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## Maternity care for women who deliver at the Monkey Bay Community Hospital

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## ABSTRACT

*Introduction:* Maternal and neonatal health are important global health issues. Every year half a million women die due to complications of pregnancy and labor. It is estimated that 4 million neonates die annually. Problems during pregnancy and delivery events increase the risk of neonatal death. The majority of maternal and neonatal deaths could be averted with relatively simple interventions. It is important to know how such interventions are implemented at the local level. The objective of this study is to describe and appraise health services to women who deliver in a rural sub-Saharan hospital, to identify obstacles to improved services and propose feasible actions that could be taken.

*Material and methods:* The study was conducted in Monkey Bay in Malawi. The Icelandic International Development Agency (ICEIDA) has supported health services in the area since the year 2000. Information was collected about women who delivered at the Monkey Bay Community Hospital (MBCH) during a one month period in the spring of 2005. Information was obtained from ANC cards, hospital files and by questioning the mothers. Data were computerized with FileMakerPro 5.5 and analysed with Microsoft Excel 2002.

*Results:* Of the 68 women who delivered during the research period only one was referred from a health center for delivery at MBCH. Ninety-two percent of the women received the recommended two doses of sulfadoxine-pyrimethamine for malaria prevention during pregnancy, 81% had an adequate status of tetanus immunization, 71% were tested for syphilis with the VDRL-test and hemoglobin was measured for 79%. In 54% of cases hemoglobin was measured during the second ANC visit or later. Eighty-one percent of the women were anemic (Hb < 11.0 g/dl). Registration of results of the various components of examination performed on admission for delivery was in the range 65 to 85%. All the women were given an oxytocic drug during delivery. The outcome of four pregnancies was stillbirth; in two instances the presentation was breech.

*Conclusion:* For women who delivered in MBCH malaria prevention during antenatal care and administration of oxytocic drugs at delivery proved to be acceptable. Other services such as tetanus immunization and syphilis screening have not been utilized to their full potential. Anemia is an important health problem for women who deliver at MBCH. Hemoglobin of all women should be measured at least once during pregnancy and as early as possible. Routines for registration of health information can be improved. By establishing facilities for cesarean sections at MBCH the hospital would become more capable of standing up to its role as a referral unit for pregnant women in the Monkey Bay Health Zone.

## LIST OF ABBREVIATIONS

ANC	Antenatal care
CHAM	Christian Health Association of Malawi
HC	Health center
ICEIDA	Icelandic International Development Agency
IPT	Intermittent preventive treatment
LBW	Low birthweight
MBCH	Monkey Bay Community Hospital
MDH	Mangochi District Hospital
MDHS	Malawi Demographic Health Survey
MEHP	Malawi Essential Health Package
MMR	Maternal mortality ratio
NMR	Neonatal mortality rate
PPH	Post partum hemorrhage
TT2	Tetanus toxoid 2 doses

## INTRODUCTION

Every year maternal ill health has far reaching consequences on a global scale. An estimated 529,000 women die annually due to pregnancy related complications<sup>1</sup>; 99% of these deaths occur in developing countries<sup>2</sup>. Many women survive obstetric complications with debilitating consequences. Currently over 300 million women in the developing world are estimated to suffer-short or long-term consequences of pregnancy or delivery<sup>2</sup>.

Maternal mortality includes deaths that occur during pregnancy, delivery and the first 42 days following delivery<sup>1</sup>. Maternal mortality is often expressed as the maternal mortality ratio (MMR) which is the number of deaths *per* 100,000 live births. The MMR is a measure of the risk of death once a woman has become pregnant. Globally MMR is about 400 deaths *per* 100,000 live births but its magnitude varies substantially between regions<sup>1</sup>. The region with the highest MMR is sub-Saharan Africa with an estimated 920 deaths *per* 100,000 live births. The lifetime risk of maternal death depends both on the MMR and the number of times a woman becomes pregnant. The lifetime risk of maternal death in sub-Saharan Africa is 1 to 16 compared to 1 to 2800 in developed countries. The most important direct causes of maternal death are: hemorrhage (25%), infections (15%), unsafe abortion (13%), eclampsia (12%) and obstructed labor (8%). Maternal deaths due to indirect causes such as malaria, anemia and HIV/AIDS account for 20% of the global total<sup>2</sup>.

Due to difficulties in statistical assessment the global extent of maternal mortality was not fully realised until the 1980s<sup>3</sup>. A conference hosted by international agencies in Nairobi in 1987 marked the beginning of the first real global action to lower maternal mortality<sup>4</sup>. Since then maternal health issues have been on the international health agenda. Efforts were reinforced in the year 2000 when the member states of the United Nations adopted the Millennium Declaration which addresses various matters of interest to the whole of humanity<sup>5</sup>. The declaration has been summarized in the eight Millennium Development Goals. Goal number five is to improve maternal health but more specifically defined with the target to: “*Reduce by three-quarters, between 1990 and 2015, the maternal mortality ratio*”<sup>6</sup>.

The World Bank estimates that maternal mortality could be reduced by 74% if all known interventions were expanded to a coverage of 99%<sup>7</sup>. As most maternal deaths

occur during delivery or the immediate postpartum period<sup>2</sup> the most effective intervention is to improve access to essential obstetric care through which approximately 52% of the deaths could be averted<sup>7</sup>. The runner up is improved access to safe abortion services (16%) followed by active management of the third stage of labor (10%) and use of magnesium sulphate and other anticonvulsants for women with preeclampsia (8%). Other interventions with less impact are iron supplementation, prevention of malaria and tetanus immunization<sup>7</sup>. Worldwide 61% of babies are delivered by skilled attendants<sup>2</sup>. It is now considered crucial to raise this proportion in order to succeed in lowering maternal mortality<sup>2,8</sup>. Formerly more emphasis was placed on screening women during antenatal care (ANC) for risk factors that would indicate possible delivery complications<sup>4</sup>. This method has not proved to be efficient in lowering maternal mortality because high risk women account for only a small percentage of all maternal deaths and the vast majority of deaths occur in women with no known risk factors<sup>8</sup>

