval was obtained from the National Health Sciences Research Committee from the Ministry of Health, Malawi, which ruled that formal approval was not necessary for this type of study. In addition, the National Health Sciences Research Committee as well as the District Health Office of the Ministry of Health ruled that written consent was not necessary for this type of operational research, which should arguably be routine practice in any district hospital in order to monitor clinical performance.

The District Health Office of the Ministry of Health took part in the study design and ensured that the study was performed conform national guidelines. This study did not involve any patients and none of the results can be traced back to individual health workers who participated in the FGDs.

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CHAPTER 9

"We cannot silence the truth as it is persistent.
We should rather confront it to avoid betraying our ideals"

Presentation to the United Nations by Dr. Denis Mukwege
(Congolese gynecologist). 25 September 2012.

Why maternal health is a human right and calls for another approach

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Abstract

In 2008 around 343.000 women died from complications of pregnancy and childbirth, the majority of whom in sub-Saharan Africa. Most of these deaths could have been prevented if adequate medical care would have been accessed in time. Therefore, a maternal death is a violation of a woman's rights to life and health, and to their right to receive equal treatment. Ensuring that these human rights are met is a requirement for making pregnancy and delivery safer. In other words, a human rights approach could serve as a powerful tool not only in holding governments accountable for their health policies, but also in helping health workers secure women's rights on the work floor.

Introduction

In 2008, 342.900 women were estimated to have died from complications of pregnancy and childbirth, the majority of whom in Sub-Saharan Africa.[1] The vast majority of these deaths are not only the result of biological causes, but are determined by poverty, inequity, gender discrimination and failure to provide accessible health care. In the past, many international initiatives to combat maternal mortality took place, but with varying results.[1]
One such initiative was the Global Safe Motherhood Initiative, launched in Nairobi in 1987. Twenty-five years later, the initiative is far from reaching its goal.[2] During the more recent Millennium Summit, the reduction of infant mortality rates and the improvement of maternal health were proclaimed the fourth and fifth Millennium Development Goals (MDG 4 and 5). Targets are the reduction of under-five mortality by two-thirds, the reduction of maternal mortality by three quarters and to increment skilled attendance at birth to 95% of all births by 2015, compared to the levels of 1990.[3] Recent studies on the progress toward MDG 5 show a moderate reduction of maternal mortality in some countries, but for most low-income countries, particularly in sub-Saharan Africa, it would take many years past 2015 to achieve the MDG 5 target at the current rate.[4]
In addition to these initiatives, a human rights movement for the reduction of maternal mortality was initiated, highlighted by the appointment of the first Special Rapporteur for the Right to Health by the United Nations (UN) in 2002. This Rapporteur produced several reports dealing with maternal mortality and sexual and reproductive rights. The right to health is legally based in the international Covenant on Economic, Social and Cultural Rights (ICESCR) and the Convention on the Rights of the Child (CRC), both of which are legally binding documents for nations that have signed and ratified them.[5]

This paper tries to formulate answers why a human rights based approach to reducing maternal mortality may be a powerful instrument, not only for (inter)national political- and civil organisations, but also for individual health care workers. This human rights perspective may help us health workers to analyse the violations of women's rights, and act accordingly.

Human rights at the level of the state
Human rights can be seen as legally binding obligations, which have been accepted by the international community and different governments. Hence, maternal mortality is a violation of treaties to which states can be held accountable.[5] At national level states have a legal obligation to take appropriate measures toward the progressive realization of the right to health. We need to realize that a maternal death is a death of a different order, in the sense that it is a direct consequence of deprivation of human dignity.[6]

The secretary General of the United Nations Ban Ki-moon, in line with the human rights approach described above, initiated the 'Global Strategy for Women's and Children's health' (Every Woman – Every Child) in 2010.[7] This strategy led to the creation of the 'Commission on information and accountability for Women's and Children's Health', which preceded the formation of the independent Expert Group Review Group on Information and Accountability for Women's and Children's Health that is responsible for access to health care, and evaluate progress or lack of it.

