Quality Aspects of Maternal Health in Tanzania

BY
DAVID PARADISO URASSA
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Abstract

This thesis assesses some indicators of quality for maternity care in Tanzania, using antenatal management of anaemia and hypertension and emergency obstetric care as focal points. The care of pregnant women consecutively enrolled in antenatal care (n=379) was observed and compared with quality standard criteria. From a tertiary level labour ward 741 cases of eclampsia were identified and their antenatal care analyzed. A health systems analysis was performed for 205 cases of pregnancy complications at district level.

There was inadequate equipment and drugs, inadequate staff knowledge and motivation, and incorrect measurements for investigating anaemia and hypertension in pregnancy. Hospital incidence of eclampsia at tertiary level was 200/10,000 live births, and was not modified by antenatal care. The quality observed in the antenatal programme indicated little impact on either anaemia or hypertensive complications. Compliance with obstetric referral was only 46% and all four observed maternal deaths occurred due to transport problems. The proposed process indicators for essential obstetric care were inadequate to assess the quality of care on a district level.

There is a need to address structural weaknesses, to motivate health workers and to improve training on quality improvement. More research is warranted on indicators for obstetric needs, accessibility and referral system.

Keywords: quality assessment, essential obstetric, antenatal care, evaluations

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urn:nbn:se:uu:diva-4221 (http://urn.kb.se/resolve?urn=urn:nbn:se:uu:diva-4221)
To my wife Goldermeir and my daughters Glory, Gladys, and Doreen
This thesis is a result of the longstanding collaboration in reproductive health research between Tanzania and Sweden.

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Uppsala University
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List of papers

This thesis is based on the following papers, which will be referred to as Papers in the text by their roman numerals I-IV:


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<th>Description</th>
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<tr>
<td>AMI</td>
<td>Absolute Maternal Indication</td>
</tr>
<tr>
<td>AMO</td>
<td>Assistant Medical Officer</td>
</tr>
<tr>
<td>ANC</td>
<td>Antenatal Care</td>
</tr>
<tr>
<td>BP</td>
<td>Blood Pressure</td>
</tr>
<tr>
<td>CA</td>
<td>Clinical Assistant</td>
</tr>
<tr>
<td>C/S</td>
<td>Caesarean Section</td>
</tr>
<tr>
<td>CFR</td>
<td>Case Fatality Rate</td>
</tr>
<tr>
<td>CHMT</td>
<td>Council Health Management Team</td>
</tr>
<tr>
<td>CO</td>
<td>Clinical Officer</td>
</tr>
<tr>
<td>EOC</td>
<td>Essential Obstetric Care</td>
</tr>
<tr>
<td>MCHA</td>
<td>Maternal and Child Health Aide</td>
</tr>
<tr>
<td>MMR</td>
<td>Maternal Mortality Rate</td>
</tr>
<tr>
<td>MNH</td>
<td>Muhimbili National Hospital</td>
</tr>
<tr>
<td>MOH</td>
<td>Ministry of Health</td>
</tr>
<tr>
<td>MOI</td>
<td>Major Obstetric Intervention</td>
</tr>
<tr>
<td>NMW</td>
<td>Nurse Midwife</td>
</tr>
<tr>
<td>PHN</td>
<td>Public Health Nurse</td>
</tr>
<tr>
<td>PMMN</td>
<td>Prevention of Maternal Mortality Network</td>
</tr>
<tr>
<td>RHCs</td>
<td>Rural Health Centres</td>
</tr>
<tr>
<td>TDHS</td>
<td>Tanzania Demographic and Health Survey</td>
</tr>
<tr>
<td>TRCHS</td>
<td>Tanzania Reproductive and Child Health Survey</td>
</tr>
<tr>
<td>UN</td>
<td>United Nations</td>
</tr>
<tr>
<td>UNFPA</td>
<td>United Nations Population Fund</td>
</tr>
<tr>
<td>UNICEF</td>
<td>United Nations Children’s Fund</td>
</tr>
<tr>
<td>UON</td>
<td>Unmet Obstetric Need</td>
</tr>
<tr>
<td>WHO</td>
<td>World Health Organization</td>
</tr>
</tbody>
</table>
Introduction

Maternal health care and the increasing need for the quality assessment and improvement

Maternal health is one of the components of reproductive health programmes that has been in place for several decades without explicit attention to maternal mortality and morbidity until the Safe Motherhood initiative was launched in 1987 (Rosenfield and Maine, 1985). For many years, the international health community and national health planners have directed their efforts towards ensuring that the coverage of maternal care (antenatal, delivery and postnatal) increases, but less attention has been directed to the content of the programme. As a result, data indicative of high coverage of care were commonly coexisting with high levels of maternal and neonatal morbidity and mortality (WHO, 1994). Attention to the quality of care has now been growing in the reproductive health field, and there have been significant efforts to define the concept of quality, its determinants and criteria and to develop methodologies to assess the quality of maternal health services.

Concept of quality in health care

The concept of quality is still debatable among researchers and organizations that have defined the meaning of quality of care in more abstract terms. In health, quality of care has been understood as the excellence in reference to improvements in health status (Gilson, 1992). It has also been defined as the extent to which application of medical science and technology is expected to achieve the most favourable balance between risks and benefits (Donabedian, 2003). Quality is also seen as the degree to which resources for health care or the services correspond to specified standards that are generally accepted to lead to desired results (Roemer and Montoya-Aguilar, 1988)

Determinants of quality of care

Usually the definitions of quality reflect the object of assessment and the measurable attributes of health care associated with good quality, and these
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vary with the level of assessment (Donabedian, 1988b; Gilson, 1992). At a general level one can look at health care systems as a whole in which resources, activities, management and outcome of health care are all implicated. In this approach, quality becomes the merit of excellence of the system in all its aspects (Donabedian, 1988a). In emphasizing this broad approach, Kwast suggested six major categories of quality of care determinants for programme development, which, in a holistic approach to reduce maternal and neonatal morbidity and mortality, are linked to the outcomes (i.e. to improve the health of women throughout their life cycle). These determinants are political environment, financing, socio-cultural factors, health systems, training/education, interaction/collaboration (Kwast, 1998).

At a more restricted level that is easier to assess, quality can be considered as one of the features of the health care resources (structure) and activities (process). The attributes of a given set of resources and the attributes of a set of activities included in the programme, affect the effectiveness with regard to the health problem being addressed (Roemer and Montoya-Aguilar, 1988).

Describing the determinants of, and methods to assess, quality of care about 25 years ago, (Donabedian, 1979) suggested an approach with three components (structure, process, outcome) that has gained widespread acceptance, probably due to its simplicity and persuasiveness. In this approach the structure refers to the conditions under which care is provided, which include firstly, human resources such as the number, variety and qualification of professional and support personnel, secondly, material resources, such as facilities and equipment, and thirdly, organizational characteristics such as the organization of medical and nursing staff, the presence of teaching and research functions, kinds of supervision and performance review, methods of paying for care, etc.

The process means the activities that constitute health care – including diagnosis, treatment, rehabilitation, prevention, and patient education that are usually carried out by professional personnel, but also including the contribution of patients and their families. The outcome means changes (desirable or undesirable) in individuals and population that can be attributed to health care, which also include: firstly, changes in health status, secondly, changes in knowledge acquired by patients and family members that may influence future care, thirdly, changes in behaviour of patients or family that may influence future health, and fourthly, satisfaction of patients and their family members with the care received and its outcomes (Donabedian, 2003).

The original Donabedian model from 1988 has been modified to fit different circumstances by incorporating other variables like administrative infra-
structure as part of the structure (Adeyi and Morrow, 1996), consumers’ perception as part of outcome (Sauerborn, 1989), etc. The underlying philosophy for improving quality of care recognizes the need to ensure that health care providers have the knowledge, skills, resources (in terms of supplies and equipment) and attitudes that are responsive to the client’s individual, social, cultural and medical needs (WHO, 1994). A model illustrating a modified Donabedian concept with its determinants amenable for assessment is presented in Figure 1.

Figure 1. Conceptual framework of quality of care and its determinants
Assessment of quality of health care

Standards of care

In monitoring and evaluation of quality of care, it is necessary to establish standards and develop criteria to assess the quality of care (Donabedian, 1982). The standards have been described as explicit statements that stipulate the desired and/or achievable level of performance against which actual performance is compared, whereas criteria are variables selected as indicators to determine whether the established standards have been met (WHO, 1994). Currently there is a substantial body of literature in reproductive health on how to assess some components of quality of care. In family planning particularly, quality of care assessment has been extensively described (Bertrand et al., 1995; Hardee and Gould, 1993; Miller et al., 1997).

The Bruce framework (Bruce, 1990) with six fundamental elements of quality of care (i.e. choice of methods, provider client information exchange, provider competence, interpersonal relations, mechanism to encourage continuity, appropriate constellation of services) is one of the tools for assessment with more focus on the interaction of client and service delivery points and less emphasis on the concept of access to the services by woman and families. Facility-based survey for the assessment of quality of service delivery is another tool that has been applied in many developing countries as a method of monitoring and evaluating quality of primary health care (Bryce et al., 1992; Garner et al., 1990).

The rapid assessment method for assessing maternal and child health services, including obstetric services, has also been applied by World Health Organization (WHO) in several countries (WHO, 1995). It covers the availability of staff, supplies, equipment, record reviews, interview staff and focus group discussions at village level. The rapid assessment method was superseded by the Safe Motherhood Needs Assessment which facilitated the development of the guidelines for Mother-Baby Package (WHO, 1994).

Another tool for assessment is the patient-flow analysis developed by the Centre for Disease Control in Atlanta, USA that has been applied in several countries of Africa, Asia and Latin America (WHO, 1991). The MotherCare Project in the USA has also developed diagnostic tools, including community diagnosis, situation analysis, and the training need assessment. The tools have been applied to assess different components of quality of care and the results are used for programme implementation and improvement in policy formulation (Harrison, 1994; MotherCare, 1993).
The Prevention of Maternal Mortality Network (PMMN) in West Africa, with a technical support team from Columbia University’s Centre for Population and Family Health supported by the Carnegie Corporation of New York, has also developed tools for quality assessment. The network has conducted situation analysis to identify barriers for emergency obstetric care and design projects to reduce maternal death in their study areas (PMMN, 1995).