Millennium Development Goal number four is to reduce child mortality where the target is to: “*Reduce by two-thirds, between 1990 and 2015, the under-five mortality rate*”<sup>6</sup>. Currently 10.6 million children die annually before reaching their fifth birthday<sup>9</sup>. Thirty-eight percent of them die during the first four weeks of life, the neonatal period<sup>10</sup>. Therefore, Millennium Development Goal number four will not be reached without reducing substantially neonatal mortality. Neonatal mortality is expressed by the neonatal mortality rate (NMR); the number of deaths *per* 1000 live births. As with the MMR the worlds highest NMR is found in sub-Saharan Africa<sup>10</sup>. In addition to neonatal deaths about 3.3 million babies are stillborn every year<sup>2</sup>. Maternal health during pregnancy and events during delivery have considerable impact on neonatal survival. Examples of factors that increase risk of adverse neonatal outcome are: hypertensive disorders of pregnancy, maternal anemia, maternal malaria, syphilis, breech presentation and obstructed labor<sup>10</sup>. Delivering good quality ANC is an important way to reduce neonatal mortality by enhancing the health of mothers. Among cost effective evidence based interventions that lower neonatal mortality are tetanus toxoid immunization, syphilis screening and treatment, intermittent preventive treatment (IPT) for malaria and prevention of preeclampsia and eclampsia<sup>11</sup>. If the coverage of interventions known to be efficient and effective in lowering neonatal mortality were expanded to 99% it is estimated that 41-72% of neonatal deaths could be averted<sup>11</sup>.

It is evident that interventions that reduce the burden of maternal and neonatal mortality exist. It is important to know how they are implemented at the local level. The objective of this study is to describe and appraise health services to women who deliver in a rural sub-Saharan hospital, to identify obstacles to improved services and propose feasible actions that could be taken. The study was conducted in Malawi.

## **MATERIAL AND METHODS**

### **The Republic of Malawi**

The Republic of Malawi is a landlocked country in south east Africa that stretches along the western shore of Lake Malawi<sup>12</sup>. The country covers nearly 120,000 square kilometers including the lake which accounts for about one fifth of the country's total surface area. The majority of Malawi's 12 million inhabitants<sup>2</sup> live in rural areas and engage in subsistence farming. The economy is based on agriculture but is heavily dependant on outside economic assistance. The main export commodities are tobacco, tea and sugar but maize forms the base of the peoples diet although fish is important for those who live by the lake. In the year 2004 Malawi ranked number 165 out of 177 nations on the U.N. Development Programme's Human Development Index<sup>13</sup> which indicates that Malawi is one of the worlds poorest and least developed countries.

There are several ethnic groups in Malawi<sup>12,14</sup>. The Chewa dominate in the central and southern parts of the country. The other major group in the south is the Yao but other groups who also live in the south are Ngoni, Lomwe and Tonga. In the north most people are Tumbuku but Tonga are also found there. In recent years ethnical and tribal distinctions have diminished<sup>15</sup>.

### **Health Care System**

The people of Malawi have access to free health care through a governmental health care system that is organized into three levels. Health centers (HC) manage the most common and easily treated problems in addition to offering maternity services. Cases that can not be dealt with at this level are referred to district hospitals which provide secondary health care including some types of surgery. Malawi is divided into three main regions: Northern, Central and Southern and each has a central hospital

that receives patients from the district hospitals in the corresponding region and provides them with tertiary care.

As there are few medical doctors in Malawi the bulk of the service is provided by other health care professionals such as medical assistants, clinical officers and nurse-midwives. Medical assistants receive two years of training in diagnosing and treating the medical problems that most commonly arise in Malawi. Clinical officers have an education similar to that of medical assistants augmented by an additional education of one and a half year with emphasis on practical procedures such as cesarean section. Nurse-midwives have a two year education in nursing and one year of midwifery training.

### **Health of Neonates and Mothers**

Neonatal mortality in Malawi is 42 deaths *per* 1000 live births<sup>2</sup> which is 10 times higher than in high-income countries but similar to the average NMR in Africa which is 44<sup>10</sup>. Child mortality is also high in Malawi, every fifth child does not reach the age of five<sup>2</sup>. According to the Malawi Demographic and Health Survey (MDHS), performed in the year 2000, the maternal mortality rose from 620 deaths *per* 100,000 live births in 1992 to 1120 in the year 2000<sup>16</sup>. Three factors are thought to contribute to this rise: An increase in deaths from AIDS, fewer mothers give birth in health facilities and the quality of care within health facilities has deteriorated<sup>2</sup>. In contrast, the World Health Organization (WHO) estimates that maternal mortality was 1800 deaths *per* 100,000 live births in Malawi in the year 2000, the third highest in the world<sup>1</sup>. This difference is due to the fact that the WHO makes adjustments to account for underreporting and misclassification. In the year 2003 the total fertility rate was 6.1<sup>2</sup>, which means that during a lifetime a woman in Malawi has 6 children on average. Recent studies have reported a prevalence of HIV/AIDS among pregnant women in Malawi in the range 18% to 28.6%<sup>17-19</sup>.

### **Mangochi District**

The Mangochi district lies on the south west shore of Lake Malawi and has a population of about 700,000 people. The Mangochi District Hospital (MDH) is situated in the town of Mangochi and receives patients that are referred from the district's primary health care facilities. The hospital has 250 beds and can perform surgical operations such as cesarean sections. The district's only medical doctor is

stationed at MDH. Other clinical staff includes clinical officers, midwives and medical assistants. The district is divided into five health zones and one of them is the Monkey Bay Health Zone.

### **Monkey Bay Health Zone**

The Monkey Bay Health Zone comprises a peninsula that abuts into the southern part of Lake Malawi and has a population of approximately 110,000 people. The town of Monkey Bay with its 30,000 inhabitants is situated near the tip of the peninsula. There are five health facilities in the Monkey Bay Health Zone and each has a defined catchment area. The government runs a community hospital in Monkey Bay and a health center in Nankumba. Both of these facilities provide service and medicine free of charge. The other three health centers (Nankhwali, Nkope and Malembo) are run by the Christian Health Association of Malawi (CHAM). At the CHAM health centers people pay for some of the services and drugs. The health centers are staffed with nurse-midwives and medical assistants. They have outpatient departments, facilities for deliveries but vary in their capability to admit patients.

