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# Quality Assessment and Monitoring of Maternal Referrals in Rural Tanzania

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**Abstract**

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An efficient referral system is essential in providing access to emergency obstetric care at higher levels of care by supporting antenatal and delivery services in the primary level of care facilities (PLCF). The aim of this thesis was to assess community and health service factors affecting the quality of maternal referrals in rural Tanzania.

Ten focus group discussions (FGDs) with health workers and community members were conducted to describe their perceptions on maternal referrals. Women (n=1118) were interviewed to determine awareness of obstetric danger signs and associated factors. Compliance with referral advice was analysed for 1538 women referred from PLCF. Counselling on danger signs and adherence to referral criteria was observed in 438 antenatal consultations.

FGDs indicated that women had limited influence, especially on emergency referrals. The process of deciding to seek referral care considered the perception of seriousness and past experience of referral, access to transport, and the cost involved. Women had low awareness of danger signs of obstetric complications: higher years of schooling increased the likelihood of being aware of danger signs. Demographic risks accounted for 70% of referred women but less than half complied with the advice. Compliance was higher for historical obstetric risks, prenatal, natal, and postnatal complications groups. Few women were counselled on pregnancy danger signs and a significant number with $\geq 5$ pregnancies and primigravidae <20 years were not informed of the risk factors.

This thesis demonstrated a need for reviewing referral guidelines and an increase in supportive supervision for health workers counselling on obstetric danger signs to enhance acceptance of referrals advices. Women's education should be given priority for increasing participation in decisions and becoming more aware of danger signs. Costs involved in maternal referrals can be relieved by improving family income, infrastructure, and alleviating the cost of referral through mobilising community transport and financial schemes.

*Keywords:* Quality, maternal referral, counselling, monitoring, rural, Tanzania

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To my beloved children Barnabas,
Allen, Donatus, and Hope

# List of Papers

This thesis is based on the following papers, which are referred to in the text as Studies and by their Roman numerals.

I. Pembe AB, Urassa DP, Darj E, Carlstedt A, Olsson P. Qualitative study of maternal referrals in rural Tanzania: Decision making and acceptance of referral advice. *Afr J Reprod Health* 2008; 12[2]:120-131.

II. Pembe AB, Urassa DP, Carlstedt A, Lindmark G, Nyström L, Darj E. Rural Tanzanian women's awareness of danger signs of obstetric complications. *BMC Pregnancy and Childbirth* 2009; 9:12.

III. Pembe AB, Carlstedt A, Urassa DP, Lindmark G, Nyström L, Darj E. Maternal referral system in Rufiji rural district in Tanzania *Submitted for publication.*

IV. Pembe AB, Carlstedt A, Urassa DP, Lindmark G, Nyström L, Darj E. Quality of antenatal care in rural Tanzania: Counselling on danger signs of obstetric complications and adherence to referral criteria *Submitted for publication.*

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# Contents

# Abbreviations

| | |
|---|---|
| AIDS | Acquired Immunodeficiency Syndrome |
| ANC | Antenatal Care |
| CI | Confidence Interval |
| CHMT | Council Health Management Team |
| DMO | District Medical Officer |
| EmOC | Emergency Obstetric Care |
| FANC | Focused Antenatal Care |
| FGDs | Focus Group Discussions |
| HIV | Human Immunodeficiency Virus |
| IMCH | International Maternal and Child Health |
| JHPIEGO | Formerly Johns Hopkins Program for International Education in Gynecology and Obstetrics |
| MCHAs | Maternal and Child Health Aides |
| MoHSW | Ministry of Health and Social welfare |
| NBS | National Bureau of Statistics |
| OR | Odds Ratio |
| PLCFs | Primary Level of Care Facilities |
| RCHC-4 | Reproductive and Child Health card number 4 |
| RHCs | Rural Health Centres |
| TDHS | Tanzania Demographic and Health Survey |
| TFR | Total Fertility Rate |
| UNICEF | United Nations Children's Fund |
| WHO | World Health Organization |

# Introduction

## The burden of maternal and neonatal mortality

Worldwide it is estimated that in 2005 at least half million women die from pregnancy-related causes, and the overwhelmingly majority (99%) of these deaths occur in low-income countries. Half of these maternal deaths occur in sub-Saharan Africa and one-third in South Asia (WHO, 2007, UNICEF, 2008). When a maternal death or morbidity occurs, her labour force is lost and the community has to care for the children and/or the disabled women at the expense of their development activities. Between 1990 and 2005, the pace in reducing maternal mortality was slower in sub-Saharan Africa than in other regions of the world: the overall global decline in maternal mortality ratio during this period was 5.4%, with an annual decline of less than 1%, in sub-Saharan Africa the decline was 0.1% (WHO, 2007).

Annually, there are at least 3.2 million stillbirths and more than 4 million neonatal deaths worldwide (Lawn et al., 2005, Zupan, 2005, Stanton et al., 2006): this is equivalent to eight neonatal deaths every minute. Ninety-nine per cent of these deaths occur in low- and middle-income countries (UNICEF, 2008). Three-quarters of neonatal death occur in the first week of life, indicating its association with pregnancy, delivery care and need for early neonatal care (Black et al., 2003, Lawn et al., 2005). In reducing child mortality, more efforts should be directed towards reduction of neonatal deaths, which contribute about 40% (Lawn et al., 2005).

Despite the current increasing indirect causes of maternal death due to the HIV/AIDS pandemic, the majority of deaths are still due to direct obstetric causes. The major direct causes include obstetric haemorrhage, obstructed labour, pregnancy induced hypertension, sepsis, and abortion complications (Urassa et al., 1995, UNICEF, 2008). Most obstetric complications, except abortions, occur during labour and delivery, and immediate after delivery. To reduce maternal and associated perinatal deaths due to direct causes, all women should have skilled attendance at delivery and timely access to appropriate emergency obstetric care (EmOC) if complications occur (Campbell and Graham, 2006). The presence of a skilled birth attendant implies obstetric complications occurring during and immediately after delivery will be readily recognised and appropriate action taken, including

stabilising the woman and referral where necessary. A skilled birth attendant is an accredited health professional with midwifery skills-such as midwife, doctor, or nurse-who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and immediately postnatal period, and in the identification, management and referral of complications in women and newborns (WHO, 2004).

The millennium development goals four and five address reduction of child-hood mortality by two-thirds and maternal mortality by three-quarters by 2015. To achieve these targets, several actors have to be involved in the process of quality of maternal care, including provision of quality antenatal care services, skilled attendance at birth, appropriate referral advice to all women in need, acceptance of referral by the women and the community, and timely care according to the condition at the referral health facilities.

## Referral during pregnancy, delivery, and after delivery

The term referral is used to denote any movement of health care seeking individuals from the lower to a higher level of care in the health system, whether advised by health worker or not. Referral systems provide access to management and skills only available at higher levels of care (WHO, 1994). An efficient referral system is essential in antenatal care and childbirth for providing access to EmOC at higher levels of care and for supporting ante-natal and delivery care in the primary level of care facilities (PLCFs). Refer-rals in maternal care can be categorised into (1) institutional or self, (2) ante-natal, delivery or postnatal referral, and (3) elective or emergency referrals (Jahn and De Brouwere, 2001).

Self-referral is when people seek care by deciding themselves to attend the higher level of care, as opposed to entering the health system at the lower level and being referred onwards only if advised at institutional-institutional referral (Sanders et al., 1998). Self-referral for delivery often without spe-cific medical reason is the most common mode of referral, whereas, institu-tional referral is less frequent and emergency referral is very rare (Sauerborn et al., 1989, Akalin and Maine, 1995, Jahn et al., 1998, Jahn et al., 2000, Nkyekyer, 2000). Although professionally regarded as an inappropriate use of referral level care, self-referral is sometimes appropriate, for a example, a woman with previous caesarean section, difficult labour, or stillbirth (Jahn and De Brouwere, 2001).

In many countries, maternal referrals from the PLCF to the referral hospitals are according to the referral guidelines provided to the first line health work-ers. Women are referred when there is a prediction for her developing an

obstetric complication (risk approach) or when she has already developed a complication that cannot be treated at the PLCF. Common risks in the guidelines are demographic factors including extremes in woman's age, primigravidity, grand multigravidity and short stature, previous history of bad obstetric outcome such as postpartum haemorrhage, perinatal death, and caesarean section. However, the detection of risk factors in antenatal care that can predict occurrence of obstetric emergencies is low (De Brouwere et al., 1998, Berglund and Lindmark, 1999, Majoko et al., 2002). Risk prediction wrongly identifies many women as being at risk who go on to have normal deliveries (Dujardin et al., 1995, McDonagh, 1996, Vanneste et al., 2000). Jahn and De Brouwere (2001) identify a core set of maternal and perinatal indications for elective referrals, including previous caesarean section, breech presentation, transverse lie, multiple gestation, hypertension, and severe anaemia. They further estimated that in rural settings, these indications would produce referral rates of 6% to 10%.

## Compliance with maternal referral advice

In many low-income countries, compliance with referral advice is low, with a range from 12% to 46% (Dujardin et al., 1995, Belghiti et al., 1998, Jahn et al., 1998, Gupta and Gupta, 2000, Jahn et al., 2000, Urassa et al., 2005). Numerous barriers to accessing care at the referral hospitals have been identified for women in rural areas with referral advice from PLCF. Transportation difficulties and the costs involved are reasons for delaying or even abstaining from referral (Thaddeus and Maine, 1994, Fawcus et al., 1996, Maine, 1997, Macintyre and Hotchkiss, 1999). The cost involved in seeking care for an obstetric complication is tremendously high for most women and their families in rural areas (McCord et al., 2001, Borghi et al., 2003). In Benin, the cost incurred for treating severe obstetric complications is estimated to be as high as 34% of the annual household cash expenditure (Borghi et al., 2003). In Tanzania, a study with the log ceiling regression model estimates most households have to allocate more than 50% of their annual consumption on maternal health care if the WHO mother-baby package is to be fully implemented (Prata et al., 2004).