Specific guidelines for monitoring the availability and use of obstetric services (Maine et al., 1997) that were later adopted by UNICEF/WHO/UNFPA (UNICEF/WHO/UNFPA, 1997) are another example of quality assessment tools. What is considered essential for the safe motherhood programme and other components of reproductive health care is a process that identifies problems in all areas of structure, process and outcome in order to assist programme managers to implement changes and improvements on both the supply and demand side (Kwast, 1998).

Various practical factors will ultimately influence the choice of assessment method such as: What are the study objectives? What data can be collected? What resources are available to give care? Which levels of health services are to be assessed? Several studies (Bryce et al., 1992; Kwast, 1998) suggested that it is best to include elements of structure, process and outcome that help us to understand why outcomes depart from expectations so that we can take steps to improve the situation. Inferences about quality are said to be impossible unless there is a predetermined relationship among the three approaches, so that structure influences process and process influences outcome, of course in a much more complex reality than a linear relationship (Donabedian, 2003). In our case, the need to relate the structural inputs into the maternal programme and its outcome, i.e. maternal mortality and morbidity, directed us to the choice of this structure, process and outcome model.

Evidence of effectiveness of antenatal interventions

The operational definition of quality assumes that there is quality to the extent that medical practice conforms to generally accepted standards, previously proven to bring about positive outcomes and responding to people’s needs (Gilson, 1992). A recent review (Carroli et al., 2001a) have shown that although systematic antenatal care (ANC) was first introduced in the early 1900s in Europe and North America, questions related to its effectiveness have begun to be tackled comparatively recently. Some of the contents of ANC visits are said to be ritualistic rather than rational health care.
The objective of ANC has been to screen a predominantly healthy pregnant population regularly during pregnancy in order to detect early signs of, or risk factors for, disease followed by timely intervention (Carroli et al., 2001a; McDonagh, 1996). In theory, ANC might reduce maternal mortality and morbidity directly through the detection and treatment of pregnancy-related or inter-current illnesses, or indirectly through the detection of women at risk of complications of delivery, ensuring that they deliver in a suitably equipped facility (McDonagh, 1996). However, how ANC programme prevents maternal and perinatal mortality and morbidity is not yet clear. Few of the procedures commonly undertaken have a major impact on morbidity or mortality, and some may have no effect at all. For others, there can be no impact unless other elements are also in place and functional (Villar et al., 2002). Because of so many stages involved that are not only resource-intensive but need to be managed and coordinated properly, it is difficult for ANC to show its expected benefit in poor resource settings.

Maternal mortality ratio (MMR) is the health indicator that shows the greatest disparity between rich and poor countries. The life-time risk of death as a result of pregnancy or childbirth is estimated at one in 23 for women in some countries in Africa, compared with about one in 7000 for women in Northern Europe (Carroli et al., 2001a). Nevertheless, there are interventions in pregnancy that have been shown to be effective in detecting, treating or preventing conditions in pregnant women that might otherwise give rise to serious morbidity or mortality. They are related mainly to chronic conditions like anaemia, hypertensive disorders in pregnancies and infections in pregnancy rather than to acute conditions such as haemorrhage or obstructed labour that emerge close to the time of delivery (Carroli et al., 2001a).

Implementations of interventions according to specified standards

If interventions are not implemented properly, we cannot achieve the expected benefit. According to the 1999 Tanzania Reproductive and Child Health Survey, ANC attendance among pregnant women was 98% with an average of four visits in approximately 70% of the women (TRCHS, 1999). However, the MMR for Tanzania was reported to be between 529 and 770/100,000 live births (TDHS, 1996; WHO, 1996b) and the findings raised doubts about the quality of the programme. The performance of programmes based on the risk approach has been questioned, particularly where resources are most scarce, and there is concern that this approach may divert attention away from improving services to all women (Bruce and Winikoff, 1990).
Anaemia in pregnancy

Anaemia is reported to affect 56% of pregnant women in developing countries and 18% in the developed countries, and in Africa the estimated prevalence in pregnant women is 50-60% (WHO, 1992). Main causes of anaemia in pregnancy have been related to inadequate dietary and or low dietary availability, increased iron needs during the pregnancy period, hookworm infestations, malaria, haemoglobinopathies, other chronic infections including HIV/AIDS (Massawe, 2002). The prevalence of anaemia, using a cut-off point for haemoglobin (Hb) <10.5 g/dl, was 60% in antenatal clinics in Dar es Salaam in 1990-1992 (Massawe et al., 1996). Anaemia was ranked the fourth most common cause of maternal mortality after abortion, haemorrhage and hypertension/eclampsia, and contributes to 11% of maternal deaths (Urassa et al., 1996). The main intervention in ANC is of iron and folic acid supplementation that is recommended for all pregnant women in areas with high anaemia prevalence in developing countries. Other interventions include prophylactic anti-malaria drugs in malaria hyper-endemic areas (WHO, 1993).

Pregnancy induced hypertension and eclampsia

The early detection of hypertension is an important part of any ANC programme. Regular blood pressure (BP) measurements, especially in late pregnancy, are advocated for prevention of hypertensive complications, especially pre-eclampsia, since they are important causes of premature births, perinatal and maternal mortality (Oney and Meyer-Sebellek, 1990). However, observations of BP recordings have found a wide range of values and poor standard practice even in a supervised clinical setting (Villar et al., 1989). In Muhimbili National Hospital (MNH), Dar es Salaam, hypertensive disorders were found in 16% of the women attending ANC (Urassa, 1984). Hypertension/eclampsia was ranked as the third cause of maternal death, contributing to 12% of these deaths, in a community-based study in Ilala district, Dar es Salaam in 1991-1993 (Urassa et al., 1996).

The incidence of eclampsia has fallen substantially in developed countries during recent decades (Douglas and Redman, 1994; Saftlas et al., 1990) in contrast to high levels in low income countries (McDonagh, 1996). Eclampsia is feared as a severe complication of pregnancy and a cause of maternal and perinatal mortality and morbidity, especially when medical resources are limited. The etiology and pathophysiology of eclampsia is still not fully understood in spite of intense basic research in recent years, thus effective primary prevention is not possible at this stage (Dekker and Sibai, 1998). It has been argued that not all cases of hypertensive disease follow orderly progression from mild to severe disease and that women may be found to be
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suffering from any stage of disease, including eclampsia, without having apparently passed through the preceding stages (Carroli et al., 2001a).

Essential Obstetric Care (EOC)

It has been suggested that a strategy to achieve a substantial decline of maternal mortality must prioritise improvement in medical treatment of obstetric emergencies since most maternal deaths occur as unpredictable obstetric emergencies (Urassa et al., 1996). Outcome indicators such as MMR have been used conventionally to monitor maternal health. However, where no comprehensive vital statistics exist, obtaining data for these indicators is difficult and costly and may not reflect the current situation. Process indicators have been advocated since they are considered easy to measure and can give information on events that affect maternal mortality as well as activities needed to prevent it (UNICEF/WHO/UNFPA, 1997). The indicator that has been adopted within the UN organizations (UNICEF, WHO, UNFPA), measures met need for emergency or EOC, i.e. the number of women with life-threatening obstetric complications treated in the EOC health facilities. Specific interventions are required to categorise a health facility as providing basic or comprehensive EOC (UNICEF/WHO/UNFPA, 1997).

Wide variations in clinic policies influence the rates for caesarean section (C/S) throughout the world (van Roosmalen and van der Does, 1995) and make the C/S rate an inadequate indicator for estimating met need for the treatment of women with obstetric complications. An alternative approach was developed (De Brouwere V et al., 1996) to monitor rates of major obstetric interventions for absolute maternal indications (AMIs), such as severe ante-partum and postpartum haemorrhage requiring surgical intervention, cephalo-pelvic disproportions, shoulder and brow presentations. The actual number of obstetric interventions for life-threatening maternal complications is assessed mathematically against the estimated incidence of these complications in a given population to give *unmet obstetric need* (UON). The authors suggest that the low-end estimates of these rates range between 1 and 2% of expected births. In a study made in Morocco, the UON was 37% (Belghiti et al., 1998).

Information on Tanzania, the rationale and objectives of the study

Tanzania is one of the three countries constituting East African Community, others being Kenya and Uganda. According to the 2002 Census it is estimated to have a population of 34.5 million people (16.8 million males and
17.7 million females) with a yearly growth rate of 2.9% (Bureau of Statistics, 2003). About 80% of the population live in rural areas. Twenty percent of the population are below the age of five years, 47% below 15 years, 49% between 15 and 64 years and 4% are 65 years or older. A map and other vital and reproductive health statistics are as shown in Figure 2 and Box 1.

![Map of Africa and Tanzania showing Rufiji district](image)

**Figure 2. Map of Africa (left) and Tanzania (right) showing Rufiji district**

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population</td>
<td>34.5 million**</td>
</tr>
<tr>
<td>Crude birth rate</td>
<td>46/1000**</td>
</tr>
<tr>
<td>Crude death rate</td>
<td>15/1000**</td>
</tr>
<tr>
<td>Population growth</td>
<td>2.9%**</td>
</tr>
<tr>
<td>Infant mortality rate</td>
<td>99/1000*</td>
</tr>
<tr>
<td>Under five mortality rate</td>
<td>147/1000*</td>
</tr>
<tr>
<td>Contraceptive prevalence rate</td>
<td>16%*</td>
</tr>
<tr>
<td>Total fertility rate</td>
<td>5.6*</td>
</tr>
<tr>
<td>Female literacy</td>
<td>60%*</td>
</tr>
<tr>
<td>Male literacy</td>
<td>69%*</td>
</tr>
<tr>
<td>Deliveries in health facility</td>
<td>44%*</td>
</tr>
<tr>
<td>Maternal mortality ratio</td>
<td>529-770***</td>
</tr>
</tbody>
</table>

*TRCHS, National Bureau of Statistics, 1999 (TRCHS, 1999)

**Box 1. Vital reproductive and general health indicators for Tanzania**
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Organization of the health care system in Tanzania

The health care system in Tanzania is served by the public, private and voluntary agency sectors and is organized in a triangular referral system with the base containing lower level heath institutions referring patients upwards towards the apex with hospitals (Figure 3).