Human rights and civil rights societies

In 2011, the Committee on the Elimination of Discrimination against Women (CEDAW) issued two landmark decisions.[8] Both cases were taken to the CEDAW with help of national civil (women's) rights groups. The first case, in Brazil, concerned A.P., who was a 28-year old woman of African descent. She was in her second term of pregnancy when she died late 2002, following inadequate treatment at a local health centre. She complained of severe abdominal pain and vomiting, but was denied admission and sent home. Several days later she was finally admitted when health care personnel were not able to detect a fetal heart rate. After having delivered a stillborn baby, she suffered a postpartum hemorrhage. She underwent an evacuation of remnant placental tissues. After this procedure, her condition worsened. Delay to refer her from health centre to hospital despite her repeated requests and delay to treat upon arrival at the hospital contributed to her death two days later.[9]

The second case concerned L.C (Peru). She was a girl from a poor area who was sexually abused many times by the age of 13. After discovering she was pregnant she tried to commit suicide. Despite a risk of permanent paralysis due to trauma of her spinal cord following the suicide attempt, doctors refused to perform a realignment of her spine due to her pregnancy. The medical board of the hospital did not allow performing an abortion, even though Peruvian law permits abortion in case of a life-treating event. It was only after three months that she spontaneously aborted and received the necessary spinal care, leaving her in a quadriplegic state.[10]

These two cases reflect incapacity of both national policies and health care workers to ensure women's rights, due to lack of access to emergency obstetric care, unjustifiable delay in treatment, discrimination of marginalized women and obstruction of safe and legal abortion[8]. In their recommendations, the CEDAW raised a number of concerns such as ensuring women's right to safe pregnancy and childbirth, access to safe and legal abortion and emphasizing health care providers' accountability.[8] These cases mark the first occasions that a UN treaty monitoring body has penalized states for human rights violations. By doing so, the UN emphasises states' but also health care providers' obligations to provide adequate maternal health care.

Human rights and health care workers

But are health care workers aware of this obligation to provide dignified maternal care and promote human rights? An increasing number of studies shows how healthcare providers' attitudinal practise towards patients could influence women's healthcare-seeking behaviours.[11,12] We even recognize our unkind behavior towards patients ourselves and yet acknowledge that this may affect care-seeking behavior. We denounce the reluctance of TBAs to refer in a timely manner, yet we underestimate the high levels of acceptability and trust among pregnant women in TBAs.[13]

These attitudinal practises could be one of the causes of the low institutional deliveries in sub-Saharan Africa. Figures show that around 80% of pregnant women on the African continent attend antenatal consultations on a regular basis, whereas only on average 45% (6%–86%) seek skilled assistance during labour.[14,15] This information should raise the question if women feel themselves comfortable during labour in a health facility while being looked after by us healthcare workers?

What is the role of us as health workers within a human rights approach? How do we retain women in our facilities? A human rights-based perspective of maternal care may guide policy making at the political level, but should also promote dignity and social justice for patients attending a clinic. This perspective should help health care workers to provide the best available care.

Indeed, adequate maternal care starts with the presence of skilled and motivated birth attendants, but there are a number of simple measures, without the use of any financial means, which health care workers also need to implement in their clinics to introduce human rights. Their role must be to secure women's rights at the work floor by guaranteeing women's privacy during labour and delivery. They need to stimulate women's active participation in the labour process, for instance women's ability to choose their positions during delivery. They should welcome and to treat all patients; particularly the poor. The sense of humiliation, experienced by deprived people, may evoke feelings of inferiority and may make women turn away from institutional care.[12] In addition, we health care workers must allow women to enter labour wards accompanied by their own caregivers or guardians, to ban every form of misconduct and to promote kindness and respect for all patients. These measures may seem obvious, but unfortunately they are not at all self-evident in many places.

Conclusion

The fact that most maternal deaths are avoidable indicates that these deaths constitute a massive infringement of women's rights. A human rights based model of care may be a powerful tool to improve medical care at the level of the interaction between the individual patient and the health worker. Translation of human rights into clinical practise should be included into the training of health workers and an integrated part of their competencies. This translation must include guarding women's privacy, encouraging them to bring an accompanying guardian and promoting respect and friendliness towards patients. These relatively simple measures are conditions without which a truly significant improvement of maternal health cannot be achieved.