### **Monkey Bay Community Hospital**

The Monkey Bay Community Hospital (MBCH) has two main roles. It provides primary health care to the residents in the catchment area of MBCH which comprises the town of Monkey Bay as well as the surrounding rural areas and towns. MBCH also receives patients who are referred from the other four health facilities in the Monkey Bay Health Zone. Like the health centers MBCH is staffed with nurse-midwives and medical assistants but in addition two clinical officers and a laboratory technician work there. The hospital has an outpatient department, a female ward, male ward, children's ward, maternity ward and a nursery for children one to 14 days old. The total number of inpatient beds is around 60; eight of them are in the maternity ward. There is a laboratory that can carry out simple tests such as measuring hemoglobin but it also has equipment to do transfusions and appropriate tests beforehand. An ambulance is stationed at MBCH. Its role is to transport patients to MBCH from health centers and homes as well as to escort patients who are referred to MDH. Mangochi is 45 minutes away from Monkey Bay. Currently there is no operating theatre at MBCH.

## **ICEIDA and the Monkey Bay Health Zone**

Since the year 2000 the *Icelandic International Development Agency* (ICEIDA) has supported health services in the area. The main goal of the project is to support Malawian authorities to implement their policy of improving health services in the Monkey Bay Health Zone<sup>20</sup>. Several things have been implemented in recent years to attain this goal. The construction of a new hospital building for MBCH was funded by ICEIDA as well as the installation of some equipment. Health professionals in the area have been supported to attend various training courses. Transport between the health facilities has been improved by purchasing motorbikes for health workers and an ambulance for patient referrals. Communication has been improved by installing telecommunication radios in the five health facilities in the area. Meetings with representatives from all parties involved in health care in the area have been held regularly to promote cooperation and flow of information. Among other things currently on the agenda is further training of staff, setting up a functioning operating theatre at MBCH and improving administration and the quality of the services provided.

## **Maternity Care at MBCH**

In the maternity ward antenatal care and delivery services are provided by midwives. Several aspects of the services relevant to this study need clarification. Information about previous deliveries, ANC visits of the current pregnancy and some other health related matters is registered onto so-called ANC cards that the mothers hold themselves, sometimes referred to as ANC-registration here. The ANC cards exist in several different forms: so-called health passports, exercise books and ANC sheets. At MBCH fundal palpation is used to estimate the gestational age during regular ANC visits and at admission for delivery. At MBCH it is a rule of thumb to discharge mothers home within 48 hours of delivery.

## **Maternal Care National Policy**

Several aspects of the national policy in maternal care are of importance for this study. Women are immunized with tetanus toxoid during ANC visits and other contacts with the health system following the 5-dose tetanus toxoid schedule<sup>21</sup>. It is optimal to reach five doses but it is considered adequate if two doses (TT2) are documented in the ANC card. For malaria prevention, all pregnant women should

receive two full treatment doses (3 tablets or 525 mg) of sulfadoxine-pyrimethamine (SP) at their first ANC visit after the 18th week and then again at 32 weeks<sup>22</sup>. Pregnant women should also be supplied with 90 tablets of ferrous sulphate and folic acid (200 mg + 0.5 mg)<sup>23</sup>. According to midwives at Monkey Bay all pregnant women should receive one treatment dose of albendazole (400 mg) for hookworms at their first ANC visit but this is not mentioned in the Malawi Essential Health Package (MEHP)\*. During pregnancy all women should be tested for syphilis with the VDRL-test<sup>23</sup>. According to the MEHP the national goal is to test the hemoglobin level of all pregnant women at least once during pregnancy and those with a hemoglobin value of less than 7 g/dl should be referred to a hospital for a transfusion<sup>23</sup>. All women should be given an oxytocic drug for active management of the third stage of labor<sup>23</sup>. During the study period the oxytocic drug used at MBCH was either ergometrine 0.5 mg + oxytocin 5 i.u. or oxytocin 10 i.u.

### **The Study Group**

The data presented in this report are part of a larger project that has three main components. First, data were collected on women who were admitted to the maternity ward at MBCH for delivery during the period 18<sup>th</sup> of March to the 17<sup>th</sup> of April 2005. Secondly, all available midwives at MBCH and other HC in the Monkey Bay Health Zone were interviewed on their attitude towards their working conditions (see Appendix 1). Lastly, before being discharged, thirteen mothers who gave birth at MBCH were interviewed on their experience of delivering at MBCH (see Appendix 2). In addition, statistics regarding maternal health during the period April 2004 to March 2005 were collected from records in the four other health facilities in the Monkey Bay Health Zone.

During the study period 116 women were admitted to the maternity ward at MBCH. For 21 of them the reason for admission was a problem related to pregnancy. Information was not gathered on these women. Data were collected for the remaining 95 women and this group can be divided into three subgroups: Women who gave birth at MBCH (n=68), women who came to MBCH but were referred to MDH before giving birth (n=21) and those admitted to MBCH with complications of deliveries that

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\* The government's health policy is outlined in the Malawi Essential Health Package (MEHP).

had taken place shortly before admission (n=6). This report concerns the 68 women who delivered at MBCH during the study period.

### **Data Collection**

The data that were collected can roughly be divided into four categories: Demography, past pregnancies, ANC of the current pregnancy and data on the present delivery. Data were collected onto a data sheet designed especially for this research project in collaboration with local health workers (see Appendix 3). The main sources of information were hospital files and the women's ANC cards but additional information that is not routinely registered in these was obtained by questioning. The sheets were mainly filled out by the author but with significant help from the midwives at MBCH.

### **Analysis**

Data were computerized using FileMaker Pro 5.5. For data analysis Microsoft Excel 2002 was used. The week of gestation at the first ANC visit was calculated when the date of this visit was available by using the date of delivery as a reference and assuming that the length of pregnancy was 38.6 weeks for all the women. The same method was used to calculate the week of gestation when hemoglobin was first measured. This analytical approach is based on the results of a study involving 1423 singleton deliveries in a rural hospital in Malawi where gestational age at delivery was estimated by a modified Ballard method which found that the average length of pregnancy was 38.6 weeks<sup>22</sup>.

### **Definitions**

The definitions of anemia and severe anemia during pregnancy used here are those of the WHO which defines anemia as a hemoglobin level of less than 11g/dl and considers it to be severe if it is less than 7 g/dl<sup>24</sup>. Furthermore, neonates are in this study considered to be premature if they are born in the 36<sup>th</sup> week or earlier and of low birthweight (LBW) if they are less than 2500 g at birth.