<table>
<thead>
<tr>
<th>Principal staff for maternal care</th>
<th>Number of institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obstetrician/gynaecologist</td>
<td>0</td>
</tr>
<tr>
<td>Obstetrician/gynaecologist/ MD/NMW</td>
<td>18</td>
</tr>
<tr>
<td>MD/AMO/NMW</td>
<td>190</td>
</tr>
<tr>
<td>AMO/CO/NMW/PHN</td>
<td>402</td>
</tr>
<tr>
<td>CO/CA/MCHA</td>
<td>4380</td>
</tr>
<tr>
<td>Village health posts</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3. Organization of medical care in Tanzania

The village health post is the lowest level of care where a village health worker selected by the village provides community-based basic health care, including first-aid services and health education.

Dispensaries are on the next level, providing services for 5,000 to 10,000 people and staffed by clinical officers (CO) (formerly medical assistants) or clinical assistants (CA) (formerly rural medical aides) who are normally in charge and assisted by maternal and child health aides (MCHAs)/public health nurses (PHN)/trained nurses and nurse auxiliaries. Dispensaries provide basic curative and maternal and child health care.

The health centres are physically larger and serve 50,000-80,000 people. They are staffed by assistant medical officers (AMO), COs or clinical assistants, nurse midwives (NMW), PHNs, trained nurses, nursing assistants/auxiliaries, laboratory technician/assistants and pharmaceutical technician/assistants. In addition to dispensary care they offer in-patient and maternity services for uncomplicated cases.
The first referral level is the district hospitals which cater for about 250,000 people or more and are staffed by medical doctors, AMOs, COs and trained NMW. A medical doctor assisted by a Council health management team (CHMT) is in charge of all medical services, curative and preventive, at a district level. All pregnant women in the district with complications during pregnancy, labour, and delivery should be referred to the district hospital. Those complications that can not be treated at district hospital are referred to regional or tertiary hospital as MNH, a place where specialists in obstetrics and gynaecology are found.

As part of social sector reforms in Tanzania, the health sector is also undergoing several reforms, one being cost sharing. However, maternal and child health services are still free at any level of government institutions. Other parts of the reforms include decentralization and public/private mix in provision of health care services with the aim of improving the quality, equity, and the access to care. In this reform health services in the district will be managed by the District Council, and the district medical officer will be assisted by a CHMT. The role of the Ministry of Health (MOH) will be focused on policy formulation and guidelines. The regional level will provide a link between the MOH and the district mainly in the areas of overseeing health policy implementation and supervision of the districts (MOH, 1994).

ANC is provided at all reproductive and child health clinics, former maternal and child health clinics, that are present at any health institution level. These institutions provide comprehensive services to the mother and child, including ANC, delivery care, postnatal care and family planning services as well as under-five immunization and growth monitoring. MCHA is a special cadre of health workers (now being replaced by PHNs) that is specifically trained to provide services at dispensary and health centre levels, whereas NMW are in charge of the reproductive and child health clinics at district hospitals.

Rationale of the study

The disparity between high ANC attendance in Tanzania and high prevalence of anaemia and hypertension in pregnancy, linked with a high MMR, raises questions on the quality of care, especially with regards to screening and management of anaemia and hypertension in pregnancy as well as EOC provided. While other studies into the quality of ANC have looked at the quality of risk factor screening during ANC (Prual et al., 2000), few have related the efforts of an ANC programme to outcomes gained at the referral level.
We aimed at investigating the extent to which routine ANC and delivery services succeeded in identifying and managing women with anaemia and pre-eclampsia, or risk factors for eclampsia, using the antenatal card guidelines at primary and secondary levels of service.
Aim of the study

The overall aim was to assess the quality of some indicators of maternal care in Rufiji rural district and Dar es Salaam urban settings of Tanzania.

Specific objectives

- To assess the quality of ANC with respect to anaemia in pregnancy.
- To assess the ability of ANC to manage hypertension in pregnancy.
- To assess the effectiveness of ANC for prevention of eclampsia.
- To assess the quality of EOC in rural Tanzania and discuss the appropriateness of the process indicators suggested.
Quality aspects of maternal health in Tanzania

Subjects and methods

Study setting

Rufiji
The three cross-sectional studies that resulted in Papers I, II and IV were conducted in Rufiji district, one of the six districts of the Coast region in Tanzania. At the time of the start of these studies (1999) Rufiji district had an estimated population of about 180,000 based on the 1988 Censes and annual population growth of 2.3%. Today, Rufiji has a population of about 203,000 with an inter-census growth rate of 2.4% based on the 2002 Census (Bureau of Statistics, 2003). The population is predominantly rural. Geographically, the Rufiji River intersects the district from west to east dividing it into flood plain, coastal-delta, and plateau (hill) zones. The road network in the district is not passable during the rainy season and the limited transport system makes people dependent on the available health services within the district. During the study period all transport across the Rufiji River was dependent on two ferries or smaller boats, although in 2003 a new bridge named “Mkapapa Bridge” has been built across the river (Figure 4).

Maternal health care (antenatal, delivery, and post-natal care) is provided at two hospitals, four rural health centres (RHCs) and 48 dispensaries. The health workers provide ANC for low risk women at dispensaries and RHCs and refer women with risk factors to a hospital according to guidelines stipulated in the antenatal card. Pregnant mothers at all levels of health care are supposed to receive iron and folate supplements free of cost at each visit and delivery services in government health facilities are free.

Utete hospital is the government district hospital that is situated to the south of the river and the office of the district medical officer is located at the hospital. The majority of the population live north of the river and therefore it is difficult for most women with pregnancy complications to access this hospital, especially during the rainy season. Mchukwi hospital is a voluntary hospital run by a religious organization, and is situated in the highly populated area to the north of the river. This hospital mainly depends on user-fees for financial support and to some extent from religious non-governmental organisations.
Subjects and methods

Dar es Salaam

Dar es Salaam is the commercial centre of Tanzania with an estimated population of 2.5 million with annual growth of 4.3% based on the 2002 Census (Bureau of Statistics, 2003). The city has three administrative parts, namely Ilala, Kinondoni and Temeke Municipal, each having a municipal hospital. A study (Paper III) was conducted at MNH, which is the teaching and referral hospital in Dar es Salaam. Apart from patients referred from up-country, the MNH receives referred patients predominantly from the municipal hospitals. The hospital conducts about 18,000 deliveries per year, and has about 20 employed specialists in obstetrics and gynaecology and about 15 postgraduate medical students working in the maternity block. Pregnant mothers with labour pains are admitted directly to the labour ward, and for any pregnancy complication to the antenatal ward until they are transferred to the labour ward for delivery. All mothers who develop eclampsia are sent straight to the eclamptic intensive care ward. A computerized database for all deliveries in MNH was established in 1998.
Study population and sampling

The study population for the assessment of anaemia and the management of hypertension in ANC (Papers I and II) was pregnant women attending antenatal clinics in the selected health facilities. They were consecutively invited to participate in the study, and were observed specifically for the care related to screening and management of anaemia and hypertension in pregnancy. The health facilities providing ANC were stratified into three strata, from which the study population was recruited. In two strata, hospitals and RHCs, all units were included in the sample, whereas in the third stratum 10 out of 48 dispensaries were randomly selected. According to recommendations this was intended to cover at least 25-30% of the health facilities in the area when assessing quality of care (Kielmann et al., 1995; UNICEF/WHO/UNFPA, 1997). At the hospitals and RHCs the first 30 women, and at the dispensaries the first 20 women, were invited to participate in the study. For one dispensary, only 19 women were available and hence a total of 379 women were studied.

To study the effectiveness of prevention of eclampsia in ANC (Paper III), a retrospective case-referent study was designed based on the labour ward database for the years 1999 and 2000. The database was established in 1998 for research purposes as well as for monthly reports aimed at monitoring the activities in the labour ward. The database was designed using Epi Info with an inbuilt check programme to minimize error during data entry. Two NMW extracted information from the labour ward registry for data entry. If information was missing, efforts were made to re-check with registers at the reception or at the antenatal wards. If the information still could not be found it was reported as missing. The database contains information on all deliveries at MNH but not on women who were referred to the hospital after delivery in other institutions. A specialist obstetrician is continuously supervising the data entry process.

In our study, eclamptic cases were defined as women whose records included a specialists’ diagnosis of eclampsia, and referents were patients who had no eclampsia. The selection of referents was done by matching for age and parity (which may be confounders). For each eclamptic case the two nearest non-eclamptic cases were taken as referents after sorting the database by date of delivery. In total 2,223 mothers were selected from the labour ward database comprising 741 eclamptic cases and 1482 non-eclamptic referents. In addition, 336 patients who were admitted with eclampsia after delivery at other hospitals in Dar es Salaam and thereby not included in the database were also studied (Figure 5).
<table>
<thead>
<tr>
<th>Topic</th>
<th>Study design</th>
<th>Study area</th>
<th>Subjects</th>
<th>Study tools</th>
<th>Recruitment period</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality of ANC for anaemia</td>
<td>Cross-sectional</td>
<td>Rufiji district</td>
<td>Pregnant women</td>
<td>Haemoglobinometer</td>
<td>Jan-March 1999</td>
<td>379</td>
</tr>
<tr>
<td>Management of hypertension as quality indicator of ANC</td>
<td>Cross-sectional</td>
<td>Rufiji district</td>
<td>Pregnant women</td>
<td>Sphygmomanometer</td>
<td>Jan-March 1999</td>
<td>379</td>
</tr>
<tr>
<td>Eclampsia at MNH as an indicator of quality of ANC</td>
<td>Case-referent</td>
<td>Dar es Salaam</td>
<td>Eclamptic cases and non-eclamptic referents</td>
<td>Data base</td>
<td>1999 -2000</td>
<td>741/1482</td>
</tr>
<tr>
<td>Process indicators and quality of EOC</td>
<td>Cross-sectional</td>
<td>Rufiji district</td>
<td>Women with pregnancy complications</td>
<td>Data collection form</td>
<td>Nov 1999 - Feb 2000</td>
<td>205</td>
</tr>
</tbody>
</table>
To assess the quality of EOC in rural Tanzania (Paper IV) women with pregnancy complications seeking care in the selected institutions in Rufiji district were studied between November 1999 and February 2000. A list of the standard diagnostic definitions for different complications (see also definition and standards) was prepared and introduced in the training to be used uniformly by all the research assistants. If a woman had more than one complication the one most immediately life-threatening was selected.

In order to maximize the number of observed complications within a limited time, all health institutions in Rufiji district were stratified into four strata by type of unit providing deliveries and number of deliveries. Thus, stratum I consists of all hospitals (n=2), stratum II of all RHCs (n=4), stratum III of all large dispensaries with more than five deliveries per month (n=10), and stratum IV of 10 out of 38 small dispensaries. The 26 units selected constitute 48% of all health institutions in the district. This fulfils the recommendations of the minimum proportion of the health institutions to cover when assessing quality of care (Kielmann et al., 1995; UNICEF/WHO/UNFPA, 1997).