Community perception of the quality of care at the PLCF and the hospital, perceived severity of the condition, and local etiological concepts may influence decision making (Jahn and De Brouwere, 2001). In Southern Tanzania, rural women particularly fear discrimination and stigmatisation: they are afraid of unfamiliar environments, lack of social and emotional support, loss of dignity, and control over decisions (Kowalewski et al., 2000).

# Strategies for improving referral to the hospitals

Efforts to increase referral acceptance employ a range of strategies depending on the barriers identified. Most strategies dealt with financial, distance, and transport barriers. Other strategies include counselling on birth preparedness and emergency readiness, use of maternity waiting homes, community mobilisation for transport and financial assistance.

Birth preparedness and complication readiness persuades pregnant women, their families, and the community to plan pregnancy care and to be prepared to deal with emergencies if they occur (JHPIEGO, 2004). Birth preparedness and complication readiness should promote preparation of normal birth by selecting skilled birth attendants and place of delivery; preparation of essential items for delivery, for example, clean delivery kit; knowledge of obstetric and newborn danger signs and when to seek help; knowledge of where and when to seek help; arrangement for access to funds and means of transport; and, prior identification of potential blood donors. If implemented, this is expected to improve access to health facilities by reducing delay in recognition of the problem and delay in seeking care. The results of implementation of birth preparedness and complication readiness packages in Siraha, Nepal, increased access and use of EmOC services (McPherson et al., 2006). After intervention in Koupela, Bukina Faso, skilled attendance at delivery increased, however, few women had clear plans for transportation (Moran et al., 2006). In Kenya, most women attending antenatal care do not receive birth preparedness and complication readiness messages: the women have low awareness of danger signs and few have plans for emergencies (Mutiso et al., 2008).

Bridging the geographical barrier through bringing the women closer to emergency care near the time of delivery has been achieved with maternity waiting homes and is commonly used in remote areas where access to care is difficult and among women in extreme poverty (WHO, 1996, WHO, 2004). Maternity waiting homes are residential facilities located near a qualified medical facility, where women defined as "high risk" can await their delivery and be transferred to a nearby medical facility shortly before delivery, or earlier should complications arise (WHO, 1996). The type of housing, catering and other services in maternity waiting homes differ from one country to another (van Lonkhuijzen et al., 2009). Although the women using the homes have higher risk pregnancies than other women directly admitted to hospitals, there is little evidence for whether the homes are associated with reduction of maternal and perinatal morbidity and mortality, and evaluation is difficult (Figa-Talamanca, 1996, Bhutta et al., 2009, Lee et al., 2009, van Lonkhuijzen et al., 2009).

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Transportation problems are preventable cause of 22% of perinatal deaths in rural Tanzania (Mbaruku et al., 2009). In a community investigation of avoidable factors of maternal death in Zimbabwe, 38% of maternal deaths were due to lack of or delayed transportation (Fawcus et al., 1996). Overcoming transportation problems is challenging in rural settings. During emergencies, communication over the provision of transportation from a district hospital or health centres has been restricted for many years. The increase in availability of more sophisticated but cheap and easy to maintain mobile phones presents a hope for the low-resource setting (Krasovec, 2004). Community mobilisation for transport is promoted in various low- and middle-income countries, but with varying levels of success (Essien et al., 1997, Ahluwalia et al., 2003, Hofman et al., 2008). Sustainability of community transport systems in resource constrained setting is a concern due to high running and maintenance costs (Bhutta et al., 2009, Lee et al., 2009).

The cost of care includes cost for transportation, medication, under the table payments, and those associated with the person accompanying the woman to the hospital (Thaddeus and Maine, 1994). The strategy for relieving the cost for poor people in remote rural setting is the establishment of community insurance schemes, community loan funds, and voucher schemes. These schemes are associated with increased maternal service utilisation in most setting where they are established. In Democratic Republic of Congo, community insurance scheme increased obstetric hospital admissions seven-fold (Criel et al., 1999) and in Mali, Senegal and Mauritania, facility deliveries has increased by 30% (Renaudin et al., 2007, Smith and Sulzbach, 2008).

## Quality in health care and maternal referral

Roemer and Montoya-Aguilar (1988) defined quality as the proper performance, according to standards, of interventions that are known to be safe, and have the ability to produce an impact on mortality, morbidity, disability, and malnutrition. Quality improvement is the process of incremental changes in the desired outcome. Donabedian (1979) describes a model of assessing quality in health care through three components; structure, process, and outcome. The structure refers to the environment, organisation, resources, and information requirement for the provision of care. The process involves technical competence, supervision, interpersonal relations, health education, documentation, and standardisation. The outcome means the changes to individuals and community due to contact with health care. Among the three components, the process appears crucial in the desired outcome of reducing maternal and neonatal morbidity and mortality.

In the Rufiji district referral system, the processes were explored at the primary level of care, including counselling of danger signs during pregnancy and advice for referral to the hospitals and this was related to the desired outcomes of awareness of danger signs of obstetric complication and compliance with referral advice.

# The United Republic of Tanzania

The United Republic of Tanzania was founded in 1964 by the union of two countries Tanganyika and Zanzibar. It is bordered by Kenya and Uganda in the north, Rwanda, Burundi, and the Democratic Republic of the Congo in the west, and Zambia, Malawi, and Mozambique in the south. The Indian Ocean forms the eastern border. The country has a total area of 945 087 km².

The 2002 census indicated a population of 34.4 million, with the 2009 population being estimated at 42 million, at a growth rate of 2%. Females comprise 51% of the total population. Women of reproductive age (15-49 years) represent 24% of the total population (NBS, 2002). The life expectancy at birth for Tanzanians is estimated as 51 years (NBS, 2002). The Total Fertility Rate (TFR) is high, estimated at 5.7 children per woman. Median age at first birth is 19.4, ranging from 18.7 years among women with no education to 23.8 years among women with at least secondary education. Modern contraceptive method use among married women is 20%. The infant mortality rate is estimated to be 68 per 1000 live births. Seventy-one percent of children 12-23 months of age are fully immunised according to the national recommendation. Almost 94% of women attend antenatal care at least once and only 47% deliver in health facilities (NBS, 2005).

Between 1999 and 2004, Tanzania made progress in reducing childhood mortality with overall under-5-year-old mortality dropping from 147 to 112 per 1000 live births and the infant mortality dropping from 99 to 68 per 1000 live births (MoHSW, 2008). Despite this achievement, maternal mortality and neonatal mortality has remained high. The maternal mortality ratio in Tanzania has been persistently high with no signs of decrease and The Tanzanian Demographic and Health Surveys (TDHS) estimated the maternal mortality ratio to be 528 per 100,000 live births in 1999 and 578 per 100,000 live births in 2005. Neonatal mortality has been reduced minimally from 40 to 32 per 1000 live births. Up to 50% of neonatal deaths occur in the first 24 hours of life (NBS, 1999, NBS, 2005).

# Organisation of the health care system in Tanzania

Tanzania is divided into 27 administrative regions. Each region has four to five districts, making 127 districts. The districts are divided into three or four divisions comprising three to four wards, with four to seven villages forming a ward. The lowest level in the administrative structure is the hamlet known as "*kitongoji*": each village has three or four hamlets.

Health care in Tanzania is provided through a mixture of government, private not-for-profit, including mission health facilities, and private for-profit, including company services. There is no clear distinction between the private not-for-profit and private for-profit health facilities (Boller et al., 2003). The health system is organised in a referral pyramid, starting with community health services at the base, then the primary health facilities, and then referral hospitals at the apex. Accessibility to primary health facilities is about 90% of people living within five kilometres. Maternal services in the government health facilities are provided free of charge (MoHSW, 2007). The cost for maternal services in the private not-for-profit and private for-profit health facilities differs from one facility to another. Generally, the private not-for-profit facilities are regarded as cheaper than the private for-profit facilities.

Community health services are provided by two people selected from the people in the village. The community health worker is responsible for health education and assists in implementation of public health interventions.

The dispensary is the first formal health unit of the primary level of care and serves a population of about 10,000 at the ward level. It mainly provides outpatient services to two or three villages, including treatment of minor conditions and reproductive and child health services. The staffing at the dispensary includes clinical officers or assistant clinical officers who are the in-charge of the dispensary, maternal and child health aides (MCHAs) or public health nurses, and nurse auxiliaries.

The Health Centre is the second formal health unit of the primary level of care, providing services to a population of a division, which is around 50,000 people. It offers in-patient and laboratory services in addition to the services provide by the dispensaries. The staffing, in addition to those at the dispensary, has assistant medical officers, registered/enrolled nurses, laboratory assistant/technicians, and pharmaceutical assistants/technicians.

At the district level, there is district or district designated hospitals, which are first referral level where necessary drugs, equipment, and skilled staffs are available to offer comprehensive EmOC services and general surgical

operations. The district medical officer (DMO), normally a medical officer or assistant medical officer is in-charge of all services in the district. The DMO is assisted by a council health-management team (CHMT). All women with high risk pregnancies or complications and who cannot be treated at the PLCFs are referred to the district hospital. The referral is according to the reproductive and child health card-4 (RCHC-4). The RCHC-4 is divided into three sections; the pregnancy care, delivery and immediately after delivery care, and follow up after delivery care. In the first part, the prenatal care, there are three categories of referral indications named A, B and C. A woman with one of the indications in category A should be referred for further investigations while one with indication in category B, should be referred for delivery. A woman requiring referral in category C is supposed to be referred immediately to hospital. In the natal and immediate postnatal period women with referral indication should as well be referred immediately to the hospital. The few cases that cannot be treated are referred to regional hospitals (which are at the regional level) or to the national level, where there are national and specialised hospitals.