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CHAPTER 10

General Discussion

This thesis consists of a series of studies of maternal care in a Malawian district. We focussed on determining the scale of maternal morbidity and mortality in the district, and set a baseline for their burden. We studied low-cost interventions to improve maternal health and looked at the role of health care workers in the provision of maternity care. Here, we will summarize our findings and put these into a broader perspective.

1. Burden of disease at district and facility level

Most mortality data remain estimates since mortality statistics are of variable quality and local data are usually not available.[1] In some areas, vital registration data are obtained through civil registration systems.[1,2,3] However, in many resource-poor settings these systems are often not available or of poor quality.[3,4] Since the proclamation of the Millennium Development Goals (MDGs), many governments of low-income countries have developed a special interest to report more optimistic data in order to demonstrate progress towards the reduction of maternal mortality.[5] They find their opponents in non-governmental organizations that benefit from giving more pessimistic data, in the hope to increase political will to establish their goals. In other words, with the establishment of the MDGs, maternal mortality has become an increasingly sensitive subject.[6,7]

We studied the burden of maternal disease in Thyolo district (**chapter 3**). By applying the sisterhood method we were able to calculate the maternal mortality ratio (MMR) and compare this with a prior Thyolo study using the same method. We demonstrated that the MMR in Thyolo District did not decrease significantly between the 1989 and 2006 surveys, and may even have increased.[8] These findings correspond with the conclusions of Hogan et al., which indicate that maternal mortality in Malawi and other sub-Saharan countries increased during the final 20 years of the last century.[9] Even though, at the time of the undertaken studies, the district health care services received a considerable amount of external support and a brand new district hospital was opened, the burden of maternal and perinatal disease did not differ much from other districts in Malawi. Many efforts have been undertaken since the end of the study. Expansion and decentralization of HIV/AIDS health care to the primary care level, combined with task shifting, resulted in increased access to HIV services.[10] Rigorous audit and feedback showed a serious decline in maternal complications, including maternal mortality and locally developed incentives led to more women delivering in health facility and thus receiving professional maternity care.[11,12]

In **chapter 4,** we analyzed what the implementation of organ-based criteria of the WHO near miss tool would mean to the women who were included into the 4M study in Thyolo and sustained severe maternal morbidity according to disease- and management-based criteria.[13] Since WHO proposes organ failure based criteria for the international classification of maternal near miss, it is necessary to assess the consequences of both approaches. Only

22% of the 4M-cohort fulfilled the WHO organ-based criteria, indicating that organ failure based criteria would underestimate severe maternal morbidity in low-resource settings. An international classification of maternal near miss using organ-based criteria requires relatively sophisticated laboratory tests, which are generally not available in most resource-poor settings. Furthermore the aim of treatment should be prevention of organ failure, since treating such conditions in low-income countries often runs behind actual practise. Therefore, the currently proposed WHO tool –to our opinion- is not suited for international comparison of maternal morbidity.

2. What kind of actions/implementations could help us to improve maternal health in low-resource settings?

Measuring the burden of disease in a particular setting is of added value, prior to introduction of specific interventions. Measurements of maternal indicators form a baseline, against which the effects of any intervention can be set. Although such undertakings are often difficult due to methodological problems or incomplete documentation, efforts should be made to acquire the best possible estimates.

The success of interventions at district level was shown earlier: decentralization of ART care led to reduced mortality in the district.[3,10] Investments in access of care and quality may benefit health care in general, and maternal health in particular. The PMTCT programme that co-existed with the general ART programme was concerned with the prevention of vertical HIV transmission. Within these programmes, HIV testing is promoted as well as other preventive measures such as antenatal and postpartum care.[14] **Chapter 5** describes how HIV testing in the labour ward, a low-cost intervention at facility level, could enhance the uptake of HIV care among pregnant or recently delivered women in a low-resource country. Therefore testing for HIV, identified as an important cause of mortality and morbidity, was expanded.

At facility level, we also reviewed obstetric haemorrhage as a specific type of maternal morbidity (**chapter 6**) and calculated its prevalence and case fatality rate.[15] Morbidity review attracts more and more interest from policy makers and programme planners since maternal morbidity could function as an important indicator of the quality of obstetric care. The numbers of maternal morbidity are much higher than of mortality allowing quicker insight into the quality of care.[16,17] In addition, severe morbidity analysis is a far more easy debatable subject compared to mortality analysis, when taking into consideration the sensitivity of the issue mentioned earlier. A ‘near miss’ could also be explained as a ‘great save’. Although we tried to minimize under-reporting, some cases of haemorrhage may have been missed given the circumstances under which this retrospective study was conducted. For instance,

a prospective study of uterine rupture in the same hospital revealed a considerably higher incidence of uterine rupture than could be deducted from medical records retrospectively.[18] Therefore, it must be noted that our study results are minimum figures.