### **Measurements**

Weights of newborns and placentas were determined on a scale accurate to the nearest 100 g. Temperature was measured in the axilla with digital thermometers

accurate to 0.1°C. At MBCH fingerprick blood is used to measure hemoglobin concentration photometrically with a HemoControl hemoglobinometer (EKF diagnostic GmbH, Berleben, Germany).

### **Ethical Approval**

This study was approved in Malawi by the National Health Sciences Research Committee and the Malawian Ministry of Health and Population. It was also approved by ICEIDA and the Faculty of Medicine Post-Graduate Committee of the University of Iceland and conducted according to a special agreement between the ICEIDA and University of Iceland.

## RESULTS

### Characteristics of the Study Group

The demographic background of the 68 women who gave birth at MBCH during the study period is summarized in Table 1. Most came from the catchment area of MBCH and none came from the catchment area of the Nkope Health Center. Only one woman was registered as being referred to MBCH from a health center. Almost 60% of the women were Chewa and a quarter were Yao. Other ethnicities accounted for a much smaller share. The average age was 24.0 years (range 15-40). Just less than one third of the women were younger than 20 years of age but 4% were older than 35.

	n	%
<b>Residence in catchment area of (n = 67)</b>		
Monkey Bay	51	77
Nankhwali	7	10
Malembo	7	10
Nankumba	2	3
Nkope	0	0
<b>Ethnicity (n = 61)</b>		
Chewa	36	59
Yao	15	25
Tumbuka	3	5
Ngoni	3	5
Other	4	6
<b>Age (n = 67)</b>		
15 to 19	20	30
20 to 24	16	24
25 to 29	18	27
30 to 34	10	15
35+	3	4

**Table 1: Demographic background of the women who delivered at MBCH during the study period, March 18-April 17, 2005.**

The median number of pregnancies *per* woman was 2.5 but one woman had a parity of 7 which was the maximum. Primigravidas made up almost one third of the group (Table 2). The median age of primigravidas was 18 years (range 15-22). Table 2 also shows the number of children each women had alive. Of the 47 women who had given birth previously to the current pregnancy, eight had lost a child (17%). One of them had lost three children, another had lost two and six had lost one. Information on previous cesarean sections was available for 59 of the women and showed that 3% (n=2) had undergone cesarean sections in the past.

	Mothers	
	(n)	%
<b>Number of pregnancies</b>		
(n = 68)		
1	21	31
2 to 4	34	50
5+	13	19
<b>Children alive (n = 63)</b>		
none	23	36
1 to 3	30	48
4+	10	16

**Table 2: The distribution of the mothers with regard to their number of pregnancies and the number of children they had alive before the current delivery**

### Antenatal Care

All the women attended ANC at least once during pregnancy and presented some kind of ANC-registration when they were admitted to MBCH for delivery. On average the first attendance was during the 24<sup>th</sup> week of gestation and the median number of visits was four; 43% attended ANC more than four times.

Information on the type of ANC-registration held is incomplete for 15 out of the 68 delivering women. Analysis of the remaining 53 women reveals that the majority held so-called health passports as depicted in Table 3 which also presents the distribution of the number of ANC visits. Health passports include special sections intended for systematic registration of risk factors; this section was filled in 64% of cases.

	n	%
<b>ANC visits (n = 68)</b>		
1 or 2	10	15
3 or 4	29	42
5 or 6	21	31
7 or 8	8	12
<b>Registration (n = 53)</b>		
Health passport	33	62
Exercise book	15	28
ANC sheet	5	10

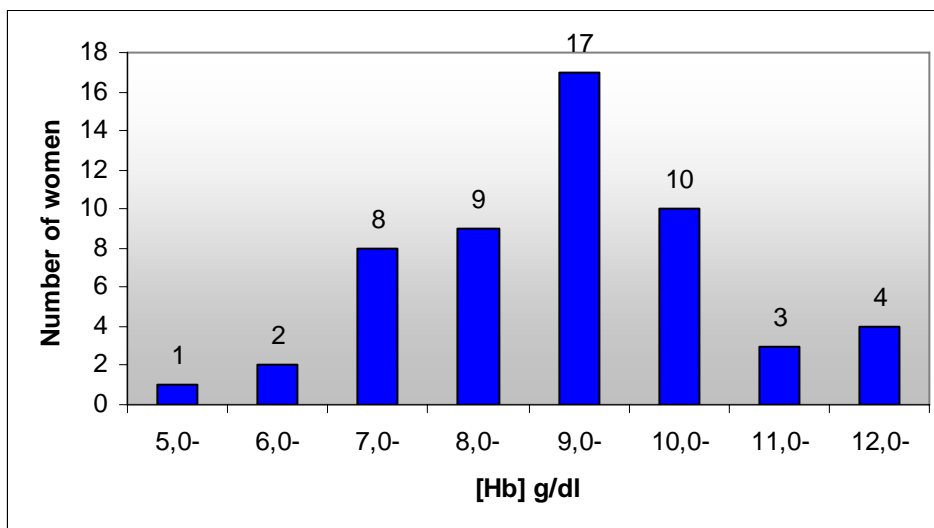
**Table 3: The distribution of the women in the study group with regard to how many times they attended ANC and the type of ANC-registration held**

Forty eight women (71%) were tested for syphilis with VDRL. Information about the result of the test and treatment given was not collected. Hemoglobin was tested for 54 of the women (79%) but most were tested only once (n = 51). Thus, the hemoglobin status of 14 women (21%) was never tested. Monkey Bay and Nkope are the only health centers in the Monkey Bay Health Zone where hemoglobin value can be determined. More than half of the women who never had their hemoglobin checked lived in the catchment area of MBCH (Table 4).

	n	%
Monkey Bay	8	58
Malembo	2	14
Nankumba	2	14
Nankhwali	2	14

**Table 4: Residence of women who did not have their hemoglobin level tested (n = 14)**

For the women who had their hemoglobin tested the average value of the first test was 9.4 g/dl (range 5.3-12.5). Forty-four (81%) were anemic (7.0 < Hb value < 11.0) and three (6%) were severely anemic (Hb value < 7.0). Figure 1 shows the distribution of hemoglobin values.