Figure 5. Data collection and admission flow for patients with eclampsia in MNH
All health workers in health facilities providing antenatal and delivery care in Rufiji district, were interviewed on their perceptions and knowledge related to their activities for screening and managing anaemia and hypertension in pregnancy.

Data collection

On the first day of data collection, for the three Papers (I, II, and IV) that were conducted in Rufiji district, an introductory meeting was held in each institution to familiarise the staff and explain the aim of the studies. It was emphasised that the research team was not representing the MOH and that the findings of this study would not be used against any staff member. In studies I and II, a research team was formed consisting of the main researcher (DPU) and two research assistants (qualified NMW) who received special training in the use of the research tools prior to the investigations. One of them (an observer) was stationed in each antenatal consultation room and the other (an interviewer) at exit gate.

Screening for anaemia and hypertension in pregnancy (Papers I and II)

In screening for anaemia in pregnancy (Paper I) the health workers used Tallqvist to estimate Hb, being the only simple subjective colorimetric method available in most of these institutions. The observer was trained in the use of the HemoCue to estimate Hb and the same instrument was used throughout the study. The accuracy and suitability of the HemoCue machine in field conditions has been well established (Massawe et al., 1996). This instrument was calibrated every day, using a control cuvette provided by the manufacturer. The standard cuvette was filled with a drop of blood from a finger prick and Hb values were read and recorded to one decimal point.

In the study of management of hypertension in pregnancy at antenatal clinics (Paper II), women were examined twice for BP, first by a health worker and then by an observer without knowledge of the results of the previous BP measurement. Using a newly purchased Aneroid sphygmomanometer, the observer measured BP on the right arm, with the mother seated and her arm resting on a table at the same level as the heart, after a minimum of five minutes of rest. The systolic and diastolic pressures were determined by the observer at Korotkoff phases I and V, respectively.

These papers used explicit measurements to assess the quality of the ANC programme, relevant to management of anaemia and hypertension in preg-
Quality aspects of maternal health in Tanzania

nancy. At each study site, an observation checklist was used to assess the availability of resources for detection and management of anaemia and hypertension in pregnancy (structure). These included presence of qualified staff, drugs and equipment for estimation of Hb, and BP. The observer also noted the process activities (patient examination and counselling). Exit interviews using a standard questionnaire with closed and open-ended questions in Kiswahili language were used to assess the outcome component of quality. The interviewer asked if they had received any feedback on detected problems, medications, or individual counselling and whether they were satisfied with the service received. Also Hb and BP readings from antenatal cards as reported by the health workers were recorded by the researchers.

Health worker interviews

A self-administered questionnaire was given to all health workers who were involved with antenatal or delivery activities at all 26 health facilities involved in the Papers I, II and IV. Most questions were open-ended and respondents were asked to state their views on job satisfaction, motivation and knowledge concerning activities within antenatal or delivery units that are related to anaemia and hypertension. All 42 health workers from 26 different health facilities working at antenatal clinics, participated in the interviews. Their type or qualification ranged from nurse attendants, health assistants, nurse assistants, MCHAs, NMW, PHNs, clinical assistants, and to COs. MCHAs with two-year training in midwifery skills were considered to be the lowest cadre of trained staff.

Eclampsia management at antenatal clinics (Paper III)

With permission from the management of MNH, the following variables in their database regarded as relevant to eclampsia were included in our file for Paper III: age, parity, number of antenatal visits, antenatal problems (a list of all possible problems detected at the antenatal clinic, e.g. hypertension, anaemia, etc.), source of admission (home, hospital transfer, and antenatal ward in MNH), mode of delivery, maternal and perinatal outcome. In order to estimate the proportion of eclamptic women who had a detected risk factor during antenatal clinic visits, we traced the women’s antenatal cards and hospital files from the medical record department at MNH. This was because the database information indicates only “antenatal hypertension” with no indication whether the hypertension was diagnosed during antenatal visits or after admission. By identifying delivery and registration numbers from the database and labour room registry book, respectively, it was possible to trace records of antenatal visits of 399 eclamptic women and 420 non-eclamptic women. The following information was extracted from their antenatal cards: The presence of oedema and protein in urine at any time, two weight meas-
urements of at least 30 days apart and three BP measurements taken at the first and the last two antenatal visits, and any referral indicated on the antenatal card was recorded.

EOC (Paper IV)

We introduced a parallel data collection form on complications because the routine data collection system reported a complicated delivery only as abnormal without specifying the type of complication. Data collectors were the health workers at each selected health institution; The variables included in this form were; the age of the woman, travel time to the health institution, type of complication, type of intervention given, qualification of staff who performed the intervention, outcome of intervention, and whether the woman was referred to another level or not. Monthly visits by the investigator were made in all health institutions to collect data and to cross-check and correct any discrepancy in the values or variables with the standard routine data collection records of the institution. All reported institutional or home deliveries; normal or abnormal, including the outcome of delivery, were traced and recorded. Women who did not comply with referral advice were traced and interviewed.

Standards and definitions

Anaemia and hypertension management (Papers I and II)

As a standard of service provision in this area, a pregnant woman was expected to attend a facility with a qualified staff (minimum MCHA) and equipment for detection and management of anaemia and hypertension in pregnancy as a structural requirement. Following the guidelines in the antenatal card, the women are expected to be examined for pallor, BP, and investigated for Hb, urinalysis and given the results of any investigation or examination (counselling) even if the results were normal. For hypertension it is recommended internationally that any pregnant woman with elevated BP $\geq 140/90$ mmHg should be referred to the hospital level for expert care. The antenatal card guidelines used in Tanzania during the study period, however, recommend referral of pregnant women with systolic BP of more than 140 or diastolic pressure of more than 90 mmHg. At the hospitals in this district persistently elevated BP was treated with anti-hypertensive and follow-up according to the doctor’s decision, but there were no written guidelines for management. For anaemia, women were expected to be examined and investigated and those found to have Hb $\leq 8.5$ g/dl or 60% by Tallqvist, should be referred to the higher level of service for investigation and treatment as per the antenatal card guideline.
Eclampsia management at the antenatal clinic (Paper III)

The international definition of pre-eclampsia includes de-novo hypertension in pregnancy in combination with proteinuria (Zhang et al., 1997). As in another study (North et al., 1999), hypertension in our study was defined as at least one measurement of systolic BP \( \leq 140 \) mmHg or diastolic BP of \( \leq 90 \) mmHg. Proteinuria was defined as a positive dipstick test (Albustix) regardless of the degree. A 24-hour urinary excretion of \( >0.3 \) g was not used to define pre-eclampsia since this test was not used in antenatal screening. All degrees of pitting oedema recorded in the antenatal period from mild to severe (+ to ++++) were regarded as positive. The rate of weight gain in one month was computed as the difference between two consecutive measurements divided by the number of days elapsed and then multiplied by 30. Excessive weight gain was defined as \( \leq 4 \) kg in thirty days at any stage of pregnancy. Eclampsia was defined as seizures (fits) occurring in the antenatal, intrapartum or postpartum period where other causes (epilepsy, cerebral malaria and meningitis) could be ruled out. In each case the diagnosis of eclampsia was confirmed by a specialist in gynaecology and obstetrics.

EOC - Paper IV

The UN indicators define obstetric complications to be antepartum and postpartum haemorrhage, prolonged/obstructed labour, postpartum sepsis, complications due to abortions, pre-eclampsia/eclampsia, ectopic pregnancy and ruptured uterus. Basic EOC functions include providing injectable antibiotics, injectable oxytocics, injectable anticonvulsants, manual removal of placenta, removal of retained products, and assisted vaginal delivery. Comprehensive EOC functions include all basic functions plus, C/S and blood transfusion.

The UN indicators define minimal acceptable levels of EOC as:

1. \( \leq 4 \) basic and 1 comprehensive EOC institutions per 500,000 inhabitants.
2. \( \leq 15\% \) of all births in the population take place in either basic or comprehensive EOC institution.
3. All women expected to have obstetric complications should be treated in EOC institutions (met need for EOC).
4. \( 5\% \leq C/S \) rate \( \leq 15\% \).
5. Case fatality rate (CFR) \( <1\% \).
UON for major obstetric intervention (MOI) classification
The UON indicators define MOIs in relation AMIs that can only be performed in hospitals to include: C/S, laparotomy, hysterectomy, internal version and craniotomy. AMIs are severe antepartum haemorrhage, incoercible postpartum haemorrhage, major Cephalo-pelvic disproportions, transverse position and brow presentation. A reference ratio of 1-2% deaths of all deliveries (UON-Network) was used as a maximum MMR in areas with no maternal care, however, each country is recommended to estimate its own reference ratio.

Statistical methods
Epi Info statistical software was used for data entry and analysis. Inter-observer variability was assessed by Kappa coefficient with value (k) indicating ≤0.20 for poor agreement, 0.21-0.40 for fair agreement, 0.41–0.60 for moderate, 0.61–0.80 for substantial agreement and ≥0.81 for almost perfect agreement between assessors (Altman, 1991). ANOVA was used to test whether the difference in proportions between health facilities was due to random variation or not. Odds ratios (OR) and 95% confidence intervals (CI) were calculated using the Mantel-Haenszel method to estimate the risk in eclamptic women (cases) in comparison with non-eclamptic women (referents).

Ethical considerations
A full explanation of the purpose of the study and investigations to be carried out was given to all participants. Informed consent was obtained from each pregnant woman. Whenever a risk factor according to the criteria was detected (i.e. elevated BP ≤140/90 mmHg) or Hb ≤8.5 g/dl), mothers were sent back to the health worker with their results for further investigations, treatment, or referral. No attempt was made to follow what kind of action was taken with these women. Before all the studies were carried out, ethical clearance was obtained from MOH, Tanzania and the Ethics Committee of Medical Faculty, Uppsala University, Sweden and all relevant local institutions were consulted and granted permission and support to the studies.
Results

The results of the quality assessment of the maternal health programme for antenatal and delivery care are presented according to standards developed for the three categories of structure, process and outcome of care. Each category of quality of care for the Papers is presented together as part of the maternal health programme.