From **chapter 6,** it became clear that reviewing medical records of a specific type of maternal morbidity, in this case obstetric haemorrhage, may yield more information than maternal mortality records alone.[16,17] We identified important substandard care factors that needed to be addressed, including unnecessary caesarean sections in case of intra-uterine death, inconsistent use of oxytocin and inadequate monitoring of pregnant women with a previous uterine scar.

To provide a comparison with a high-income country, the nationwide population-based incidence of MOH as part of Severe Acute Maternal Morbidity (SAMM) due to antepartum haemorrhage (APH) in the Netherlands was described (**Chapter 7)**. We compared risk factors for APH, assessed maternal and fetal outcomes and calculated the proportion of APH cases complicated by PPH. Severe APH occurred in 7.3% women with major obstetric haemorrhage. Maternal case fatality rate was 0.9%. Perinatal mortality rate was 27.6%. In addition to this, postpartum haemorrhage occurred in 73.5% of women with APH. In the Thyolo study (**chapter 6**) maternal case fatality rate (4.5%) and perinatal mortality rate (51%) were considerably higher for the APH group, especially when placental abruption was the course.
In the Netherlands, increased risks for antepartum haemorrhage were observed for (1) non-Western immigrants, especially women from sub-Saharan Africa, (2) women with a scarred uterus, (3) those who became pregnant through artificial reproduction techniques, (4) increased parity, and (5) multiple pregnancy. APH is an important risk factor for caesarean delivery, which increases the risk for obstetric haemorrhage in subsequent pregnancies. Although much less frequent than PPH, its prognosis is worse and therefore deserving more attention.

Both studies from Malawi and the Netherlands analyse obstetric haemorrhage as part of maternal morbidity (**chapter 6 and 7**). They may be categorized as operational research, defined as 'the search for knowledge on interventions, strategies, or tools that can enhance the quality, effectiveness, or coverage of programmes where the research is performed.[19] This implies that research questions are generated by identifying constraints and challenges in the daily provision of health care. The intention is to come up with direct and practically relevant interventions.[19]

Both studies reveal a great deal of information which was not possible to retrieve from mortality files alone. These near-miss analysis are used to compliment maternal mortality reviews and help policy makers and program planners to set targets and improve maternal health care. In addition morbidity analysis distinguishes itself from mortality analysis due to its opener manner in which audit could be performed. They provide a less threatening way to examine and improve the quality of obstetric services. Especially for health care providers involved in the care of women as she has survived the near-miss event. It is extremely important to perform these audits in a blame free surrounding.

The role of health care providers in the provision of maternal care

The role of health care workers in the provision of health care remains indisputable. Yet many low-resource countries depend on health systems that can be characterized by tremendous shortages of skilled health staff. Malawi faces an enormous human resources crisis. Reasons for this shortage of personnel are three-fold. Malawi has historically not been able to sustain costs for training of medical staff and relied on expatriate doctors to cover unmet needs. Secondly, the HIV/AIDS-pandemic compounded medical staff shortages and third, much of the investment in training and retention of medical staff has been lost by an efflux of people from the public into the private sector and by migration to high-income countries.[20]

Those who remain in the clinics face excessive workload and poor salaries, which may lead to reduced motivation. All these factors are among the many other determinants of substandard care, such as poor knowledge or inadequate skills. Although this may be understandable, it is not acceptable. Involvement of health staff, by means of audit and feedback, has shown that health outcomes in the district could be improved. Audit was considered not merely an evaluation of care but functioned as a learning tool.[21]

In two studies, described in this thesis, the role of health care workers was ascertained. (**chapter 8 and 9**). **In Chapter 8,** the perspectives of health care workers about the management of obstetric haemorrhage were captured. Focus group discussions were performed to validate substandard care factors for obstetric haemorrhage described in **Chapter 6** and identify additional substandard care factors, such as the limited use of oxytocin, performing caesarean sections on non-viable fetus and insufficient monitoring of pregnant women, that may not have emerged from this morbidity review.[22]