**Figure 1: Distribution of hemoglobin values for the first measurement of hemoglobin (n = 54)**

The date of the first hemoglobin test was available for 39 women and on average it was performed during the 29<sup>th</sup> week of pregnancy (range 19-39). The women who had their hemoglobin tested attended ANC on average for the first time in the 24<sup>th</sup>

week like the group as a whole. Table 5 shows how many times ANC had been attended when the first hemoglobin measurement was done.

	n	%
<b>Timing of hemoglobin testing</b>		
At 1 visit	16	41
Between 1 and 2 visit	2	5
At 2 visit	8	20
Between 2 and 3 visit	1	3
At 3 visit	7	18
Between 3 and 4 visit	0	0
At 4 visit	3	8
After 4 visit	2	5

**Table 5: The number of times ANC had been attended when the first hemoglobin measurement was done for the 39 women where the date of this event was available**

Only 2 women received a transfusion. Their hemoglobin values were 6.8 and 9.3 g/dl. Two other women who had a hemoglobin value under 7.0 g/dl did not get a transfusion.

Over 90% of the women received two doses of SP and likewise over 90% received at least 30 iron tablets (Table 6). On the other hand, the overwhelming majority did not receive albendazole for deworming. The TT2 status was adequate in about 4/5 of instances.

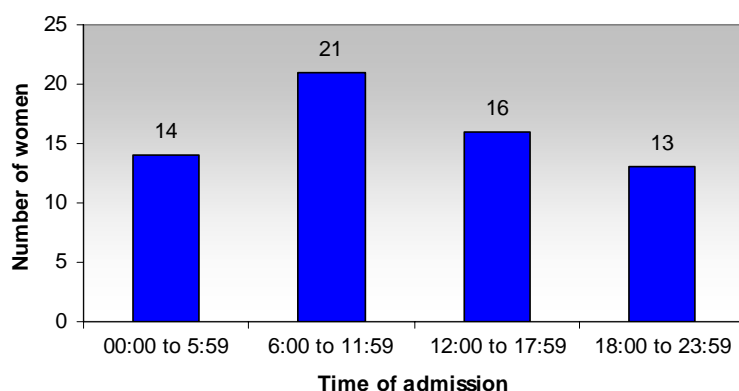
	n	%
<b>SP2 (n = 67)</b>		
2 x 3 tablets given	63	94
Inadequate	4	6
<b>Iron (n = 66)</b>		
Given at least once	61	92
Never given	5	8
<b>Deworming (n = 67)</b>		
Given	2	3
Not given	65	97
<b>TT2 (n = 67)</b>		
Adequate	54	81
Inadequate	13	19

**Table 6: Treatment and vaccination that the women in the study group received during their pregnancy**

### **Admission for Delivery**

The median and also most frequent number of admissions to the maternity ward at MBCH *per day* was two (range 0-6). Figure 2 shows the time of admission divided into four six hour intervals beginning at midnight. One third of the women were

admitted between six o'clock in the morning and noon. The registered time of admission does not necessarily represent the time when a women arrived at the hospital but rather the time when she was taken to the delivery room.



**Figure 2: Distribution of the time of admission for delivery**

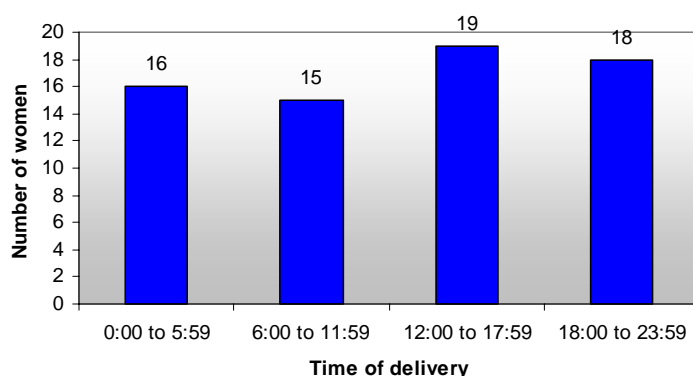
The registration of the findings of examination on arrival is summarized in Table 8. No component of the examination was registered for all the women. The items most frequently missing were temperature and blood pressure, both missing for about a third of the women. The items registered most frequently were the findings of examination for odema and anemia, missing for only 15% of the women. Only two women were registered as anemic following examination on arrival. According to fundal palpation on admission the median gestational age was 36 weeks (range 30-40) and over half of the women (55%) delivered preterm, that is had a gestational age of 36 weeks or less. On admission women are questioned about the use of traditional oxytocic medicines. Four out of 53 women admitted that they had used such a medicine.

	n	%
Blood pressure	46	68
Temperature	44	65
Preeclampsia	54	79
Anemia	58	85
Odema	58	85
Presentation	56	82
Fundal palpation	56	82

**Table 7: Registration of the results of examination carried out on admission for delivery**  
Various components of the examination and the number of women that they were registered for.

## Delivery

The median number of deliveries *per day* was two (range 0-7). The mode value was one delivery *per day* for a total of eight days and no women delivered in a total of six days during the research period but on one occasion there were 7 deliveries in the same day. Almost half of the women (46%, n=31) were registered as already being in the second stage of labor on admission. Figure 3 shows the distribution of the women with regard to the time of day when delivery occurred.



**Figure 3: Distribution of the time of day when delivery occurred**

All deliveries during the study period were singleton with outcomes as shown in Table 8. In four deliveries the outcome was stillbirth, in two of these cases the presentation was breech and in the third the mother had been diagnosed with syphilis during pregnancy. Nothing abnormal could be found in the antenatal history of the fourth mother. Stillbirths are omitted from subsequent analyses that regard newborns. Twenty four of the children were girls (38%) but 40 boys (62%).

	n	%
<b>Outcome (n = 68)</b>		
Fullterm	61	90
Preterm	3	4
Stillbirth	4	6
<b>One minute Apgar score (n = 64)</b>		
≤6	2	3
7	1	1
8	19	30
9	42	66
<b>Five minute Apgar score (n = 64)</b>		
8	1	2
10	63	98

**Table 8: Outcome of delivery and Apgar scores for live births**

Birthweight was available for all newborns while length and head circumference were only available for 42 and 44 neonates, respectively (Table 9). The average birthweight was 3056 g (range 1900-4200). The average birthweights of males and females were 3113 g (range 1900-4200) and 2963 g (range 1900-3500), respectively.