Structural quality
Antenatal screening for anaemia and hypertension (Papers I and II)
The assessment of quality of the antenatal programme for anaemia in pregnancy (Paper I) revealed that half of the rural health clinics had no instrument to measure haemoglobin. The Tallqvist colour scale was the principal method used to measure haemoglobin in all hospitals and RHCs but none of the government dispensaries had this material. Both hospitals had colorimeters for Hb examination but they were not functioning at the time of assessment. Only the hospitals could perform investigations of blood for malaria parasites and stools for helminthes (Table 2).

Nine out of ten dispensaries had functioning sphygmomanometers and stethoscopes. This equipment was missing in one of the four RHCs. Investigation of albumin in urine (dip-stick) was possible in the hospitals and in all RHCs but only in one of the dispensaries. Only the two hospitals had the entire necessary infrastructure available for managing hypertension in pregnancy (Table 2). Qualified staff trained in assessing anaemia and measuring BP were present in all clinics except one of the ten dispensaries.
Table 2. Number and percentage of health care institutions with adequate structural facilities for screening, management and prevention of anaemia and hypertension in pregnancy

<table>
<thead>
<tr>
<th>Structural facilities</th>
<th>Health care institutions</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dispensary</td>
<td>RHC</td>
</tr>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
</tr>
<tr>
<td>Trained staff</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>Hb instrument</td>
<td>2</td>
<td>20</td>
</tr>
<tr>
<td>Iron/folate tablets</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>Antimalarial tablets</td>
<td>8</td>
<td>80</td>
</tr>
<tr>
<td>Sphygmonomnometer</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>Stethoscope</td>
<td>9</td>
<td>90</td>
</tr>
<tr>
<td>Albumin investigation</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>Anti-hypertensives</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diazepam</td>
<td>4</td>
<td>40</td>
</tr>
<tr>
<td>No. of institutions</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

*in all cases Tallqvist colour scale

EOC (Paper IV)

Using strictly the UN standard, (each health facility should have performed at least six EOC functions to qualify for a basic EOC institution and in addition provide blood transfusion and surgery to become a comprehensive EOC facility), only one of the hospitals would qualify as being a comprehensive EOC facility. None of the RHCs or dispensaries fulfilled the basic EOC requirements.

The modified definition used in our study requires the facility to possess all the injectable drugs and perform at least one procedure and one minor surgical intervention to be a basic EOC. While two dispensaries had a shortage of the three essential EOC drugs, all RHCs and hospitals had these drugs. Unlike all health centres and hospitals, where all the required interventions were performed, more than half of the dispensaries performed neither parenteral administration of one of the drugs nor any minor surgical intervention within a period of 3 months. Both hospitals thus qualified for comprehensive EOC. All RHCs, but only five out of 10 large and two out of 10 small dispensaries, qualified for basic EOC (Table 3).
Table 3. Number of health care institutions that performed different types of EOC functions during three months in Rufiji district

<table>
<thead>
<tr>
<th>Type of EOC function</th>
<th>Dispensary N=20</th>
<th>RHC N=4</th>
<th>Hospital N=2</th>
<th>Total N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inject oxytocin</td>
<td>10</td>
<td>4</td>
<td>2</td>
<td>16 (62)</td>
</tr>
<tr>
<td>Inject antibiotic</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>14 (54)</td>
</tr>
<tr>
<td>Inject anticonvulsant</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>10 (38)</td>
</tr>
<tr>
<td>Manual removal of placenta</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>12 (46)</td>
</tr>
<tr>
<td>Assisted vaginal delivery</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>3 (12)</td>
</tr>
<tr>
<td>Removal of retained product</td>
<td>6</td>
<td>3</td>
<td>2</td>
<td>11 (42)</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2 (7.7)</td>
</tr>
<tr>
<td>Surgery</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2 (7.7)</td>
</tr>
<tr>
<td>Basic EOC</td>
<td>7</td>
<td>4</td>
<td>2</td>
<td>13 (50)</td>
</tr>
<tr>
<td>Comprehensive EOC</td>
<td>2</td>
<td></td>
<td></td>
<td>2 (7.7)</td>
</tr>
</tbody>
</table>

Human resources

More than one-third of the 42 health workers working in antenatal and delivery units of the district health facilities had shorter training than an MCHA. These were nurse attendants (with only on-job training), nurse assistants (with one year training in elementary or basic nursing), and health assistants (one year training in health education and community preventive activities). About one-third of the health workers in these units were males and most of them were working as clinical assistants or COs.

Working conditions

Two-thirds of the health workers did not have an opportunity to attend any training course in one year prior to this investigation. The only opportunity for training was during three-monthly supervisions by the district health management team. About two-thirds were satisfied neither with their promotions nor with their working conditions. Many complained about having stagnated in one position without promotion for many (median=10) years.

Standard of knowledge

Health worker’s knowledge on some antenatal activities was measured by a self-administered questionnaire. Most of them (83%) were familiar with the instruments to measure BP. However, only 24% could mention the steps involved in preparing patients before measuring BP and one-third knew the correct actions to take when a patient is diagnosed to have elevated BP.
Two-thirds would refer a hypertensive woman to a higher level of care as their first action. About half of the health workers knew how to examine a pregnant woman for signs of anaemia and the correct action to take. Most of them (88%) would refer a patient with severe anaemia to a higher level of service. The vast majority (95%) of the health workers had an impression that the quality of ANC they provided was average or above. Only 17% of them had been offered any special training in ANC besides their pre-service training.

Accessibility

The district delivery complications that were treated in the two hospitals for one year (1998) were recorded. The patient’s village was identified from the labour-ward and the theatre registry and demographic information was obtained from the district medical officer. The accessibility of women with complications to the two hospitals in the district is presented in Table 4. The further the distance from the women’s residence to the hospital, the fewer the complications that were received by the hospitals from the respective catchment population.

Table 4. Number and percentage of delivery complications received at the hospitals in one year (1998) in relation to distance (kms) from the patient’s residence

<table>
<thead>
<tr>
<th>Distance in kms</th>
<th>Catchment population</th>
<th>Estimated delivery complications</th>
<th>Complication received at hospital</th>
<th>Compliance rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10</td>
<td>19,800</td>
<td>120</td>
<td>59</td>
<td>49</td>
</tr>
<tr>
<td>10-20</td>
<td>54,800</td>
<td>330</td>
<td>93</td>
<td>28</td>
</tr>
<tr>
<td>21-40</td>
<td>47,200</td>
<td>288</td>
<td>27</td>
<td>9.4</td>
</tr>
<tr>
<td>41-60</td>
<td>23,400</td>
<td>140</td>
<td>13</td>
<td>9.3</td>
</tr>
<tr>
<td>61-90</td>
<td>11,900</td>
<td>71</td>
<td>3</td>
<td>4.2</td>
</tr>
<tr>
<td>91-150</td>
<td>18,100</td>
<td>107</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>Total</td>
<td>175,200</td>
<td>1056</td>
<td>196</td>
<td>18</td>
</tr>
</tbody>
</table>

Process quality

Antenatal screening for anaemia and hypertension (Papers I and II)

The process of screening and management for anaemia and hypertension was studied in 370 and 379 women, respectively. The majority (58%) of the women were not checked for anaemia at all. Few women were clinically examined even at dispensaries where this was the only feasible option. Only 10% were clinically examined and 37% had their haemoglobin assessed. The
agreement between the health worker’s (Tallqvist) and the observer’s (HemoCue) diagnosis of anaemia using the Kappa index was fair in mild and moderate anaemia but very poor for the most anaemic women. Health workers thus tended to underestimate the severity of anaemia.

Only one third (35/100) of the women diagnosed with moderate to severe anaemia (Hb ≤8.5 g/dl) by the observer were detected by the health workers and only 4% of those with anaemia that needed action (Hb ≤8.5 g/dl) received the results and proper action (Table 5). Nevertheless, 96% of all women attending the ANC clinics received iron and folate tablets, without any relation to the clinical findings.

A poor process quality was also observed in screening for hypertension. Health workers detected only four out of twelve women with elevated BP. There was a low degree of agreement between health workers and observers in diagnosing women with elevated BP as estimated by the Kappa coefficient. Health workers tended to measure lower values of BP than the observer, thereby underestimating the degree of hypertension. Only one woman who was detected to have elevated BP by health workers was adequately managed (Table 5).

Table 5. Number and percentage of pregnant women screened for anaemia (n=370) and hypertension (n=379) and managed properly

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Levels</th>
<th>Present (Observer)</th>
<th>Detected (Health workers)</th>
<th>Properly managed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td><strong>Anaemia</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=370</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;11.0</td>
<td>255</td>
<td>68</td>
<td>96</td>
<td>38</td>
</tr>
<tr>
<td>&lt;10.5</td>
<td>215</td>
<td>58</td>
<td>74</td>
<td>34</td>
</tr>
<tr>
<td>≤8.5</td>
<td>100</td>
<td>27</td>
<td>35</td>
<td>35</td>
</tr>
<tr>
<td>&lt;7.0</td>
<td>23</td>
<td>6.2</td>
<td>10</td>
<td>43</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=379</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥140/90</td>
<td>12</td>
<td>3.2</td>
<td>4</td>
<td>33</td>
</tr>
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</table>

36
Antenatal screening of risk factors for eclampsia (Paper III)

The process quality of the antenatal programme for detection of hypertension and other risk factors for eclampsia was studied in 741 women who had developed eclampsia and in 1482 non-eclamptic referents. One-third (34%) of the eclamptic women made three or fewer antenatal visits compared with 19% of the non-eclamptic women. Eclamptic women were twice as likely to attend less than four times, compared with non-eclamptic referents (OR=2.2; 95% CI:1.8-2.7). The median number of antenatal visits for eclamptic women was four, compared with six for non-eclamptic women.

In the sub-sample of 819 women whose antenatal records could be traced, about 95% had been screened for hypertension, 33% for proteinuria, 92% for oedema and 85% for weight gain at antenatal clinics (Figure 6). Whereas 40% of the women, who later developed eclampsia, had no risk factor detected almost 30% of the non-eclamptic women had a risk factor recorded on their antenatal cards. All risk factors detected were more common in women who later developed eclampsia than in the non-eclamptic women.
Figure 6. Percentage of eclamptic (n=399) and non-eclamptic (n=420) referents who were screened (S) or had a risk factor detected (D) among the women delivered at MNH.
EOC (Paper IV)

The results of assessment of process quality are summarised in Table 6. The achievements in relation to standards for the indicators used show that the total number of deliveries in EOC facilities far exceeds the minimum requirements. The “met need” for management of complications at EOC facilities is, however, below standard as well as the C/S rate. Using the UON indicator, the MOIs for AMI in the district was 2.6% against a reference ratio of 1% (Table 6).