Encouraging is the fact that attitude problems towards women in labour is brought up by health care workers themselves. They recognized and rejected unkind behavior and neglect towards patients and acknowledged that this may negatively affect care-seeking behaviour. This brings us to the issue of human rights (**chapter 9**), which may sometimes be regarded

as 'documents in drawers' that do not have a clear connection with the work ´on the floor´. Unfortunately, human rights offenses are a reality in many settings around the world, in low- and high income countries. This reality is seen in Malawi (unkind behavior towards patients, negligence) as well as in the Netherlands where non-Western immigrants, especially sub-Saharan African women, have a higher risk to sustain severe maternal morbidity. Although the increased incidence of SAMM among non-Western immigrants may be explained by other factors, such as genetic or socio-demographic differences, there are also factors related to their immigration-status that influence the risk of maternal morbidity.[23] Many times such groups systematically experience worse health or greater health risks than more advantaged social groups. Pursuing the elimination of such health disparities ensures health equity and improves the rights of those immigrants.[24] Efforts to introduce health equity could be initiated by general policies, but also by health care providers' attitudes themselves.

Health care workers have a moral obligation to provide care of the highest attainable standard and thus to ensure human rights. Adequate maternal care starts with the presence of skilled and motivated birth attendants. Health care workers need to implement a number of simple measures in their clinics to introduce human rights.
Their role must be to secure women's rights at the work floor by guaranteeing women's privacy during labour and delivery, allowing women to enter labour wards accompanied by their own caregivers or supporters, to exile every form of mistreatment and to promote kindness and respect for all patients. These measures are evidence-based and do not need any financial investment,[25] but they foremost mean better communication with the women who come under their care.

Recommendations

1. Measurement of maternal mortality at district level may help to monitor progress towards a reduction of maternal mortality. Results can be used for advocacy and putting maternal health on the agenda.
2. Maternal morbidity audit should be promoted as an additional tool to identify substandard care factors in maternity care both in low- as in high-income countries. It should be blame-free and could be used as an educational tool and thereby boosting morale.
3. Interventions to increase uptake of HIV testing among pregnant women and therefore treatment at facility level could improve maternal outcome.
4. A human rights approach may serve as a tool not only to hold governments accountable, but also to help health workers promote and protect women' s rights on the work floor. Health workers are accountable for what is happening under their responsibility. Women should be allowed to bring a caregiver with them into every labour ward on this globe.

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CHAPTER 11

Summary/Samenvatting

Summary

This thesis is divided into two parts. The first part is comprised of studies that calculate the magnitude of maternal mortality and morbidity in a Malawian district. These studies set the basis for the second part, in which low-cost interventions to reduce maternal mortality and morbidity are described, with an emphasis on the role of health workers.

Part 1. Background: maternal mortality and morbidity in Thyolo, Malawi

Chapter 2 is a situation analysis of health services in Thyolo district at the time the studies took place. Maternal mortality was calculated at community level using the sisterhood method and compared with a prior sisterhood survey. We demonstrated that the MMR in Thyolo District did not decrease significantly between the 1989 [409 per 100 000 live births] and 2006 [558 per 100 000 live births] surveys, and may even have increased. (**chapter 3**).

In **Chapter 4,** severe acute maternal morbidity that occurred at the local level was analyzed using the newly suggested WHO criteria for maternal 'near miss'. Only 22% of the severe morbidity cases in Thyolo fulfilled these organ-based criteria, indicating that such criteria may underestimate maternal morbidity in low-resource settings.

Part 2. Actions to reduce maternal mortality and morbidity

Chapter 5 describes how permanent availability of HIV testing in maternity and labour wards could help increase uptake of HIV testing among pregnant women in order to improve maternal care and initiate PMTCT and early neonatal treatment.

Maternal morbidity review is of added value to mortality audit. **Chapter 6** describes analysis of a specific type of morbidity: hospital-based obstetric hemorrhage. This was calculated at 43.1 per 1 000 deliveries, with a case fatality rate of 4,5%. This study also elicited several substandard care factors in the prevention of hemorrhage: the limited use of oxytocin, performing caesarean sections on non-viable fetus and insufficient monitoring of pregnant women.