## Rationale for this study

As in most low-income countries, Tanzania has high rates of maternal mortality (WHO, 2007). Referral is an integral part of the health care system in these countries. Although a referral system exists, it does not work properly. The detection of women at risk of complication is low (Prual et al., 2000, Urassa et al., 2002, Majoko et al., 2005) and a majority of women referred do not comply with the advice (Dujardin et al., 1995, Jahn et al., 1998, Gupta and Gupta, 2000, Jahn et al., 2000, Majoko et al., 2005, Urassa et al., 2005). To address low compliance to maternal referrals, there is need for determining contributing factors in the community and in the provision of health care that influences the use of referral services.

This study was designed to analyse the quality of maternal referrals in a rural setting, with the assumption, the outcome of maternal care reflects women's awareness of danger signs of obstetric complication, perceptions on the referral criteria, interaction with health workers, and the health care system. This was deemed necessary to provide practical recommendations for improving maternal referral guidelines, and to guide policy makers in the implementation of maternal care services.

# Study aim

The aim of this study was to assess community and health service factors affecting the quality of maternal referrals in Rufiji district, Tanzania.

## Specific objectives

1. To describe the process of decision making in seeking care for maternity problems and to identify factors influencing acceptance of referral advice from health workers.

2. To determine awareness of danger signs of obstetric complications and the associated factors.

3. To determine the proportion of women reaching the referral hospitals and document factors influencing reaching the referral hospitals.

4. To assess health workers counselling of pregnancy danger signs and adherence to referral criteria as stipulated in the national reproductive and child health card-4.

# Subjects and Methods

## The study area

Rufiji district is one of the six districts in the Coastal Region of Tanzania. The district covers an area of about 14,500 km$^2$. It has a mean altitude of less than 500 m above sea level with mainly tropical forest and grassland vegetation. The district has hot weather throughout the year with a short rainy season in October to December and long rains from February to May.

The district has a river, from which its name is derived, the Rufiji River, which divides the district from West to East into roughly two equal halves and comprises flood plains, coastal-delta, and plateau zones. The district has five divisions divided into 19 wards: eight wards in the flood plain, four in the coastal-delta, and seven in the plateau zone. There are 128 villages in the district, each with an average population of 1600; each village has two to three hamlets (v*itongoji*).

According to 2002 census results, the district has an estimated population of 203,102, of which 104,704 are female. The mean household size for the whole district is 4.6 (NBS, 2002). The main ethnic group is the Ndengereko, who are believed to be the original inhabitants of the area. Other ethnic groups include Ngindo, Matumbi, Nyagatwa, Pogoro and Makonde. Despite their ethnic differences, all inhabitants are fluent in Kiswahili, the national language. The majority of the population are peasants growing cassava, rice, sorghum and maize as food crops. Cashew nut is the main cash crop available.

The main form of transport is vehicular, motorcycles and bicycles, but most roads in the district are impassable during the rainy season. In the flood plains and coastal-delta, canoes or boats are used as alternative means of transport, but are dependant on water levels. The poor transport system renders most people dependent on the health services available within the district.

The district has two hospitals, Mchukwi and Utete, which provide comprehensive EmOC. Utete hospital situated to the south of the river is a government hospital and serves as a district hospital; Mchukwi hospital is to the

north of the river and is owned by the Pentecostal missionaries (Figure 1). Both hospitals have doctors (medical officers and assistant medical officers) offering obstetric operations and other medical treatments to patients. There are four rural health centres (RHCs), and 52 dispensaries: the RHCs and dispensaries are the PLCFs and staffed by clinical officers with two to three years training in clinical medicine after secondary education, registered and enrolled nurses with four years training in nursing and midwifery, public health nurses trained for three years to provide public health services including maternal and child health services, MCHA with two years training in maternal and child care and/or nurse assistants regarded as non skilled attendant (medical attendants) with one year training in nursing or on job training. These health workers provide antenatal and delivery care for low risk women. Women categorised as high risk and women with complications are referred to the hospitals according to guidelines stipulated in the RCHC-4 (MoHSW, 2006). All health workers in the district are trained on Focused Antenatal Care (FANC) which was adapted from the recommended new WHO model (MoHSW, 2002). There is one ambulance at Utete district hospital that serves the whole district; families of the woman have to contribute for fuel. Many women referred to the hospital and their families depend on other means of transport.
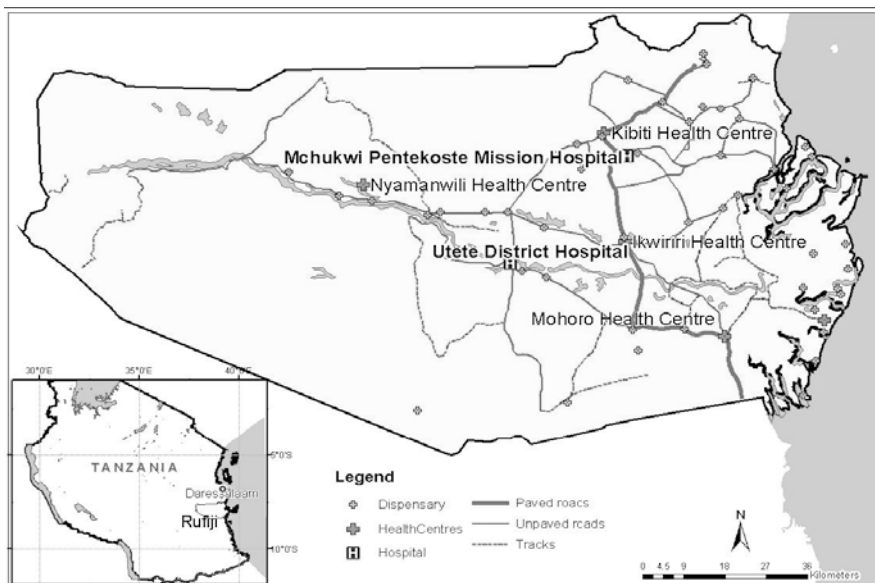


*Figure 1.* Map of Rufiji district and Tanzania (insert) showing distribution of health facilities in the district.
Source: *www.malariajournal.com/content/download/figures/1475-2875-7-4-1*

# Study designs and study populations

This thesis was based on one qualitative study comprising focus group discussions (FGDs) and three quantitative studies including community survey, longitudinal follow-up of referred women, and health facility survey. A summary is presented in Table 1.

Table 1. Summary of methods of data collection, study population, and main outcome measures for the four studies.

| Study | Study design | Data collection method | Study subjects | Main outcome measure | Main analysis |
|---|---|---|---|---|---|
| I | Qualitative | Focus group discussions | 85 community members 11 health workers | Decision making Acceptance of referral | Qualitative content analysis |
| II | Cross sectional | Interviews | 1118 women | Awareness of danger signs | Multivariate logistic regression analysis |
| III | Longitudinal follow-up | Enrolment at primary level of care and identify those reaching hospitals | 1538 referred women | Proportion reaching referral hospitals | Descriptive statistics |
| IV | Cross sectional | Observations and Exit interviews | 435 antenatal clients 31 health workers | Adhere to referral criteria Opinions on referral | Descriptive statistics |

## Focus group discussions (Study I)

FGDs were chosen for data collection as perceptions at group level can be captured from the interaction in the discussions (Kitzinger and Barbour, 1999). Two RHCs were purposely selected from the four RHCs in the district due to being furthest from the two hospitals, which are referral points and from Dar es Salaam. One RHC is located to the north of the Rufiji River, 102 km from the nearest hospital by road, the other is to the south of the river, 57 km from the nearest hospital.

In April and May 2005, ten FGDs were held: two FGDs with health workers working with maternity care, one in each RHC, and eight FGDs were held with women and men in the community; four in each village. The community participants were selected from a village nearest to each RHC. To cover the variety of perceptions in the community, participants were selected by age; old and young and gender; male and female. Participants fifty years or

more were included in the old group. Formal leaders including the village chairperson were excluded, as they could have influenced freedom of expression among the participants. The chairpersons of the villages assisted in the recruitment participants from the villages to ensure that all hamlets within the villages were represented.

## Cross-sectional studies (Studies II and IV)

Study II was performed from November to December 2006 and the study population included women who had experienced pregnancy in the past two years to ascertain actual maternal experiences and minimise recall bias. The district was stratified by geographical zones. There were eight wards in the flood plain, four wards in the coastal-delta, and seven wards in the plateau zones.

In each zone, two wards were randomly selected and from each ward, two villages were randomly selected: resulting in 12 villages. Cluster sampling of women in each village selected was used; thus, all women who have had an experience of pregnancy (excluding those who were pregnant for the first time at the time of study) within the past two years in the selected villages were included in the study.

Study IV was performed between March and July 2008. The study population was stratified by type of health facility the women visited for antenatal care. To minimise the variance contribution from strata with few subjects, stratified random sampling of health facilities was used. The sampling fraction for RHCs was 100% and 29% for dispensaries; thus, four RHCs and all 14 dispensaries involved in the follow-up of maternal referral study were included in the sample. All health workers providing maternal care and women attending antenatal care on the day of the visit were included in the study.