	Girls	%	Boys	%	Total	%
<b>Weight in g</b>						
< 2500	2	8	4	10	6	9
2500 to 2999	9	38	6	15	15	24
3000 to 3499	9	38	20	50	29	45
3500 to 3499	4	16	9	22	13	20
≥ 3500	0	0	1	3	1	2
Total	24		40		64	
<b>Length in cm</b>						
< 48	6	33	4	17	10	24
48 to 51	7	39	17	71	24	57
≥ 52	5	28	3	12	8	19
Total	18		24		42	
<b>Head circumference in cm</b>						
< 32	2	11	2	8	4	9
32 to 35	13	68	19	76	32	73
≥ 36	4	21	4	16	8	18
Total	19		25		44	

**Table 9: Distribution of birthweight, length and head circumference by sex**  
(stillbirths are omitted)

### Third Stage of Labor

All women were given an ergometrine or oxytocin injection after delivery. The blood loss was estimated for all except one woman. The median quantity of estimated blood loss was 100 ml (range 50-200). The most frequently made estimations were 100 ml (n=36) and 150 ml (n=15).

The median weight of the 26 weighed placentas was 400 g (range 300-550). The condition of 64 placentas was reported. Five placentas were abnormal: two were rugged, one had an extra lobe, one had white patches and one was said unhealthy without further specification. Other placentas were judged to be healthy.

Following 65 deliveries the condition of the perineum was reported. Most often the perineum was intact (n=49, 75%) but it was torn in 13 instances (20%) and three times (5%) an episiotomy had been done. All the perineal tears were sutured.

## Breastfeeding Practices

Information regarding breastfeeding after birth was lacking in many cases. All women for whom data was available initiated breastfeeding within one hour of delivery except one and all were breastfeeding on discharge. During their stay in MBCH two neonates (4%) were given something else than breastmilk. One received an alcohol containing spasmolytic medication brought in and administered by the mother but it was not specified what the other one had been given.

	n	%
<b>Did breastfeeding begin within 1 hour of delivery (n = 59)</b>		
yes	58	98
no	1	2
<b>Was the mother breastfeeding on discharge (n = 54)</b>		
yes	54	100
no	0	0
<b>Did the baby have anything else than breastmilk while staying at MBCH (n = 46)</b>		
yes	2	4
no	44	96

**Table 10: Breastfeeding practices during the stay at MBCH: initiation, status on discharge and introduction of complementary foods**

## Disposition

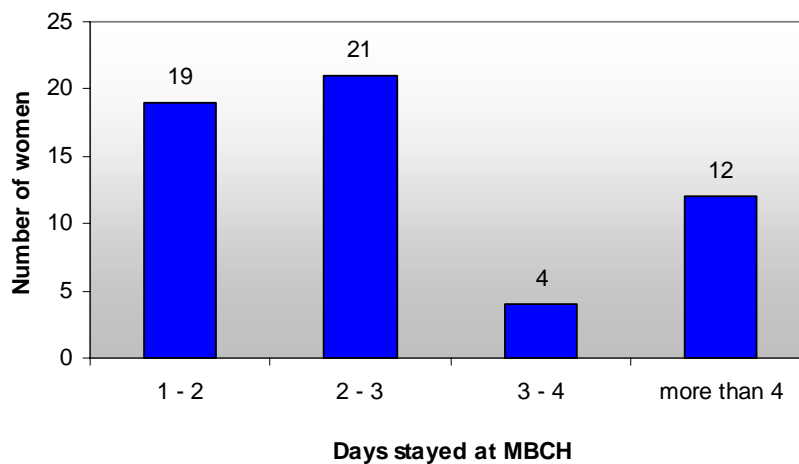
The median number of discharges *per day* was one which was also the most frequent value. On seven days no one was discharged; the maximum of eight discharges during one day was reached once. The time of discharge was registered for 61 women. All were discharged between 8:00 and 16:00. Only six (10%) were discharged after twelve o'clock. On discharge, the blood pressure of 24 women (35%) was not taken and registered. The temperature of 59 neonates (92%) was taken on discharge (Table 10); the median temperature was 37.0°C (range 36-38.4).

	n	%
<b>Temperature in °C</b>		
<36.5	15	25
35.5 to 37.4	30	51
37.5 to 38.4	14	24

**Table 11: Temperature of neonate at discharge (n = 59)**

Forty-nine of the neonates (77%) were weighed on discharge and for them it was possible to calculate how much their weight had changed from birth to discharge. About 2/3 gained weight while staying at MBCH. For the 17 infants who had lost weight the median loss was 200 g (range 100-700); two infants lost more than 500 g.

The length of stay at MBCH could be calculated for 56 women. Almost 3/4 of them stayed at MBCH for less than 3 days. The average time elapsing from admission to discharge was 3 days and 4 hours. The shortest duration of stay was 26 hours and the maximum 10 days. Twelve women stayed longer than four days. Eleven of them had babies who were admitted to the nursery with fever and this caused the delay of discharge. On average these women stayed at MBCH for seven days (range 4-10). One of the women who stayed longer than four days did so because her infant was prematurely born. When looking only at the women with no special problems the average time of stay was two days and three hours (range 26 hours to 3 days and 14 hours).



**Figure 4: Length of time the mothers stay at MBCH (n = 56)**

## DISCUSSION

The present study describes health services provided to women who delivered at the Monkey Bay Community Hospital, a primary health care facility in rural Malawi. ICEIDA has supported the health services in the area since the year 2000 in several ways such as by improving physical structures, transport and communications between the health care facilities as well as by strengthening human resource capacity

through training. Some aspects of the services proved to be satisfactory such as the distribution of malaria prophylaxis and administration of oxytocic drugs during delivery. Other services such as tetanus immunizations, syphilis screening, transfusions and hemoglobin measurements are not utilized to their full potential. The registration of health data, in particular at admission to MBCH, can be improved. In some cases relatively simple measures might be sufficient to improve the quality of the services.