As a comparison with a high-income setting an assessment of maternal morbidity resulting from antepartum haemorrhage was performed in the Netherlands (**chapter 7**). Severe APH occurred in 7.3% of women with major obstetric haemorrhage. Maternal case fatality rate was 0.9%. In the Netherlands, for instance, increased risks for antepartum haemorrhage were observed for non-Western immigrants.

In **chapters 8** and **9**, the role of health care workers in improving maternal health is highlighted. In **chapter 8,** the health workers' perspectives of the management of obstetric haemorrhage were captured using focus group discussions. Causes mentioned for the high number of obstetric hemorrhage cases were: 1) the chronic lack of materials and supplies, 2) reluctance of TBAs to refer in a timely manner and absence of basic skills among TBAs, 3) the persistent lack of human resources play a major role in managing obstetric hemorrhage and 4) lack of training in obstetric care of the health care workers.

Chapter 9 describes why a human rights based approach to reduce maternal mortality may be a powerful instrument, not only for (inter)national political- and civil organisations, but also, and perhaps most importantly, for health care workers. Their power to initiate change may well be underestimated by 'higher echelons' or by themselves.

Gezondheidswerkers en maternale zorg in Malawi: mortaliteit en morbiditeit op district niveau

Samenvatting

Dit proefschrift valt uiteen in twee delen. Het eerste deel bestaat uit studies die de omvang van maternale mortaliteit en morbiditeit in een Malawiaans district berekenen. Deze studies vormen de basis voor een tweede gedeelte van het proefschrift waarin met gebruik van low-cost interventies getracht wordt de maternale mortaliteit en morbiditeit te reduceren. Daarbij is een speciale rol weggelegd voor de hulpverleners.

Deel 1: Achtergrond: maternale mortaliteit en morbiditeit in Thyolo, Malawi.

Hoofdstuk 2 geeft een analyse van het gezondheidsysteem in het district Thyolo op het moment dat de studies hier plaatsvonden. In **hoofdstuk 3** werd de maternale mortaliteit berekend op district niveau. Wij konden aantonen dat de maternale mortaliteits ratio niet gedaald was tussen 1989 [409 sterftes per 100 000 levend geborenen] en 2006 [558 per 100 000 levend geborenen] en waarschijnlijk zelfs is gestegen.

In **hoofdstuk 4** werd severe acute marternal morbidity dat plaats vond op lokaal niveau geanalyseerd, gebruik makend van de nieuwe WHO criteria voor maternal 'near miss'. Slechts 22% van de ernstige morbiditeits cases in Thyolo voldeden aan deze 'organ-based' criteria. Dit betekent dat het gebruik van dergelijke criteria voor maternale morbiditeit een onderschatting geeft van morbiditeit in lage-inkomens landen.

Deel 2. Handelingen ter reductie van maternale morbiditeit en mortaliteit.

Hoofdstuk 5 beschrijft hoe door permanente toegankelijkheid van HIV testen op de verloskamers en kraamafdeling het aantal nieuwe zwangere vrouwen die getest worden op HIV, toeneemt. Dit met het doel om maternale zorg te verbeteren door preventie van verticale transmissie evenals vroegtijdige neonatale behandeling.

Maternale morbiditeit review is van toegevoegde waarde naast mortaliteit audit. **Hoofdstuk 6** beschrijft de analyse van een specifiek type morbiditeit: obstetrisch bloedingen op ziekenhuis niveau. Dit werd berekend op 43.1 per 1000 bevallingen (case fatality rate 4.5%). De studie onthult ook een aantal 'substandard care' factoren die aanwezig zijn bij obstetrische bloedingen: namelijk het geringe gebruik van oxytocine, het uitvoeren van keizersneden op niet levende kinderen en slechte monitoring van zwangere vrouwen.

Een vergelijking van de maternale morbiditeit met hoge-inkomenslanden op basis van antepartum bloedingen (APH) werd uitgevoerd in Nederland en wordt beschreven in **hoofdstuk 7**. APH betrof 7,3% van de vrouwen met ernstig obstetrisch bloedverlies. De CFR was 0.9%. In Nederland werd bij niet-westerse immigranten een verhoogd risico waargenomen op het ontstaan van een APH.