## Longitudinal follow-up study (Study III)

All pregnant women attending antenatal and delivery services in the PLCF from 1st June 2007 to 30th June 2008 were recruited into the study. Women who were referred during pregnancy, delivery, or after delivery were registered and those reaching hospitals were identified. The period of 13 months was chosen to capture seasonal variation in maternal referrals during the rainy and dry months of the year.

# Data collection

## Focus group discussions (Study I)

FGDs were conducted by a team of researchers consisting of an obstetrician and gynaecologist, a community health specialist, and a social scientist. The first three community FGDs and the two FGDs with health workers were moderated by the social scientist, while two assistants; operated tape recorders and recorded non-verbal communication. The remaining five community FGDs were moderated by the obstetrician and gynaecologist with two assistants.

The FGDs with health workers were conducted at the health facilities before the start of work in one RHC and after working hours in the other. In the community, the FGDs were conducted at the village offices or under the Mango tree. Kiswahili was the language used in all sessions, which were tape-recorded.

The researchers introduced themselves to the participants before the start of the session and explained the purpose, procedures of the study and that participation was voluntary. Thereafter, the participants introduced themselves. The moderator introduced the topics: *Where does the community seek care in pregnancy and delivery? What are the danger signs? How are decisions on referral made? What factors affect acceptance of referral instructions?* and, *What is their opinion on quality of maternal care provided*. The FGDs lasted between 60 and 90 minutes.

## Cross-sectional studies (Studies II and IV)

In both studies, nurse midwives with experience of research surveys were trained to perform interviews and observations. In Study II, the village leader was informed of the research activities before the day of data collection. On the day of data collection, house-to-house visits were made by the aid of a hamlet chairman, who introduced researchers and research assistants to the houses. All women who had experienced pregnancy in the past two years were identified and interviewed with a questionnaire comprising closed and open-ended questions. Information on awareness of danger signs of obstetric complication, socio-demographic characteristics, and use of antenatal and delivery services were collected. Those absent on the first visit were revisited, and if they were absent again, they were regarded as non-respondents.

The responses were sorted to identify medically recognised life-threatening obstetric complications based on the national antenatal care guideline and

the Safe Motherhood Initiative recommendations. The list of complications mentioned by the respondents included vaginal bleeding during pregnancy and delivery, severe vaginal bleeding after delivery, anaemia, swelling of lower limbs, fits of pregnancy, severe headache, high grade fever, child does not move, severe abdominal pain, awareness of fast heart beats, high blood pressure, prolonged labour, loss of consciousness, and retained placenta. Awareness of danger signs of obstetric complication was defined as the ability to mention at least one recognised danger sign during pregnancy, delivery, or after delivery.

Data collection for Study IV was at the PLCFs. Two research assistants visited each health facility for two days. On the first day, the research assistants introduced themselves to the health workers and explained the aim of the study, familiarised themselves with the surroundings, and collected facility records information. The second day was used to collect data. The pregnant women were asked their permission for the research assistant to be present in the consultation room during the antenatal consultation to observe health worker-pregnant women interaction. The research assistant was as discreet as possible during the assessment in order not to participate in the interaction in any way and sat behind the patient, but in a position not directly in front of the health worker. She used a checklist to record consultation interaction in the room. The seven pregnancy danger signs listed in the FANC (MoHSW, 2002) were included in the checklist.

After the observation, pregnant women were requested to participate in the exit interview. The exit interview was at a convenient place in the health facility premises away from health workers and other women attending the antenatal clinic. The questionnaire included women's opinions on the referral advice given and whether they would comply or not.

## Longitudinal follow-up study (Study III)

A parallel data collection system was established to identify all women referred to the hospitals. All health workers at the PLCF and involved in the study were trained before entering into the study. The training involved giving clear and concise information on the referral guidelines according to the RCHC-4 (MoHSW, 2006) (Table 2), recording in register books the women given referral advice, writing referral letters and tracing the women not reaching the hospitals after the period of estimated date of confinement.

All women referred to the hospitals were registered in a PLCFs register. A tag of research identification number was stapled on the women' antenatal cards for easy identification by health workers at the referral hospitals. Women referred were identified at the antenatal clinics and maternity wards

of the referral hospitals. Diagnoses given at the hospitals were recorded. Outcome of pregnancy was recorded when the woman delivered, whether at the hospital or at the PLCFs.

Table 2. Referral indications according to RCHC-4, Tanzania.

*Category A*
Age <20 years
Ten or more years since last pregnancy
Previous caesarean section*
Previous stillbirth/perinatal death (within one week)
Three or more consecutive abortions
Intercurrent illnesses (heart disease, diabetes mellitus, tuberculosis)

*Category B*
≥5 pregnancies
Height <150 cm
Pelvic deformity
First pregnancy at 35 or more years
Previous caesarean section* or vacuum delivery
Postpartum haemorrhage in previous delivery
Retained placenta in the previous delivery

*Category C*
Blood pressure 140/90 mm Hg or more
Haemoglobin less than 60% (8.5 gm/dl)
Albumin in urine
Sugar in urine
Gestational age more than 40 weeks
Intrauterine foetal death
Abnormal lie after 36 weeks
Oedema of the legs, face and hands
Suspected twin pregnancy
Fundal height too big or too small for gestation age
Danger signs**

*Indications of referral during natal and immediately postnatal period*
Spontaneous rupture of membranes without labour
Labour before 34 weeks
More than 12 hours since labour started
Abnormal lie or presentation of the baby
Vaginal bleeding
Variability of foetal heart beats (< 120 or > 160 beats per minute)
Elevated body temperature of >38° Centigrade
Eclampsia or blood pressure 140/90 mmHg or more
Haemoglobin less than 60% (8.5gm/dl)
Small pelvis or big baby
Meconeum
Retained placenta
Severe perineal tear
Blood loss more than 500 mls

*Caesarean section is in categories A and B.
**Danger signs are not stated.

Women who did not reach the referral hospitals were identified by comparing the registers at the PLCFs and the hospitals. These women were traced by the health workers at the PLCFs within their respective catchment areas. The women that were found were interviewed to determine the reason for not going to the hospital, and to determine maternal and newborn outcome. For women that had died, a relatives or person who was with the mother during the incidence was interviewed (Figure 2).
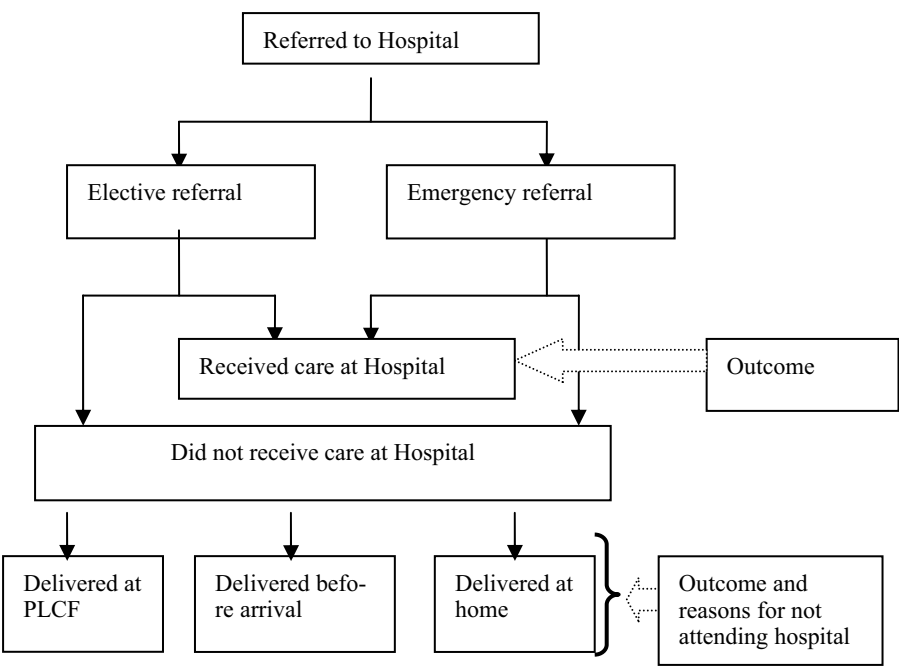


*Figure 2.* Flow chart illustrating the tracing of women at the PLCFs, referral hospitals, and their residences.

# Data analysis

## Qualitative content analysis (Study I)

The audio taped FGDs were transcribed in Kiswahili and then translated to English. One tape for an FGD with young men was excluded from the analysis due to a recording defect. A qualitative content analysis method (Graneheim and Lundman, 2004) was used to analyse the data. This method was chosen as it has a concrete analytical framework that can be easily followed. All texts from the FGDs were first analysed for identification of patterns of the decision-making processes and then for identification of factors influencing acceptance of referral. Each analysis included thorough reading of the transcribed text to identify meaning units, that is, statements related to

the topic of analysis. The meaning units were then condensed, abstracted and coded. These codes were categorised according to similarities and differences in content. The manifest content, which is concerned with what explicitly appears in the text, was analysed.

## Statistical analyses (Studies II, III, and IV)

In all three studies, analysis was with the Statistical Package for Social Sciences (SPSS), windows version 14.0.

Data were summarised by frequency tables and Chi-square test was used to determine associations between dependent and independent variables. ANOVA tested the difference in the mean interaction time between cadres of health workers (Study IV). The differences were considered significant when $p<0.05$. Factors found to be associated with awareness of danger signs (Study II) and client having been counselled on pregnancy danger signs (Study IV) in the bivariate analysis were tested in a multivariate logistic regression analysis. Odds ratio (OR) and 95% confidence interval (CI) were calculated to estimate the associations between awareness of danger signs (Study II) or client having been on counselled pregnancy danger signs (Study IV) and each independent variable. The risk for perinatal death for women not complying with referral in relation to those complying was analysed using odds ratio (OR) and 95% CI.