### **Where Do the Women Come From?**

About  $\frac{3}{4}$  of the women who delivered at the MBCH, during the study period, resided in its catchment area. This is not unexpected since MBCH provides primary health care to the residents of this area. Yet, taking into consideration the role of MBCH as a referral hospital for this area, it is surprising that only one woman was actually referred for delivery at MBCH from a health center in the area. This can be explained either by incomplete registration or alternatively that MBCH is not properly functioning as the referral unit it is intended to be. If the latter is true then the women who did come from other catchment areas came on their own without being referred, possibly seeking service that is free of charge. But this gives reason to ask what happens to the women who experience problems during delivery at the health centers? In its current state of functionality MBCH does not have much more to offer to women in labor than the health centers in the area. Consequently health workers and women alike may for practical reasons see it as most economical to bypass MBCH and go directly to MDH, where the highest level of service in the region is provided, including cesarean sections.

During the study period no women from the catchment area of Nkope were admitted for delivery at MBCH. Although this could be a mere coincidence it is tempting to come up with an explanation based on the geographical relationship of Nkope, Monkey Bay and Mangochi and the different levels of service provided in these facilities. Nkope is a CHAM facility situated by the road between MBCH and MDH. If a woman living in the catchment area of Nkope decides to deliver in a government facility, where services are free of charge, she can go to either MBCH or MDH. If she goes to MBCH and a problem comes up she will most likely be sent to MDH and consequently has to travel back the same way as she came. Therefore, under the current circumstances the referral hierarchy in the area is not practical for a

woman living in Nkope and to her it probably seems more logical to go directly to MDH rather than to MBCH.

Women from the catchment areas of Nankumba, Malembo and Nankhwali came for delivery at MBCH during the study period. It is probably more convenient for them to follow the referral hierarchy as MBCH is situated between MDH and these health centers.

### **General Characteristics**

The 24.0 years average age of mothers is not far from the 24.9 years found in a community-based study conducted by Fjalldal in the Monkey Bay Health Zone in the year 2003<sup>25</sup>. The mean age of primigravidas in the study population was found to be 18.0 years as compared to about 19.0 years in the southern region of Malawi according to the MDHS<sup>16</sup>. Primigravidas made up 31% of the study population; Fjalldal found in the year 2003 that 21% of pregnant women in the Monkey Bay Health Zone were primigravidas<sup>25</sup>. This can possibly be taken as evidence of success in encouraging primigravidas to deliver in health facilities. However, it may also indicate that multipara women prefer to deliver at home.

Just less than 1/5 of the women who had delivered before had lost a child. Large families are favored in Malawi<sup>26</sup> and therefore loss of children may lead to further pregnancies which add to the burden of mothers who already have a high lifetime risk of dying from pregnancy related complications.

### **Antenatal Care**

In Malawi it is recommended that women attend ANC four times during pregnancy<sup>16</sup>. All the women attended ANC at least once, the median number of ANC visits was 4 and only 15% attended ANC less than three times. This good ANC attendance is in line with findings of a previous study in the Monkey Bay Health Zone<sup>25</sup> as well as findings at the national level<sup>16</sup>. On average the first ANC attendance was after about 6.0 months of gestation which is identical to what the MDHS found for women living in rural areas but in disagreement with the recommendation in Malawi that women should first attend ANC during the first trimester<sup>16</sup>. It is interesting that 43% of the women attended ANC more than four times because current knowledge suggests that in low-risk pregnancies there is no significant benefit associated with using an ANC model with more than four visits during pregnancy<sup>27</sup>.

Therefore, in low-risk pregnancies visits in excess of four can be viewed as undesirable because they do put increased strain on the limited resources available.

All the women presented some kind of ANC-registration. Twenty-five percent of the women in Fjalldal's community-based study possessed health passports<sup>25</sup> compared to 62% in the current study population. In recent years the health passports have been strongly advocated by health workers and these findings can be viewed as an indication that these efforts have led to some success although the study populations are not fully comparable.

The risk sections in the health passports were filled out in less than 2/3 of the cases. Antenatal care registration routines need to be improved. However, proper registration is not facilitated by the heavy workload midwives face during ANC particularly on Mondays and Tuesdays when the ANC sessions are overfull. Thus, distributing visits more evenly throughout the week might make it possible to give better attention to each pregnant woman.

It was not feasible to collect information on where ANC was attended. Since a quarter of the women resided outside the catchment area of MBCH some women probably attended ANC at other health centers. This should be born in mind in the ensuing discussion on services provided during ANC visits.

### **Anemia**

Maternal anemia during pregnancy has been related to increased risk of adverse pregnancy outcomes such as premature labor and low birthweight<sup>28</sup> as well as stillbirth<sup>2</sup>. In addition, severe anemia increases the risk of maternal death but the connection between moderate anemia and maternal death is more obscure<sup>29</sup>. It is estimated that about one half of pregnant women in developing countries are anemic<sup>24</sup>. A study from the year 2000 involving 2728 pregnant women in rural Malawi showed that 72% were anemic (Hb < 11.0 g/dl) and 4% were severely anemic (Hb < 7.0 g/dl)<sup>30</sup>. The corresponding numbers found in this study, 81% and 6%, respectively, are not far off. The prevalence of anemia in these two populations is higher than in developing countries in general but similar to the neighboring countries on the continent<sup>30</sup>.

Blood testing is the preferred method for the detection of anemia. The WHO recommends that the hemoglobin level of all pregnant women should be tested during their first ANC visit<sup>31</sup>. The MEHP sets forth the aim of testing the hemoglobin level

of all pregnant women<sup>16</sup>. The 79% coverage observed in this study does not fully attain this goal but is much higher than the average coverage of 26% reported in Mangochi district<sup>16</sup>. The women who did not have their hemoglobin checked do not seem to be more likely to live in the catchment areas of health centers that do not have facilities for hemoglobin testing. On average the first attendance to ANC was during the 24<sup>th</sup> week and this obviously sets limits to how early the first hemoglobin test can be taken but on average the first test was taken 5 weeks later and the testing was done during the first ANC visit in only 41% of cases. It is desirable to measure hemoglobin as early in pregnancy as possible but it has to be considered that the laboratory services at MBCH depend on only one laboratory technician.