In **hoofdstukken 8** en **9** wordt de rol van de gezondheidswerkers in het verbeteren van de maternale zorg belicht. In **hoofdstuk 8** worden standpunten van gezondheidswerkers met betrekking tot het beleid van obstetrische bloedingen gebundeld door middel van focus groep discussies. Zaken genoemd als oorzaak voor het hoge aantal obstetrische bloedingen waren: 1) chronisch tekort aan materialen en voorraden, 2) weerzin van TBAs (locale vroedvrouwen die werken in de dorpen en niet geregistreerd staan als officiële gezondheidswerkers) om patiënten tijdig te verwijzen en afwezigheid van basale deskundigheid bij dezelfde TBAs, 3) chronisch tekort aan arbeidskrachten in het algemeen en 4) onvoldoende obstetrische training bij gezondheidswerkers zelf.

Hoofdstuk 9 beschrijft waarom een 'mensenrechten gebaseerde aanpak' ter reductie van maternale mortaliteit een krachtig instrument is. Niet alleen voor (inter)nationale- en maatschappelijke organisaties, maar ook, wellicht het meest belangrijk, voor gezondheidswerkers zelf. Hun kracht om politieke verandering te bewerkstelligen wordt onderschat door de hogere echelons, maar ook door hun zelf. Hierin ligt een taak voor hen.

APPENDICES

List of abbreviations

Acknowledgements

Curriculum vitae

List of publications

The Safe Motherhood Series

List of Abbreviations

ANC	antenatal care
APH	antepartum hemorrhage
ARV	Anti-retroviral drugs
CEDAW	Committee on the Elimination of Discrimination against Women
CFR	Case fatality rate
CO	Clinical Officer
DHO	District health officer
DHS	Demographic and Health Survey
EHP	Essential health package
EmOC	Emergency obstetric care
FGD	Focus group discussions
GDP	Gross Domestic Product
HCW	Health care workers
HIV	Human Immunodeficiency Virus
MDG	Millennium Development Goals
MMR	Maternal Mortality ratio
4M-study	Study on Maternal Morbidity and Maternal Mortality
MOH	Major Obstetric Haemorrhage
MoH	Ministry of Health
MSF	Médicins sans Frontières
PMTCT	Prevention mother to child transmission
SAMM	Severe acute maternal morbidity
TBA	Traditional birth attendant
VSO	Voluntary Services Overseas
WHO	World Health Organization

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Malawi, the warm heart of Africa, has been a companion for a period of 6 years during the writing of this thesis and will ever be. I think of all the brave women who participated in this research project. I admire you for your vitality and savoir-vivre. In this thesis I have tried to hear your voices.

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Secondly, my dear Thomas! You were my successor in Malawi and have become a true friend during these years. And suddenly you became also a co-promotor! It was you who proposed a plan to collaborate and to join hands when I came to a deadlock. Your red pen I learned to fear and to appreciate. Thank you so much for all the effort you put in this thesis. I also thank Kinke for her time and patience.

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Curriculum vitae

The author was born in Leiden on the 25th of October 1972. At the age of two he went to Indonesia where his father was offered a post as minister of the Dutch-Reformed church. A peaceful childhood would follow. In 1979 he returned to the Netherlands where he would later complete his education in Almelo. Life back in the Netherlands was totally different to the serene atmosphere overseas and his moving was experienced as a culture shock.
Jogchum wanted to study medicine but at that time, admittance into medical school in the Netherlands was based on a lottery system. He was unfortunate not to get in, but Belgium offered an excellent alternative and he completed his degree in 2002. During his studies he had the opportunity to visit Zimbabwe and Suriname as part of an internship. In 2005, together with his gorgeous wife Debby, he left for Malawi where they both worked as physicians at Thyolo District Hospital.
In 2007 he returned to the Netherlands where he started his residency in Obstetrics and Gynaecology at the Medical Centre Haaglanden (prof. dr. P.J. Dörr and dr. M.J. Kagie) The Hague and Leiden University Medical Centre (prof. dr. J.M.M. van Lith).
Jogchum is happily married and has three children: Job, Lieve and Caspar.

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