# Ethical considerations

Ethical approval was obtained from Muhimbili University of Health and Allied Sciences, Senate Research and Publication Committee. Permission to conduct the studies was given by the Rufiji district and village authorities, the office of the District Medical Officer, and corresponding health facilities. The purpose of study, benefits, and the right to refuse participation was explained to each participant. Informed consent was obtained from each participant and participants had liberty to refuse or leave the study at any time.

In the health facility survey, if the health workers missed any of the reasons for referral, that was identified by the research assistants, this was communicated to the health worker and the client after the exit interview.

# Results

## Process of decision making when referral is advised

The FGDs with health workers and the community members revealed the process of referral often started when a woman was advised by the health worker to go to hospital. For most elective referrals, the woman was alone during the antenatal clinic visit when she was advised to go to hospital, and informed her husband, or in-laws or parents if they were not married, afterwards. Some women did not agree with the referral advice given at the PLCFs. They did not inform their husbands or parents, thus, no one knew they had been advised to go to the hospital, unless a complication occurred and they seek care to the PLCF or when they visited the PLCF for delivery, then they might be informed.

In emergency referrals, the woman and another person, usually the husband escorting her to the PLCF, were informed of the need for referral and the husband informed his parents, the woman's parents and other relatives. The women had limited participation in the process of decision making, especially for the arrangements for emergency referral. In this situation, the husband, parents on both sides and other relatives decided whether or not to go, how to get money to pay for the costs, and where to seek care (Figure 3).

Husbands had the overall responsibility of making the decision when women are referred to the hospital. In most circumstances, the husbands are the heads of the families, have economic power, and assist in arranging for blood transfusions when needed. If the husbands do not agree with the referral advice, the woman's parents have the possibility to interfere and take their daughter to the hospital. When this happens, the husband has no alternative but to accept and join them.
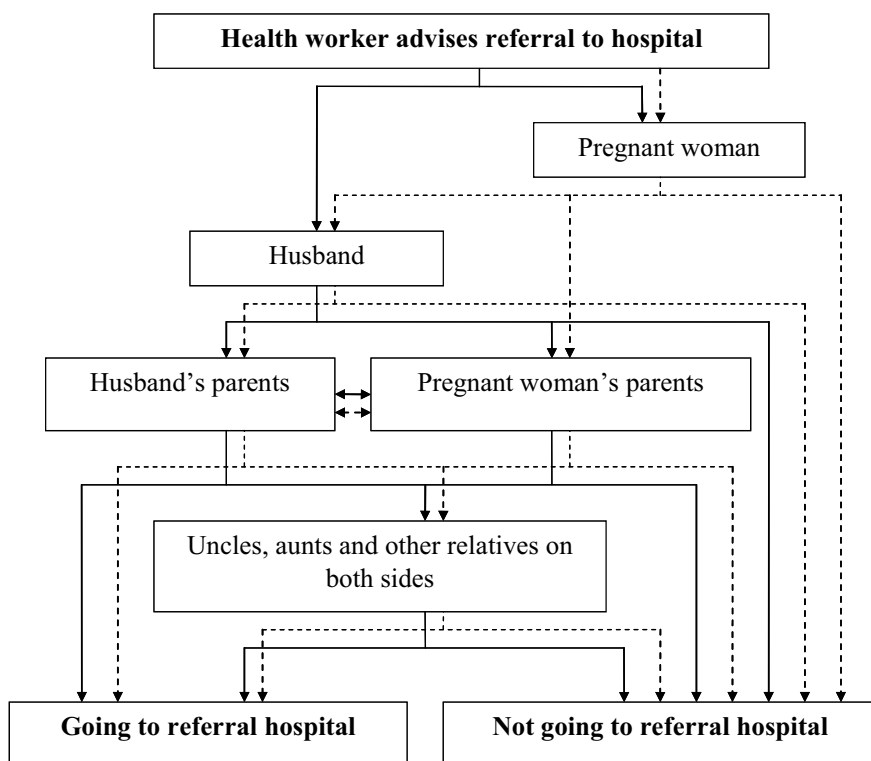
*Figure 3.* The process of decision-making during maternal referral. Key: Solid arrows are for emergency referral and dotted arrows are for elective referral

## Factors influencing acceptance of referral advice

Five factors influencing the acceptance of referral advice from health workers emerged from the FGDs:

1. Perceptions of risk and complications in pregnancy and childbirth
2. Previous experience of referral
3. Cost of transport to the referral hospital
4. Cost of living at the referral hospital
5. Perceptions of quality of care at hospitals and health centres.

Community members assessed the seriousness of pregnancy-related problems differently than the health care system did. Most referral advice due to risk factors without obvious signs identified by health workers were taken less seriously than referral advice due to occurrence of a complication. The women's decision not to accept referral was influenced by previous experi-

ences of referral when no complication occurred. The community generally agreed to elective referrals for previous caesarean sections and under-aged women with larger abdomens than normal. However, they did not agree with referral advice for indications such as first pregnancy, young age, short stature and five or more pregnancies.

The unreliability of transport and the high cost involved when women with complications were referred as emergencies hindered referral acceptance. Furthermore, when a woman was referred at least two people needed to accompany her to the hospital to assist her, bringing food, cleaning clothes, keeping in contact with other members of the family if she is very sick, and donating blood when needed. The woman could stay outside the hospital to await delivery if she was referred due to a risk identified during antenatal care. All these living expenses added to the cost of referral.

The hospitals were considered to provide acceptable quality of care. Health workers were perceived as kind, respectful, team workers, providing care immediately when needed and instructions given to the women and their relatives on cleanliness and other services were better at the hospitals. The health centres provided lower quality of care than expected by the community and were opened late, and were not very clean. Health workers were not always present during working hours, did not listen careful to the women and did not honour the confidentiality of the women's medical information.

## Determinants of awareness of danger signs of obstetric complication

From the 1151 women selected for the study, 33 (2.8%) were absent at the first and second visits and were regarded as non-respondents; thus, 1118 women were interviewed. Of these 1118 women, 571 (51%) knew at least one danger sign. The percentage of women who knew at least one danger sign related to pregnancy was 26%, in relation to delivery 23%, and to the period after delivery 40%. Few women knew three or more danger signs, especially for the delivery (Figure 4).

In the bivariate logistic regression analysis, the independent variables marital status, occupation, and advice to deliver in hospital were not associated with awareness of dangers, and were therefore not included in the multivariate logistic regression analysis. Secondary or higher education increased the likelihood of awareness of obstetric danger signs six-fold, compared to no formal education (OR=5.8; 95% CI: 1.8-19). Grand multipara (≥5 deliveries) women were more aware than women with lower parity (OR=2.2; 95% CI:

1.3–3.8). Women aged 30 or more were more likely to be aware of danger signs than women 19 years or younger were (OR=2.3; 95% CI: 1.2-4.1). Other factors associated with likelihood of awareness of danger signs were delivered in health institutions (OR=1.4; 95% CI: 1.1-1.9), four or more antenatal care visits (OR=1.4; 95% CI: 1.1-1.9), and had been informed of a risk or complication during antenatal care visits (OR=2.6; 95% CI: 1.8-3.8).

The independent variable time at booking for antenatal care (gestational length 3 months or less and 4 months or more) was not significant in the multivariate logistic regression analysis.
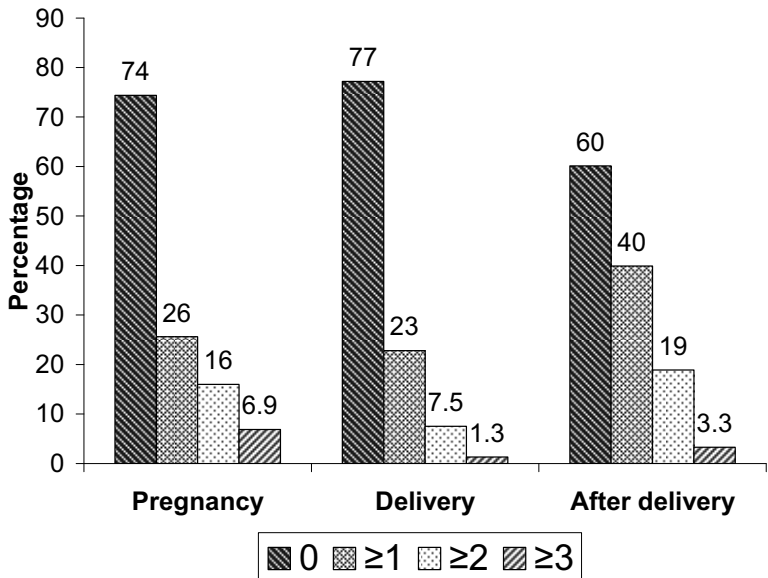


*Figure 4.* Percent of women who knew 0, ≥1, ≥2, and ≥3 obstetric danger signs during pregnancy, delivery, and after delivery.

# Women's compliance with referral advice

Among 5596 women booked for antenatal care, 1538 (28%) were referred to hospital. The majority 1079 (70%) of the women were referred due to demographic risks, with ≥ 5 pregnancies and age <20 years accounting for 994 (65%) of all referrals. Historical obstetric risk accounted for 186 (12%), prenatal complication 189 (12%) and natal and immediate postnatal complication 84 (5.5%). Previous caesarean section was the reason for 65% of referrals in the historical obstetric risks group. Prolonged labour accounted for 4.2% of all women referred to hospital and 76% of women referred with natal and postnatal complications.