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Standards</th>
<th>Achievements</th>
</tr>
</thead>
<tbody>
<tr>
<td>By UN indicator for a population of 500,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comprehensive EOC</td>
<td>≤1</td>
<td>2</td>
</tr>
<tr>
<td>Basic EOC</td>
<td>≤4</td>
<td>11</td>
</tr>
<tr>
<td>Birth at EOC</td>
<td>≤15%</td>
<td>61%</td>
</tr>
<tr>
<td>Complications at EOC (met need)</td>
<td>100%</td>
<td>74%</td>
</tr>
<tr>
<td>C/S rate</td>
<td>≤5% and ≤15%</td>
<td>4.1%</td>
</tr>
<tr>
<td>Hospital CFR</td>
<td>≤1%</td>
<td>1.0%</td>
</tr>
<tr>
<td>Successful obstetric referrals</td>
<td>100%</td>
<td>46%</td>
</tr>
</tbody>
</table>

By UON Indicator

| MOI for AMI | 1-2% | 2.6% |

In total 1427 women were studied. There were 176 normal home deliveries and 1046 uncomplicated institutional deliveries. Two hundred and five women were managed by the health care system due to delivery or pregnancy complication. The complications included 58 abortions and two ectopic pregnancies. As the study covered 86% (155,000) of the district population, the expected number of deliveries in the whole district was estimated at 1600 (Figure 7).
Figure 7. Flow chart on normal and complicated deliveries and pregnancy complications in Rufiji district
Outcome quality

Antenatal screening for anaemia and hypertension

The prevalence of anaemia (Hb <10.5 g/dl) in mothers attending ANC was 58%, and only 3.8% of those with documented anaemia in the whole study group were treated in any way (Table 5). About 95% of the women reported that they were highly to moderately satisfied with the service. The question was not related to any specific aspect of the health care. The efforts in screening and managing hypertension in pregnancy showed that, at the visits observed, overall 3.2% of women were found to have an elevated BP (in Paper II) as assessed by the observer, compared with 1.1% as detected by health workers in the clinics. Similar to Paper I, about 95% of the women reported that they were generally satisfied with the care they received, with no difference in satisfaction between those who had received information on the BP results (94%) and those who had not (95%).

Eclampsia (Paper III)

The total number of deliveries in two years (1999 – 2000) in the labour ward at MNH was 36,279, and 741 women were admitted with eclampsia. Thus, the hospital-based incidence of eclampsia was 200/10,000 deliveries. An additional 336 eclamptic women were admitted to the eclamptic ward from other hospitals after delivery. The total number of deliveries in the catchment area of MNH during the two-year period was 156,030, thus the population-based incidence was 69/10,000 (1077/156,030).

Maternal deaths were 11 times more common among eclamptic than non-eclamptic women. The CFR for eclamptic women delivered at MNH was 5.0%, and was significantly higher in referred women than in self-referrals (7.8% vs. 4.1%, p=0.049). In the sub-sample of 336 eclamptic women admitted after delivery in other places than MNH, the case-fatality rate was 15% (52/336). Thirty-nine percent (287/741) of the singletons or first babies to eclamptic mothers died compared with 9.7% (143/1482) in the non-eclamptic women.

EOC (Paper IV)

In this rural district, three women died on the way to hospital and one woman died at hospital shortly after arrival with a uterine rupture, after being delayed for days due to the lack of transport. Thus, all four maternal deaths were in fact related to transport failures. Out of 56 referred patients only 26 arrived at either of the two hospitals making, the rate of successful obstetric referrals to be 46%. 
Discussion

General discussion
The four Papers in this thesis were undertaken to provide some explanation of the observed gap between high ANC attendances and the high maternal mortality in Tanzania. The studies clearly indicate different areas of quality deficiencies in the maternal health programme concerning specifically ANC and EOC. All four Papers will be discussed together as reflecting the total programme for maternal health care. The discussion on the implications of the findings will follow the order in which results have been presented. Preceded by methodological considerations, a discussion will follow on structural quality, with a section on human resources, accessibility, process quality and then outcome quality. The general conclusions and recommendations will close this chapter.

Methodological consideration
All cross-sectional studies have a problem in the random variation of the variables studied. In health facilities with seasonal (monthly kit) availability of drugs and supplies, a cross-sectional study may fall on atypical days when the facilities have a shortage or when they are well stocked. In our Papers from Rufiji, all the facilities had drugs on the days of study. Another longitudinal study from Tanzania has reported frequent shortages of iron and folate tabs in antenatal clinics in similar settings (Massawe et al., 1996).

The observational/cross-sectional design (in Papers I and II) was appropriate to assess the quality of ANC in everyday practice because it does not influence the process as much as an experimental design and it gives a more realistic picture of the nature of the activities without disturbing the actors or changing their focus. However, observational studies of health workers are said to have response bias (“Hawthorne effect”) (Mayo) whereby the participants or subjects in research, instead of acting naturally, try to please the researcher. The presence of an observer in the examination room might influence the behaviour of the health worker towards treating women more courteously than usual and making all the necessary examinations more carefully. This potential bias was minimized firstly by the research team in
introducing themselves as not representing the MOH (the employer) and ensuring that the results of the observations would not be used against them. Secondly, the observations were made on the second day of visiting the health facility to allow for improved contact between health workers and the research team and to reduce the health worker’s anxiety. Even if we don’t know the extent to which this observation influenced the health worker’s responses, we have no reason to believe that it would have altered the conclusions of the studies with regard to process attributes of quality, given the poor performance by health workers.

Also, if patients are interviewed near health facilities about health worker performance, they may tend to be unrealistically lenient to avoid the risk of being denied the best care at their next visit. Women were interviewed outside the facility buildings in a place where the health worker would not hear the conversations. Other researchers have concluded that patients cannot tell the difference in medical quality of care and therefore the results of the studies of patient satisfaction should be interpreted with care since they are related mainly to the contact with, and behaviour of, the health worker (Hendriks et al., 2002). Assessment of satisfaction in pregnant women is even more difficult since women with no symptoms (e.g. of moderate anaemia or hypertension) may feel more satisfied if they are told that they have no problems, compared with patients with disease symptoms who actively are seeking help.

The principal problem of using routine data is their incompleteness and inaccuracy. With respect to data on risk factors for eclampsia, “antenatal hypertension” was mentioned in the labour ward database, and it was unclear how it was defined. Therefore, we traced all the available case files and antenatal cards from the medical records and re-entered the relevant variables into the computer.

In assessing emergency obstetric care, the routine data collection did not include the type of complications that pregnant women had. We had to develop a parallel data collection system to include all the required variables, i.e., the type of complications, interventions, and outcomes. Routine data, if not modified, are often insufficient for assessing quality of obstetric care (using UN or UON indicators). Therefore, such assessment may mean a substantial cost for new report books and extensive training for health workers (Goodburn et al., 2001).

Our expectation was to observe the outcome quality of care as the result of the structure and process inputs made in the health care system. The author of the model structure, process, and outcome indicated clearly that the influencing relationship among three components is a probability and not a cer-
Quality aspects of maternal health in Tanzania

tainty. The higher the probability that one component influences the other, the firmer the establishment of scientific evidence of the relationship. As the model was developed to assess clinical practice where it performs reasonably well, for non-clinical practice it may need some modifications (Donabedian, 2003).

Structure quality

The structural requirements for the maternal health part of the Mother-Baby package (WHO, 1994) are well established and operational in many countries. These requirements are essential for the maternal health programme to be functional. Using the programmes of anaemia and hypertension in pregnancy as representing ANC activities, the situation in a rural setting typical of low-income country was found to be less than adequate.

Although the antenatal card guideline requires a mother to be referred if the haemoglobin is below 8.5 g/dl, lack of equipment for measuring haemoglobin in all government dispensaries was an obvious indication of the inability to make correct referral decisions for women with anaemia in pregnancy. Similarly, despite the need of recording BP and proteinuria on the local antenatal card, it was found that the majority (90%) of the peripheral dispensaries had no means of performing any urine investigation (albustix). Thus, already this deficient structure makes it impossible to implement correct referral for severe anaemia and pre-eclampsia in low level health facilities. This is an expression of the inadequate funding of activities in the public health sector, but in our study most women still received chemoprophylactic iron and folate tablets.

Human resources

The trained staff is a very important part of the structural requirements as it determines the proper use of other structural elements in the process component of quality of care. A skilled health worker in a maternal health programme is described as a person equipped to provide community-based, technologically-appropriate and cost-effective care to women during their reproductive lives and this person should have midwifery skills (WHO, 1994). In Tanzania, MCHAs, although mis-interpreted (Abou-Zahr and Wardlaw, 2003) as unskilled auxiliary midwives (probably because of the name Aide), have two-year midwifery training and therefore are qualified as skilled health workers. They formed the majority of the health workers involved in the Papers I, II and IV and all were interviewed through a self-administered questionnaire.
The reported lack of short course training for two-thirds of the health workers in our study, lack of necessary equipment for their activities, and dissatisfaction with their salaries, promotions and working conditions, could have influenced their performance in the antenatal clinic, as was observed in our Papers I and II. Other studies have shown that availability of basic equipment for assessing anaemia and close supervision was associated with health workers’ motivation in service provision (Massawe et al., 1999). Health workers and pregnant women appreciated a method that gave the actual measurement of Hb as opposed to inspection of conjunctiva (Koblinsky et al., 1994; Van den Broek et al., 1999). These opinions were reflected by our health workers since more than half of them suggested improvements in their health facility on laboratory services and staff training. The reported lack of short course training for health workers in our study, could explain why some of them were not confident in explaining their practice in managing women with anaemia or hypertension in pregnancy.

A study on life-saving skills needs assessment was conducted by the MOH, Tanzania in 1999, and revealed serious flaws in health workers’ ability to deal with obstetric emergencies, including complications of unsafe abortion. A life-saving skills training curriculum is ready for the training to be implemented gradually all over the country (MOH, 2000a). However, training alone may not be the only solution. A study conducted in South Africa reported that after successful completion of a perinatal education programme, midwives in an obstetric unit could improve in documenting obstetric history but there was still no satisfactory detection of obstetric problems and appropriate action was only taken in fewer than 12% of the cases (Le Roux et al., 1994). Education for quality improvement is an important need, but in that study more research was recommended on factors related to poor performance of well-trained staff in spite of availability of equipment and supplies.