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Less than half of the women (n=693: 45%) complied with referral advice. High compliance was observed in the historical obstetric risks, prenatal, and natal and postnatal complications groups. Women with ≥5 pregnancies and age <20 years had the least compliance.

In all groups, financial constraint was the major reason for non-compliance. Other reasons included difficult to get transport, labour started suddenly, delivered on the way to hospital, and no one was available to accompany the woman to hospital. Out of 431 women traced in the demographic risk group, 15 (3.5%) considered it unnecessary to comply with the referral advice given.

There were six maternal deaths. Four of the women died at the hospital: two women had severe pre-eclampsia, the third had antepartum haemorrhage and preeclampsia with twin pregnancy, and the fourth woman had severe post-partum haemorrhage. The other two women did not comply with referral advice and died in the village: one died two weeks after aborting, and it was unknown when and why the other woman died.

Generally, there was no elevated risk for perinatal death among women not complying with referral advice (OR=1.2; 95% CI: 0.64-2.2). Although not significant, the risk of perinatal death was elevated in the groups with prenatal and natal complications in women not complying with referral advice (OR=1.6; 95% CI: 0.34-7.8).


# Counselling on danger signs and adherence to referral criteria

Thirty-two health workers were observed providing antenatal care to 438 clients. Three clients left the study after the observations, leaving 435 women participating in the exit interviews. The number of health workers in each cadre and interactions (in brackets) observed were: nurse auxiliaries 11 (118); MCHAs 5 (87); public health nurses 9 (128), and registered/enrolled nurses 7 (102).

The information given on pregnancy danger signs was observed at the primary level facilities. Median client-health worker interaction-time was 10 minutes (range 2-54 minutes). The mean client-health worker interaction time was 14 minutes for nurse auxiliaries, 15 minutes for MCHAs, 13 minutes for public health nurses, and 8.9 minutes for registered/enrolled nurses (ANOVA, p<0.0001).

Two out of five (42%) clients were not informed of any pregnancy danger sign and only 8.7% of clients were informed of all seven of the danger signs: median number of pregnancy danger signs was 2 (range: 0-7). More than half of the clients (n=61: 60%) attended by registered/enrolled nurses were not informed of any danger signs (Figure 5).
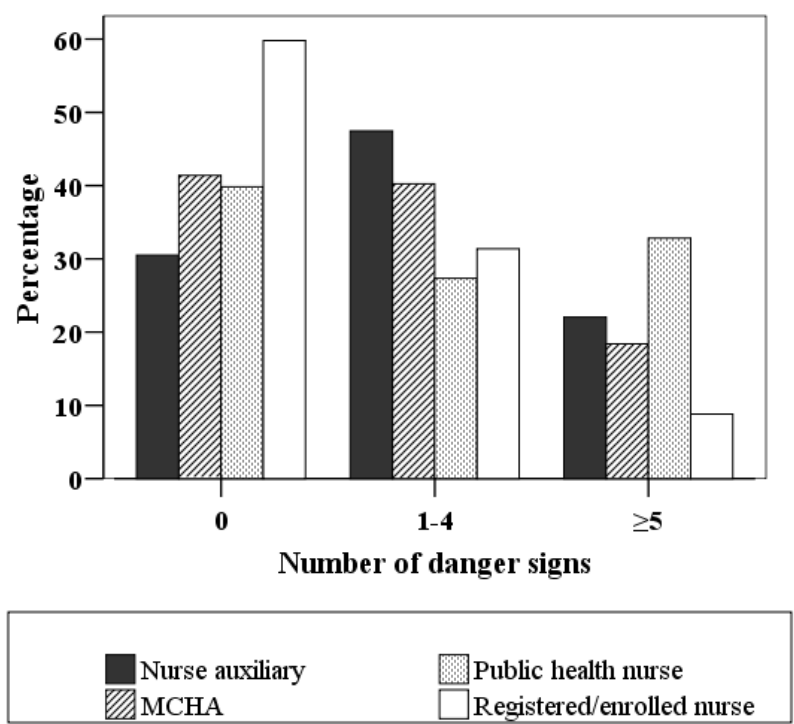


*Figure 5.* Percent of clients informed of 0, 1-4 or ≥5 pregnancy danger signs according to the cadre of health worker providing care.

In the bivariate logistic regression analysis, age of the mother, marital status, educational level, gravidity, and having been referred by the provider were not associated with being counselled on danger signs of obstetric complication, and were thus excluded from the multivariate logistic regression analysis. Occupation, number of antenatal care visits, gestation age at the visit, and cadre of provider were included in the multivariate logistic regression analysis. Only the cadre of the provider was associated with women being counselled on danger signs. MCHAs were more than three times more likely to inform a client of a danger sign than nurse auxiliaries (OR=3.7; 95% CI: 2.1-6.5) and public health nurses (OR=2.3; 95% CI: 1.3-4.3) and registered/enrolled nurses (OR=2.4; 95% CI: 1.4-4.2) were two times more likely to provide information on danger signs than nurse auxiliaries (Table 3).

More than two-thirds (n=111: 69%) of women were referred due to ≥5 pregnancies and primigravida <20 years. Among 125 clients who had ≥5 pregnancies, only 75 (60%) were informed of the risk, whereas, 36 out of 51 (71%) primigravidae <20 years were informed of the risk.

Table 3. Bivariate and multivariate logistic regression analysis of the likelihood to be informed of at least one danger sign. Odds ratio (OR) and 95% confidence intervals (CI).

| Characteristic | Counselled on danger sign | | Bivariate analysis | | Multivariate analysis | |
|---|---|---|---|---|---|---|
| | Yes | No | OR | 95% CI | OR | 95% CI |
| *Age* | | | | | | |
| -19 | 40 | 21 | 1 | | | |
| 20-29 | 130 | 102 | 1.4 | 0.77-2.7 | | |
| 30- | 81 | 61 | 0.96 | 0.63-1.5 | | |
| *Marital status* | | | | | | |
| Single | 45 | 24 | 1 | | | |
| Married/cohabiting | 206 | 160 | 1.5 | 0.85-2.5 | | |
| *Educational level* | | | | | | |
| No formal education | 101 | 59 | 1 | | | |
| Primary education or above | 150 | 125 | 1.4 | 0.96-2.1 | | |
| *Occupation* | | | | | | |
| Peasant | 203 | 132 | 1 | | 1 | |
| Other | 48 | 52 | 1.7 | 1.1-2.6 | 1.5 | 0.96-2.5 |
| *Gravidity:* | | | | | | |
| Primigravida | 56 | 33 | 1 | | | |
| Multigravida | 195 | 151 | 1.3 | 0.81-2.1 | | |
| *Number of antenatal visits* | | | | | | |
| First visit | 96 | 51 | 1 | | 1 | |
| Revisit | 155 | 133 | 1.6 | 1.1-2.4 | 1.5 | 0.94-2.5 |
| *Gestational age (weeks)* | | | | | | |
| -27 | 141 | 83 | 1 | | 1 | |
| 28- | 110 | 101 | 1.6 | 1.1-2.3 | 1.4 | 0.86-2.1 |
| *Indication for referral* | | | | | | |
| Yes | 101 | 59 | 1 | | | |
| No | 150 | 125 | 1.4 | 0.96-2.1 | | |
| *Cadre of provider* | | | | | | |
| Nurse auxiliary | 82 | 36 | 1 | | | |
| MCHA | 51 | 36 | 3.4 | 1.9-5.9 | 3.7 | 2.1-6.5 |
| Public health nurse | 77 | 51 | 2.1 | 1.2-3.8 | 2.3 | 1.3-4.3 |
| Registered/enrolled nurse | 41 | 61 | 2.2 | 1.3-3.8 | 2.4 | 1.4-4.2 |

# Discussion

These studies investigated aspects of maternal referral system in a rural setting in a low-income country. The aspects investigated included: community and health workers perception of maternal referral, women's awareness of danger signs of obstetric complication, counselling on pregnancy danger signs during antenatal consultation in the PLCF, compliance with referral advice given at PLCF, and the outcome of their pregnancies. The maternal referral system was complex. The women had limited participation in the decision making process, especially if there was a complication arises and the community's own judgment of the seriousness of the condition appeared different from the medical perspective and was based on previous experiences (Study I). In addition, despite high attendance for antenatal care, there was low awareness of danger signs of obstetric complication (Study II) and poor provision of information on pregnancy danger signs and non-adherence to referral guidelines during antenatal consultation by the health workers (Study IV). The poorer compliance with demographic risks than with historical obstetric risks and complications arising during pregnancy, delivery, and after delivery were reiterated in Study III.

## Methodological considerations

### Focus group discussions (FGDs)

A qualitative approach was used in Study I, and this complemented and clarified the findings of the longitudinal follow-up study (Study III). The qualitative study was used to obtain a deeper understanding of community perceptions of maternal referral from their perspective. The FGDs allowed community members and health workers to discuss the topic openly aside from their own perceptions, experiences, priorities, and use of preferred wording, which is difficult to obtain in quantitative studies (Kitzinger and Barbour, 1999). This was important, as there is lack of information on how the community view referral advice provided at the PLCF. This study further formed the basis for the design of Study II on the awareness of danger signs of obstetric complication and the phrases used by the participants in the FGDs were used in the questionnaire, thus contributing to its quality.