Others authors (Dieleman et al., 2003; Fathalla, 2003) have also shown that the main motivating factors for health workers were to be appreciated by their superiors and the community, a stable job, income, and training, while the main discouraging factors were related to low salaries and difficult working conditions. Whereas the performance of the health care system depends ultimately on the knowledge, skills and motivation of the people responsible for providing care, the motivation has been identified as a key factor.

“The equation for performance is not the sum of knowledge, skills and motivation. It is the sum of knowledge and skills, multiplied by motivation. If motivation is zero, performance will be zero what ever the level of knowledge and skill of the provider” (Fathalla, 2003).
Quality of health worker performance has been reported to be better in institutions that are managed by non-government organizations (Boller et al., 2003; Bosse, 2000). It is presumed that staff motivation in non-government organizations is higher than in government institutions, mainly related to better equipment and non-monetary incentives. This may partly explain the fact that in our study more than three-quarters of the MOIs were conducted in the non-government hospital. A quality management triangle that includes quality design, quality control and quality improvement has been advocated as essential, interrelated and mutually reinforcing components of quality assurance (Kols and Sherman, 1998).

Accessibility

The issue of accessibility, which according to our conceptual framework of quality of care is part of health system characteristics, was a major cause of maternal mortality in this study. Other authors (Bailey and Paxton, 2002; Jahn et al., 2000) have shown that geographical and financial accessibility to obstetric services, although only marginally influenced by the health care system, are the main contributing factors to maternal mortality. Women’s perceptions and interpretation of danger signs have been found to be other barriers beyond distance and cost in another study in a similar setting (Kowalewski et al., 2000). The three women with pregnancy complications who died on the way to the health facility in our study district are testimony of this weakness. In addition, referral compliance in our study was less than 50%. Although the health policy of Tanzania is to provide free obstetric services in all government health institutions, the reality is that there are many costs that individual women and their families have to pay, like gloves and suture materials, but the most important is transport. Our study, similar to other authors (De-Groot and Van Roosmalen, 1993; Jahn et al., 1998), has shown that the further the distance from the hospital to the women’s residence, the fewer the women with complications from these areas were received in the hospitals and hence a risk factor for maternal mortality (Mbaruku et al., 2003). The question is where do those other women go, since they are equally prone to develop complications? One explanation from the field experience is that some of the pregnant women who have already been warned of pregnancy complications, like women with previous C/S due to cephalo-pelvic disproportion, and have relatives near these hospitals, move and stay with their relatives before delivery. When these women are registered at the hospital some of them would mention that they come from a nearby village of their relatives instead of their more remote residential village. Estimation of the proportion of women who may develop complications compared with those who have been attended in the district, suggests that very few women with complications seek care outside the district.
Process quality

The process quality of maternal care is defined as the extent to which the activities that constitute maternal care, including screening, diagnosis, treatment, and education or counselling, concerning problems such as anaemia and hypertension in pregnancy, and EOC, conform to the stipulated guidelines.

Anaemia and hypertension in pregnancy

Improvement of detection of anaemia is essential in order to increase awareness of the problem and the motivation to look for the solution. Clinical assessment for pallor in pregnant women has been shown to have low sensitivity (Meda et al., 1996; Van den Broek et al., 1999). The Tallqvist method, which is commonly used when laboratory resources are poor, seriously underestimated the most severe cases of anaemia in our study. The HemoCue haemoglobinometer that was used by the observer in this study, was easy to learn and simple to use under field conditions. However, the cost of the disposable microcuvettes makes it expensive compared with other methods. A colour scale for assessing Hb recently developed by WHO has been tested elsewhere (Van den Broek et al., 1999) and is recommended for use in screening for anaemia at antenatal clinics in settings where resources are limited. Theoretically, moderate and mild iron deficiency may be corrected by oral therapy in women attending antenatal clinics in mid-trimester, but studies have demonstrated variations in improvement of haemoglobin (Massawe et al., 1999; Rooney, 1992). Sometimes guidelines for dispensing prophylactic drugs against anaemia or malaria are not respected (Boller et al., 2003). Low compliance with conventional iron tables due to side-effects has been confirmed (Ekstrom EC et al., 1996). Even if iron supplements are provided, women must be motivated to take them. Late booking is also a problem, especially for the women with severe anaemia, as they may need more time to correct the anaemia than the period available during antenatal visits (Massawe et al., 1999).

Deficiencies in the screening programme were also noted for hypertension in pregnancy (Paper II). Screening by a health worker was not done in 35% of the women attending ANC facilities in the district. A similar study on quality of risk factor screening in Niger (Prual et al., 2000) reported that 44% of women attending ANC were not examined for BP by midwives, despite having all the necessary equipment available in all institutions participating in that study. Many reports have shown that only a low proportion of risk factors are detected at antenatal clinics (Rooney, 1992). There was also considerable disagreement between the BP measurements made by health workers and by the observer. A similar result was also reported in Niger where
disagreement between the reference examiner and midwives was high for many risk factors (Prual et al., 2000). Systematic errors in routine recording of BP measurements have been reported (Carroli et al., 2001a), indicating failure in standardization of the method and/or terminal digit preference and the use of different Korotkoff sounds.

In another study conducted in Niger (Prual et al., 2000) it was found that midwives claimed lack of time as the reason why they did not search for risk factors that could be detected by physical and/or biological examination, including BP measurements. In our study, two-thirds of the pregnant women had their BP checked but only 9% were informed about the result, indicating poor communication between the provider and the client even in hospitals and RHCs. A study on anaemia in pregnancy in similar settings also reported poor communication, but peripheral clinics were more likely to give information to the women than the large overcrowded clinics at the hospital (Massawe et al., 1995). Studies on drug compliance emphasize that regardless of which type of practitioner is consulted, communication between provider and client is very important and has considerable effect on client compliance (Nyanzema, 1984).

Eclampsia

In Paper III, women who later developed eclampsia had a median of only four antenatal visits, which was fewer than in the control group. Several randomized studies have shown that a reduced-visit programme of ANC is as effective and safe as the standard model (Carroli et al., 2001b; Munjanja et al., 1996). However, in a large multicentre randomized trial (Villar et al., 2001) comprising almost 25,000 pregnant women, pre-eclampsia/eclampsia was slightly more common in women who attended a median of five visits compared to control group making eight visits. Although in our study, BP was measured at least once in 95% of the pregnant women, hypertension was detected in only 28% of the women who later developed eclampsia, using the international standard with a cut-off point of ≥140/90 mmHg. Using the local guidelines according to the antenatal cards with a cut-off point of >140/90 mmHg for referral, would have identified a risk in only 18% of the eclamptic women. It is not known whether the inaccuracy of the BP measurement that is reported in Paper II could be generalised to this material. A diastolic cut-off of 90 mmHg may also be inadequate due to differences in geographic or ethnic variation of normal BP (Koblinsky et al., 1992).

Improved detection and care for women with hypertensive disease in pregnancy (HDP) have improved maternal and perinatal outcomes. There is, however, little evidence to suggest which specific interventions are effective. Eclamptic fits in hospitals have also been reported in the UK, indicating that
early detection and treatment are not effective in preventing disease progression (Douglas and Redman, 1994). In Sweden, analysis of historical data suggests that the early fall in mortality from eclampsia, primarily due to improved case survival, might be a result of better treatment of advanced disease (Hogberg and Joelsson, 1985). The above findings may indicate low reliability of ANC with regard to prediction and management of obstetric problems and this has been demonstrated in both developed and developing countries (Rooney, 1992).

Only one-third of the women in our material were tested for proteinuria. Although a positive test was significantly more often seen in eclamptic women than in referents, there were also a large number of positive test results among the non-eclamptic women. A positive dip-stick test for proteinuria may have other causes, such as urinary tract infections. It is difficult to get high predictive values of any test for risk of eclampsia due to low incidence of eclampsia in the general population. “The lower pre-test probability of the disease in a group of individuals to be tested, the lower the predictive value of a positive test will be regardless of sensitivity and specificity (unless the test is gold standard)” (Riegelman, 2000).

Proteinuria has been shown to be the only predominant sign in 10% of women with eclampsia and one-third of the women had only mild hypertension (Douglas and Redman, 1994). However, using either oedema or proteinuria, the identification of women who developed eclampsia was reported to be low (Golding J et al., 1988). In our study, oedema and excessive weight gained were significantly more often found in patients who later developed eclampsia compared with non-eclamptic women, but also a substantial number of non-eclamptic women had these signs.

The fact that all risk factors, or any combination of them, were of limited value in predicting eclampsia, illustrates the operational problems associated with the use of these indicators, or the limitations of the indicators themselves; in either case decreasing the effectiveness of the antenatal programme as a preventive strategy for eclampsia. Prodromal symptoms, including dizziness, headache and blurring of vision, have been reported more in women who later develop eclampsia (Bugalho et al., 2001). However, it was not known how long before the occurrence of eclampsia had these symptoms appeared.

Given the population incidence of eclampsia in this setting, and the presence of risk factors in non-eclamptic women, it can be estimated from our material that about forty otherwise healthy and symptom-free women would have had to be closely monitored in order to prevent one single case of eclampsia. Inevitably, this would mean a substantial increase in medical interventions,
in already overburdened hospitals, and would certainly pose a challenge to the health sector in low-income settings.

Although at least one risk factor was present in 60% of the eclamptic women during antenatal visits, less than 10% were referred to hospital for further management before onset of eclampsia. This is a sign of severe shortcomings in the referral system. It is obvious that any improvement in the quality of screening for risk factors will be of little value if the results are not transferred into adequate action.

Eclamptic women admitted from the antenatal ward had a lower CFR than those referred from other hospitals or self-referred. The finding indicated that improvement in management is possible and the conditions of referred patients could have been worse due to delays in seeking transport. Close monitoring in hospital has been recommended as necessary for good maternal outcome (Kullberg et al., 2002; Moller and Lindmark, 1986). The fact that 35 women developed eclampsia while under observation in the antenatal ward of MNH indicates that management of pre-eclamptic women is in need of improvement. A recent study shows that prophylactic magnesium sulphate may prevent eclamptic fits in women with severe pre-eclampsia (Maggie-Trial-Collaboration-Group, 2002). The current management in MNH is to use magnesium sulphate to treat any woman with signs and symptoms of pre-eclampsia.

EOC
An indicator of good quality should be sensitive, measurable, achievable and reliable.

In Paper IV, by using the accepted definition, the met need for obstetric care of 76% was considerably higher than reported from Mozambique, Nepal, Senegal (Bailey and Paxton, 2002) and Eritrea (Gottlieb and Lindmark, 2002). Underreporting of obstetric emergencies and over-reporting due to double counting have been observed in a system developed to monitor obstetric services in Malawi (Goodburn et al., 2001). A comprehensive parallel data collection, as the one instituted in this study, may be more reliable.

The problem of definition of obstetric complications is another reason for variations in the met need indicator. In the study area, the cut-off point for diagnosis of haemorrhage was blood loss in excess of 500 ml. The amount of bleeding was based on the perception of health workers and patients since measurement tools were not used. Inconsistencies in the definition of blood loss have also been reported (Goodburn et al., 2001; Hussein et al., 2001). Complications of abortion included infection or persistent haemorrhage re-
quiring evacuation of retained products. In settings where cases of abortions are common, this could contribute to an inflation of the met need indicator since only few abortions really need any intervention (Pathak et al., 2000). In countries like Tanzania, where induced abortion is illegal, these cases may be labelled as complications of spontaneous abortion to cover for the legal aspect. It is also difficult to separate cephalo-pelvic disproportions diagnosis from other causes of prolonged labour, especially when partograms are not used.

The rate of C/S in our study is lower than the recommended minimum of 5% and at least 14% of the sections were done on foetal indications. The validity of the assumption, that when the C/S rate is low, the majority of operations are done for maternal indication has been questioned. A large variation in the proportion of sections performed for maternal indications has been reported in Senegal, where the rate of C/S is as low as 1.2. Also in many countries a relatively low MMR has been reported with a C/S rate of less than 2.5% (Ronsmans et al., 2002). A rise in the C/S rate does not necessarily indicate progress in reducing maternal mortality (van Roosmalen and van der Does, 1995) and fixing the arbitrary minimum rate of 5% may not be adequate if only maternal mortality is addressed.

UON

Both the indicators “met need” and “UON” are designed to identify whether women who need obstetric care really receive it. However, it is not clear how one indicator can be transformed into the other. UON does not include non-surgical as life-saving medical interventions, or such a common procedure as removal of retained placenta. We used a reference ratio of 1% and our estimated ratio of 2.6% implied that the need of MOIs was covered and exceeded. Ideally, this reference ratio is supposed to be established locally from the baseline studies of the area but where this is not available it is acceptable to adopt a reference ratio from another area with similar characteristics. We adopted the reference ratio of 1% from a Moroccan study since we did not have a local reference; however, how this level was decided is unclear. It is said to originate from the assumption that in areas without any obstetric care MMR is 1-2% (UON-Network), and therefore the interventions to avert maternal death should also have a maximum of 2% of all births. This assumes that no interventions are done in cases who might survive without it, a clinically impossible Utopia! There are reasons to believe that still less is known about how this indicator operates. In a study conducted in Mtwara, Tanzania, to estimate UONs (Jahn et al., 2000; UON-Network), the MOI for AMI ratio for the Mtwara region was estimated to be 1.69% against a reference ratio of 1% also adopted from the Moroccan study. This finding led to reference ratio of 1.5% for Tanzania being sug-
gested at the East and Central Association of Obstetrics and Gynaecologists (ECSAOGS) Conference in March 2000 (Weyers-Faraj, 2000). Assessments made in Tanga region, Tanzania (Weyers-Faraj, 2000) revealed an MOI for AMI ratio of 0.98%, which could indicate fair achievement according to the old reference ratio of 1% but still far behind the new target of 1.5%. Our finding in Rufiji district of an MOI for AMI ratio of 2.6%, and still the presence of maternal mortality in the district, will either suggest a reconsideration of the issue of reference ratio, or the whole indicator in general. Probably the UON would need a large material from regional or national surveys and may not be applicable for quality assessment as a management tool at district level.

Outcome quality
According to Donabedian (2003), the outcome is taken to mean changes (desirable or undesirable) in individuals and population that can be attributed to health care provided. The high prevalences of anaemia and eclampsia together with a high maternal mortality ratio in this area are outcomes of care that indicate ineffectiveness and low quality of antenatal and delivery care, and are discussed sequentially as follows.

Anaemia in pregnancy
Although comparable to reports from other parts of Tanzania (Bergsjo et al., 1996; Massawe et al., 1996), and tropical Africa, where prevalence rates of 50-60% during pregnancy have been reported (Meda et al., 1996; WHO, 1992) the prevalence of anaemia in pregnancy is very high. The factors contributing to anaemia include inadequate iron stores due to multiple or closely spaced pregnancies, increased nutritional demand during pregnancy, poor food intake, hookworm infestation, malaria and recurrent and chronic infections (Fleming AF, 1989). The recommended strategies are based on known major causes of anaemia in the region and include prevention and treatment of malaria and hookworm as well as improved nutrition (Geelhoed et al., 2003; MOH, 2000b; Premji et al., 1999). However, the success of these strategies depend on the ability of the health services to provide the expected quality of care.

Patient satisfaction
Although satisfaction with care expressed by the majority of women attending these clinics for anaemia and hypertension screening was high to moderate, there are limitations in this study with respect to reliability and validity of the questions on client satisfaction. Other qualitative research has shown
that when women are knowledgeable about different modes of treatment they are more inclined to question their rights and demand choices (Kabakian-Kasholian T et al., 2000). The expressed satisfaction at all levels of health care could either mean lack of knowledge among women on what care they could expect from the antenatal clinics, or lack of difference in quality of care at different levels of the district referral system. Quality of care from the patient’s point of view may simply be seen in the framework of patient expectations versus actual experiences, which is subject to knowledge and prior experience, and therefore likely to change with accumulation of experience (Sitzia and Wood, 1997). Another author (Williams, 1994) has pointed out that dissatisfaction is only expressed when an extreme negative event occurs and therefore a positive response in satisfaction should not be interpreted as indicating that care was “Good” but simply that nothing “extremely bad” occurred.

Eclampsia

The hospital incidence of eclampsia in Dar es Salaam, estimated to be 200/10,000 deliveries, is to our knowledge among the highest reported. The ineffectiveness of ANC in management of hypertension in pregnancy documented in Paper II affects the occurrence and magnitude of eclampsia in pregnancy in Paper III. The incidence is similar to the one reported in Varanasi Hindu University, Varanasi, India 220/10,000 (Swain et al., 1993). However, it is higher than in other African countries, where reported incidences range from 29 to 130 per 10,000 (Majoko and Mujaji, 2001; Oladokun et al., 2000). The incidence observed may still be considered as a minimum since those who died before referral or at home were not included in hospital records, although earlier studies have indicated that a majority of lethal pregnancy complications are seen at hospital level (Urassa et al., 1996). It has been suggested that increased awareness within the community of the danger signs and need for referral for pre-eclampsia/eclampsia may contribute to a reduction in mortality due to this condition (Bugalho et al., 2001; WHO, 1996a).

The CFR for women who were delivered at MNH was 5.0% compared with 15% in cases referred from other hospitals after delivery. These figures are higher than reported from developed countries (Douglas and Redman, 1994; Kullberg et al., 2002) but lower than in some other developing countries with CFRs ranging from 9% to 32% (Majoko and Mujaji, 2001; Mwinyooglee et al., 1996; Oladokun et al., 2000; Swain et al., 1993). The relatively low CFR in MNH may be attributed to the presence of the eclamptic intensive care unit, which has been reported to be lacking in other settings (Majoko and Mujaji, 2001; Onwuahafua et al., 2001). The case-fatality rate was also
lower for women coming from the antenatal ward but, nonetheless, these cases had not been prevented through observation in hospital.

**EOC and maternal outcome**

Although the occurrence in the health facilities in our study district of one death among 97 women with complications reflects acceptable quality according to the indicators, three deaths that occurred during transport to these health facilities make this indicator less useful to the district as a whole. Maternal death or near-death audits may help improving case management (Bailey and Paxton, 2002). The hospital CFR is of limited significance where a large proportion of complicated obstetric cases are delivered outside health institutions, as in this study. The three maternal deaths during transport highlighted the importance of the referral system for maternal mortality and, therefore, it should also be assessed as part of the quality of obstetric care.
The risk approach strategy for the ANC programme for anaemia, hypertension and pre-eclampsia has limited impact on maternal morbidity and mortality due to inadequacy of structure and process quality. Essential equipment and drugs for management of these conditions are essential.

Given the inadequate coverage and unreliable screening procedures for the level and causes of anaemia, it will remain essential to provide prophylactic haematinics, anti-malarial and probably anti-helminthic tablets to every pregnant woman. Future studies are recommended on the effectiveness of anti-helminthics to decrease anaemia in pregnancy in areas with high prevalence of hook-worm infestation.

The sub-standard process quality was linked to the standard of knowledge, skills and motivation of our health workers. Health worker training for quality improvement in ANC and life-saving skills in obstetric care is essential for continuous improvement of maternal health care. Factors affecting health worker motivation, both monetary and non-monetary incentives, should be part of the quality improvement programme.

The transport, accessibility and referrals to the hospital need special attention and research since they are the main contributing factors for maternal mortality in most poor-resource settings.

Whereas improved case management of women with pre-eclampsia or eclampsia at the first referral level will be the most feasible option at the moment, further research is warranted on the performance of predictive indicators for eclampsia and the effective interventions to prevent it. The high incidence of eclampsia in this setting makes it suitable for further studies.

The indicators for EOC are insufficient to monitor quality of EOC in settings where deliveries with pregnancy complications are happening outside health facilities. They do not clearly identify areas for improvement and hence other sources of information, including community-based data and individual case audits, will be necessary to complement the information from these indicators. This study calls for more research to establish more well-defined indicators that can be linked to activities for reducing maternal mortality.
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Quality aspects of maternal health in Tanzania


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Quality aspects of maternal health in Tanzania


A doctoral dissertation from the Faculty of Medicine, Uppsala University, is usually a summary of a number of papers. A few copies of the complete dissertation are kept at major Swedish research libraries, while the summary alone is distributed internationally through the series Comprehensive Summaries of Uppsala Dissertations from the Faculty of Medicine. (Prior to October, 1985, the series was published under the title “Abstracts of Uppsala Dissertations from the Faculty of Medicine”.)