Trustworthiness in qualitative research is described by three interrelated aspects: credibility, dependability, and transferability (Graneheim and Lundman, 2004). Credibility refers to choice of method of data collection, how well participants are selected, and how the data are collected and analysed, according to the topic of the study. Dependability is the possibility of change in data collection and analysis over time and possible changes introduced by the researchers at the time of analysis. Transferability is the degree to which findings can be transferred to another setting outside the study area and can be facilitated by providing detailed descriptions of the study subjects and setting (Malterud, 2001). However, it is realised that the ethnicity of the community, degree of women's autonomy, financial capability, distance to PLCF and hospitals interact to form a unique situation to the setting, which may be different from other settings.

Purposive sampling of the participants to include both male and female, different age groups, and health workers contributed to increase the different perspectives, which increased credibility. Detailed description of the study setting was provided to facilitate assessment of the transferability to other settings. Moreover, the author (AP) and one researcher (PO) participated in identifying meaning units, condensing, abstracting, and coding of the data. Agreement was reached on categories emerging from the data. The quotations presented in study I, describe the similarities and differences between categories.

Dependability was minimised by collecting data with a topic guide prepared by the researchers and used by AP under supervision of a social scientist. The data were transcribed immediately after collection and translated into English. The transcribed data were rechecked several times by listening to the tapes. The Kiswahili version of the transcripts was referred to during the analysis process to ensure the actual meaning was presented.

The researchers' pre-understanding of the topic of research plays a role in the research process (Dahlgren L et al., 2007). Pre-understanding of maternal care in low-income countries was extensive among all researchers: AP and DP are Tanzanian citizens by birth and had undergraduate training in the country. AP worked as a medical officer in Northern Tanzania for 5 years and then as an Obstetrician and Gynaecologist for 9 years at Muhimbili National Hospital. DP has been a community specialist working in Tanzania for 20 years, and has participated in research and interventions on maternal care in the Rufiji district. AC worked in rural Tanzania as a surgeon for eight years before coming back to Sweden. PO worked in Mozambique and Angola as nurse midwife and has extensive research collaboration in Tanzania, India, and Sri Lanka. ED, an experienced obstetrician and gynaecologist, has worked on reproductive health research in Uganda and Tanzania. This was

an additional strength of the study, as the researchers' conceptions and experiences were repeatedly addressed during data collection and analyses to ensure the results represented the views of the informants and not those of the researchers.

## Cross-sectional studies (Studies II and IV)

Study II, focused on women who had been pregnant in the past two years at the time of the study. The goal was maximum recall of information on previous pregnancy experiences and shorter periods increase the quality of reported data. Women were asked if they knew the danger signs of obstetric complication, if they responded with a yes, they were asked to mention danger signs, with probing for further responses. This approach has limitations, as some women may refrain from answering subsequent questions, through saying 'I don't know', due to anxiety; thus, causing under reporting. This was reduced by asking separately for the danger signs during pregnancy, labour and delivery and after delivery. The use of female midwives as research assistants trained on data collection created an atmosphere of self-confidence and could have reduced under-reporting of the danger signs.

The observational study (Study IV) provided a realistic depiction of what was happening during antenatal interaction between the women and health workers. However, the presence of an observer might improve health workers performance in response to the fact they are being observed ("Hawthorne effect"). The bias was decreased through the researchers informing the health workers they worked independently and did not represent the MoHSW and the results could not be used against them and that observations were on the second day and researchers had prior contact with health workers on the first day of the visit. The effect of the presence of an observer is short-lived, and performance falls steadily back to the usual situation before the observation started (Leonard and Masatu, 2006). As the health workers performed poorly, it was considered the presence of the observer did not affect the daily provision of antenatal services.

## Longitudinal follow-up study (Study III)

In the longitudinal follow-up of maternal referrals (Study III), routine data collection did not include identification of the women, date the referral was given, and reason for the referral i.e. delivery, further assessment or due to complication. A data collection system was established to capture the information: this entailed training of health workers and supplying register books, referral forms, and other stationery. Training and retraining was sometimes unavoidable as health workers were transferred in and out of the selected study facilities; thus, the visits were monthly.

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The women registered at the health facilities with their names, father's name, husband's name, the hamlet (*kitongoji*), hamlet's chairman, and the village. In the respective catchment areas, health workers assisted in tracing women not reaching the hospitals after referral, when the time of delivery was due. This proved difficult as 323 (21%) of all referred women could not be traced and their outcomes were unknown: either they had moved out of the study area or their names were unknown to village and hamlet leaders. The health workers were remunerated for each woman they followed and received assistance with transportation where necessary but still some areas were inaccessible: some women were mobile within and outside the district. In rural areas, the health workers knew almost every woman attending the health facilities. Thus, most women not traced were from suburban areas of the district and health workers did not know most of the women attending the health facilities. This was the same for village and hamlet leaders in suburban areas, as they did not know all the people in their administrative area. Another reason for failing to trace the women could be that some women married and moved to the husband, others were divorced, or remarried after enrolment into the study: it was common for the woman to change her name after been married or remarried. This is one complexity of following-up clients in the low-income countries, where identity is the problem. The women lost to follow-up in this study was within the range (16% to 38%) of most antenatal care studies (Carroli et al., 2001), but was much higher than in a cohort study in Mozambique where 9% were lost to follow-up from 908 women (Osman et al., 2000).

As maternal death was a rare event, the impact of compliance on the referral groups (demographic risks, historical obstetric risks, prenatal complications, and natal and postnatal complications) was difficult to assess, and a larger sample size would have been required; a difficult task at district level due to amount of resources needed. Choosing severe acute maternal morbidity was inappropriate as some women were referred because of morbidity, which was a continuum between physiological pregnancy and maternal death. Thus, compliance was chosen as the outcome measure. Compliance was defined as arriving at the hospital after being referred from the selected PLCFs. The definition is limited, as some women intending to go to hospital labour might have gone into labour suddenly and delivered in their residences or en route to the hospital.

# Discussion of findings

## Women's limited participation in decision making

Husbands, parents on both sides, and other relatives played a role in deciding where and when to seek care, especially in emergency referral (Study I). Women's limited participation in the decision to seek care may be imbedded in the cultural context, educational, and economic status of the women, and the community in general. In Rajasthan, India, some mother-in-laws are against the use of the health facilities for emergencies until traditional healers have been consulted (Gupta and Gupta, 2000). In Hoima district in Uganda, the husband is the main person deciding whether to seek care. In contrast, in Jhenaidah district in Bangladesh other members of the family influence the decision to seek care (Parkhurst et al., 2006). As there is community involvement in maternal emergency referrals, emphasis should be placed on the importance of birth preparedness and complication readiness as the first step in increasing community involvement; thus, reducing the first and second phases of delay (Thaddeus and Maine, 1994). McIntyre et al (2009), describe access to care in low- and middle-income countries as a multidimensional concept based on the interaction between the health care systems and the individuals, households, and communities. Gender equity, women's education and empowerment, and alleviation of poverty could be a cornerstone in increasing referral acceptance.

## Women's low awareness of obstetric danger signs

One of the elements of birth preparedness and complication readiness entails women and the community to be aware of danger signs of obstetric complications. The importance of identifying women developing obstetric complication, prompt referral and early arrival to the hospital providing EmOC is the foundation for reducing maternal mortality and morbidity (WHO, 1994). Women in Rufiji have low awareness of danger signs of obstetric complication (Study II). Studies in other low-income countries have similar findings (Hasan and Nisar, 2002, Kumbani and McLnerney, 2006). Awareness of danger signs of obstetric complication can reduce delay in accepting the condition needs referral to hospital when advised and increase vigour in finding transport; thus, decreasing the first and second phases of delay (Thaddeus and Maine, 1994, Gabrysch and Campbell, 2009). Husbands, mother in-laws, and the community participate in the decision to seek care when referral is given. Therefore, awareness of danger signs of obstetric complication should extend to all who are involved in decision-making for referral. Involving husbands and other family members in antenatal care increases birth preparedness and postnatal care attendances (Mullany et al., 2007). Aside from education provided in antenatal and postnatal care clinics,

interventions through radio messages and community drama groups can be successfully used to increase awareness of danger signs, as it has been in Guatemala (Perreira et al., 2002). Introducing appropriate Safe Motherhood information to girls in primary schools before they become pregnant is another means of increasing awareness (Mushi et al., 2007).

Education is commonly associated with better utilisation of maternal services and lower morbidity and mortality in low-income countries (Setel et al., 2000, Simkhada et al., 2008, Gabrysch and Campbell, 2009). Better education is associated with enlightenment and awareness of different health conditions and exposure to information is crucial (Hasan and Nisar, 2002, Kumbani and McLnerney, 2006, Anya et al., 2008). In Nigeria, formal education was a major determinant for the change towards women taking decisions in the absence of their husbands (Odimegwu et al., 2005). In Study II, a higher level of education was the important predictive factor for increased awareness of danger signs. Women with secondary education and above were six times more likely of being aware of danger signs than women with no formal education. This emphasises the importance of education for increasing awareness of both danger signs of obstetric complication and other health messages when provided.

Increased awareness among older and multiparous women may be related to their own experiences of pregnancy or events in the community. Women's experience of obstetric risk or complication in their last pregnancy could have been an important source of information, leading to more awareness of danger signs. When a complication occurs, health workers should take the opportunity to inform the woman and her family about obstetric danger signs and likely causes. This may increase awareness of the danger signs within the community and reduce negative perceptions about referrals.

## Women's poor compliance with referral advice

For the risk approach to be successful, the predictive value of the risk factors must be high, women detected to be at risk must be given referral advice and be able to reach the hospitals. Most risk factors have a low predictive value for the occurrence of obstetric complications (Dujardin et al., 1995, McDonagh, 1996, Vanneste et al., 2000) and reason for negative attitude towards referral could be that the majority of women do not develop complications when referred. Women with risk factors or complications may be given referral advice but do not honour the advice because they consider the reason for referral unimportant. In the FGDs (Study I), the community perceived some referral advice provided by health workers especially the demographic risks including first pregnancy, young age, short stature, five or more pregnancies, as unnecessary. This was derived from their own experi-

ences of women who were referred but had normal deliveries at home, PLCF, or at the hospital and created a lack of trust in the referral advice: the community perceived this as a waste of money and resources. A similar situation is described in rural Zimbabwe (Mathole et al., 2004). To improve the services provided, policy makers and health workers need to consider the community's perspectives on the use of maternal care.

The Tanzania RCHC-4 has 37 indications for referral during pregnancy, delivery, and immediately post delivery. In the longitudinal follow-up (Study III) of women referred from the PLCF to the hospital, a majority (70%) of women were referred because of demographic risks, 92% of these because they had to ≥5 pregnancies and age <20 years. Similarly, in the southern part of the country, Mpembeni (2009) reports a majority of referrals being due to demographic risks. In Leon, Nicaragua, a majority of women could be classified as high risk due to a large number of risk factors: the presence of many risk factors contributes to low compliance (Essen et al., 1994).

The proportion of women complying with referral advice differed in the referral groups (Study III). Compliance was low in the demographic group and higher in the historical obstetric risks, prenatal, natal and postnatal complications groups: the low compliance to referral in the demographic risks group concurred with other studies in sub-Saharan setting (Jahn et al., 1998, Majoko et al., 2005, Mpembeni, 2009). Compliance to referral due to some risks and complications is related to physical accessibility to the hospitals as well as perception of danger to the woman and the baby (Dujardin et al., 1995). Women's non-compliance with referral advice is sometimes related to not understanding the reason behind the referral (Kowalewski et al., 2000). Thus, from the finding of the follow-up study (Study III) and the FGDs (Study I), it is likely the community did not consider demographic risks as reasons for being referred to the hospitals.

It is suggested that the antenatal card should include only important and well-defined risk factors (Essen et al., 1994, Mahomed et al., 2000, Villar and Bersgjo, 2002). A randomised control trial in Mtwara, Tanzania, compared a modified antenatal card, adapted from the WHO recommended antenatal card (Villar and Bersgjo, 2002) and the Tanzania RCHC-4. In a modified antenatal card, five risks were removed including age <20 years, 10 or more years since last pregnancy, height <150 cm, pelvic deformity, and sugar in urine. Previous caesarean section was removed from category A (woman referred for further investigations) but retained in category B (woman referred for delivery). Grand multiparity was re-categorised from ≥5 to ≥8 pregnancies, young age at first pregnancy from <20 to <16 years, and age at first pregnancy from >35 years to age >40 years. The modified antenatal card reduced the number of referrals four-fold, with similar maternal

and foetal outcomes (Mpembeni, 2009). Redefining the risk factors and cut-off points for referral in low-income countries is safe, acceptable, economic, and will increase health sector credibility as well as reducing the number of unnecessary referrals and avoiding congestion in the hospitals.

In 2002, Tanzania introduced focused antenatal care (FANC), which was adapted from the WHO guideline for a new mode of antenatal care. The antenatal visits changed to being a goal-oriented, the number of visits for normal pregnancy was reduced to four, and counselling was to become an integral part of the consultation (MoHSW, 2002, von Both et al., 2006). The risk markers (referral indication) on the RCHC-4 were not changed or adapted accordingly, as almost all risk markers are the same. Deciding cut-off points and excluding some risk markers is challenging, especially with the problematic access to hospitals in rural areas being more difficult in the presence of complication or birth of the baby on the way to hospital (Etuk et al., 2000, Fenton et al., 2002). However, Mpembeni's (2009) results of the randomised trial in Mtwara, Tanzania, presents the opportunity for changing the cut-off points and re-categorisation the risks and may improve trust in the referral indications; thus, improving compliance.

Difficult and costly transportation were barriers for accepting referral advice (Studies I and IV), and supported the work of other studies (Thaddeus and Maine, 1994, Campbell et al., 1995, Kwast, 1995, Fawcus et al., 1996, Maine, 1997, Hussein and Mpembeni, 2005). Rural areas often have few roads, which are difficult to pass, especially during the rainy season. Although there are attempts to alleviate the problem of transport and the cost involved in different low-income countries, there is the problem of sustainability and community ownership (Essien et al., 1997, Shehu et al., 1997, Ahluwalia et al., 2003). The Tanzanian government equipped most primary health facilities with vehicles (Jahn and De Brouwere, 2001), but this could not be sustained due to high running costs of the vehicles and the cost of the drivers' salaries.

Beyond transport costs, the cost of care, accommodation for accompanying people, food, and sometimes drugs are a major concern in the study area (Studies I and III), and has been demonstrated before both in Tanzania and in other sub-Saharan countries (Shehu et al., 1997, Kowalewski et al., 2002, Borghi et al., 2003). These costs may deter women with complications from accepting referral advice given at health facilities, despite the resources being mobilised when the community perceives the woman to be in danger. Maternity waiting homes for women with high risks pregnancies as recommended by the Tanzania government (MoHSW, 2008) and subsided schemes, such as voucher schemes, have been tried in different countries, but

with varying results. There is need to identify the best options for alleviating the costs the community incur when women are referred to the hospitals.

## Health workers inadequate counselling of pregnancy danger signs and adherence to referral indication

An estimated 15% of all pregnant women will develop life-threatening complications, which will require timely and appropriate intervention to avert maternal death (WHO/UNFPA/UNICEF/AMDD, 2009). Most complications cannot be predicted; thus, it is taken that all pregnancies are at risk. Counselling on pregnancy danger signs during antenatal care is crucial for equipping pregnant mothers and their families for better decision-making in birth preparedness and emergency readiness. In Rufiji, there were short contact times between women and health workers, poor provision of information on pregnancy danger signs, and poor adherence to referral indications on ≥5 pregnancies and age <20 years (Study IV). Studies assessing the provision of antenatal care indicate weakness in the different aspects. There is less time spent on individual counselling per consultation than is required (Murira et al., 1997, Jahn et al., 2000, von Both et al., 2006, Anya et al., 2008). Provision of information on obstetric danger signs is inadequate, counselling is poor, and the detection of risks factors and complications is low (Prual et al., 2000, Urassa et al., 2002, Urassa et al., 2006), and non-adherence of health workers to the referral criteria (Dujardin et al., 1995, Mugisho et al., 2003, Majoko et al., 2005). As most women were not aware of the danger signs, it could be one reason fewer women sought care when danger signs occurred or delayed accepting referral when advised.

In Tanzania, women should be informed about all seven of the pregnancy danger signs at any visit to antenatal care, as indicated in the MoHSW FANC (MoHSW, 2002). In study IV, fewer women were informed of the danger signs than was anticipated. The higher cadre, registered/enrolled nurses had shorter contact time with the clients and did not inform the majority (60%) of their clients about any pregnancy danger signs. Performance is directly proportional to motivation which includes being appreciated by superiors, having a stable income, and training and is inversely proportional to barriers including low salaries and poor working conditions (Dieleman et al., 2003, Fathalla, 2003). In northern Tanzania, health workers report several barriers to the provision of care, these include: poor supervision from the district level, delayed promotions, dealing with conditions they have not learnt, and lack of feed back on cases referred to the higher level (Manongi et al., 2006). The unexpected finding on low quality of counselling implies higher cadres are less satisfied with their job and this directly affects their performance.

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# Conclusions and Recommendations

Community has its own way of risk calculation and deciding on maternal referrals, which do not follow the existing referral indications stipulated in the RCHC-4 (Study I). There is poorer compliance with demographic risks than with historical obstetric risks, prenatal, natal and postnatal complications risks (Study III). To improve acceptance of referral advice, there is a need for the referral guidelines to be reviewed and to include a consideration of community views. The review should involve removing risks with poor predictive development of complication and changing the cut-off points for some risks.

Health workers counselling of pregnancy danger signs is poor, as only two out of five women were informed of at least one danger sign and six out of ten women with ≥5 pregnancies and seven out of ten women <20 years were provided referral advice (Study IV). Women have low awareness of danger signs of obstetric complications; better awareness of danger signs was strongly associated with increasing level of education (Study II). As most women attend antenatal care, strategies for improving the quality of counselling health education and counselling during antenatal care visits are essential. This includes supportive supervision of health workers by the CHMT and increasing the number of trained health workers. Moreover, involving husbands and other family members at the antenatal clinics may improve community awareness of danger signs; thus, increasing birth preparedness and complication readiness, as they participate in decision-making when a complication occurs. Other sources of information including community-based radio messages and educational sessions could be used to target the whole community. Intensifying the provision of formal education, as emphasised in the second millennium development goal, enables women to better understand the information provided and increases participation in decision-making during referrals.

Transportation difficulties and the overall cost involved in maternal referrals (Studies I and IV) can be relieved by poverty reduction in the community, infrastructure improvement, and community transport and self-financing schemes. The use of maternity waiting homes is another alternative, but community involvement is crucial.

There is still a need for more knowledge on the process of appropriate refer-rals in maternity care and for assessment of the effectiveness of interventions to increase the quality of the maternity care. To provide a deeper understand-ing of the roles of different individuals in the family and the community, a qualitative in-depth interview study is on-going with women who were re-ferred but who did not comply and all people involved during the time of the referral. An intervention study at community level involving pregnant women and their families is in the planning stage. Village health workers will be trained on birth preparedness and complication readiness and visit families with pregnant women to provide education.

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