### **Iron Supplementation**

Maternal anemia in low-income countries has multifactorial causes but iron deficiency has traditionally been considered the most important one<sup>32</sup>. It is clear that iron supplementation during pregnancy reduces the likelihood of anemia during late pregnancy but no evidence exists that supplementation improves maternal or neonatal outcomes<sup>29,33</sup>. This has been blamed on non-compliant pregnant women simply not taking their iron tablets. Yet, recent work suggests that the problem is more complex and that iron supplementation alone will not provide the solution<sup>34</sup>. In addition, it has been pointed out that with good obstetric care most anemia-related maternal deaths are preventable<sup>35</sup>. Nevertheless, it is considered good practice to provide all pregnant women with iron and folate supplementation<sup>8</sup>. Guidelines from the International Nutritional Anemia Consultative Group (INACG) recommend that pregnant women in developing countries should receive daily supplements of iron and folate for 6 months<sup>36</sup>. In Malawi it is recommended for women to take iron supplements for at least 90 days during pregnancy. In the present study population 92% of the women got at least 30 iron tablets. The MDHS found that iron supplements were provided to mothers for 70% of recent births<sup>16</sup>. Information on whether women got the recommended 90 tablets was not collected, but according to the MDHS only 10.4% of pregnant women in Mangochi district receive the 90 recommended iron tablets.

### **Transfusions**

The only intervention directed against maternal anemia that has been shown to improve maternal and neonatal outcome is blood transfusion for women with very

low hemoglobin<sup>29</sup>. In Malawi blood transfusion is indicated for pregnant women confirmed to have Hb < 7 g/dl<sup>23</sup>. Two of the three women in the study group who had a hemoglobin value below this cut-off point did not get a transfusion. Here it is possible to utilize better the facilities that are already in place but again the lack of staff is an obstacle because the hospital's only laboratory technician needs to be available for transfusions to be performed.

### **Hookworms**

Hookworms can lead to anemia by causing intestinal bleedings<sup>29</sup>. Where hookworms are endemic the INACG recommends that all women should be given antihelminthic treatment<sup>36</sup>. A single dose (400 mg) of albendazole during the first ANC visit in the second trimester has been shown to augment the positive effect iron supplementation has on hemoglobin value<sup>37</sup>. Antihelminthic treatment for pregnant women is not mentioned in the MEHP but according to the staff at MBCH all women should receive one dose of albendazole at their first ANC visit. Only two women in the study population received albendazole. It is difficult to determine the significance of this finding as information on the policy is conflicting. Further, a study on the etiology of anemia in pregnant women in Blantyre by van den Broek *et al.* concluded that hookworms were unlikely to contribute significantly to the presence of anemia in their study population<sup>34</sup>.

### **Malaria**

Malaria in pregnancy increases the risk of anemia<sup>38</sup>, low birthweight<sup>38</sup> (both through preterm delivery and intrauterine growth retardation), spontaneous abortion and stillbirth<sup>2</sup>. Malaria is endemic in Malawi and studies have reported a prevalence of 19% to 65%<sup>38</sup> among pregnant women. Providing malaria prophylaxis to pregnant women by giving a full therapeutic dose of sulfadoxine-pyrimethamine twice during pregnancy is referred to as intermittent preventive treatment. This reduces the risk of maternal anemia<sup>39</sup> and low birthweight<sup>40</sup>. In Malawi it is the national policy to provide malaria protection to pregnant women with intermittent preventive treatment<sup>22</sup>. Three studies in Malawi have reported the coverage of the recommended two doses of SP to be 29.3%<sup>16</sup>, 30%<sup>40</sup> and 36.8%<sup>41</sup>. In the current study the coverage was 94%.

Why is the coverage so much higher than has been observed in other studies? Two of the aforementioned studies are population-based and women who deliver outside health care facilities might be expected to be less likely to receive the recommended two doses of SP than those who deliver in health care facilities. But, it is unlikely that this is the only explanation as the study that reported a coverage of 30% was a hospital-based study although the study population was an urban one. As the ANC attendance was good in all the three study groups as well as in the current one the observed difference might lie in better availability of SP at MBCH. The results might also reflect that mothers and health workers in this area give high priority to preventing malaria and its consequences. Whatever the explanation for the high coverage is, midwives should be encouraged to continue practice along the same line.

### **Tetanus Immunization**

In the year 2000 tetanus was estimated to be responsible for 200,000 neonatal deaths in the world which amounts to 5% of neonatal mortality<sup>42</sup>. In addition 30,000 maternal deaths are attributed to tetanus annually<sup>42</sup>. Neonatal and maternal tetanus are both preventable by immunization with tetanus toxoid. In Malawi a written record of receiving two doses of tetanus toxoid is considered adequate but the aim is for women to receive five doses.

A survey conducted in 2002 concluded that neonatal tetanus has been eliminated in Malawi<sup>21</sup>. The same survey found that 84% of pregnant women had received at least two doses of tetanus toxoid which is similar to the 81% coverage observed in this study. It is probable that coverage in the current study group is an underestimate because women who have lost the written account of their immunizations are considered to be unimmunized. The observed coverage is encouraging as a high coverage is vitally important in order to ensure that elimination of neonatal tetanus is maintained. Indeed the national goal for coverage of maternal tetanus immunization is 100%<sup>23</sup>.

### **Syphilis**

A study conducted by McDermott *et al.* in Mangochi District found that syphilis infection during pregnancy greatly increased the risk of fetal death, stillbirth and neonatal death<sup>43</sup>. In addition congenital syphilis can cause serious sequelae and malformations<sup>44</sup>. Further, McDermott *et al.* found that the prevalence of active

syphilis during pregnancy in Mangochi District was 3.6% during the years 1987 to 1990. Treatment with penicillin effectively improves pregnancy outcomes<sup>45</sup>. The main problem is to identify women with syphilis but researchers agree that in order to prevent the mortality and morbidity caused by syphilis it is a better option to screen all pregnant women during their first ANC visit rather than only those with risk factors<sup>43,44</sup>. Seventy-one percent of the women in the study group were screened for syphilis with the VDRL-test. This is an encouraging finding for the health services in the Monkey Bay area since the national coverage is only 30%, but in line with national goals the aim should be to test all women<sup>16</sup>.

One of the women who had a stillbirth had syphilis diagnosed during pregnancy. Although nothing can be asserted as to the cause of the stillbirth, untreated syphilis during pregnancy increases the risk of stillbirth by a factor of ten<sup>43</sup> and despite appropriate treatment an adverse outcome is experienced in up to 14% of cases<sup>45</sup>.

### **Admission for Delivery**

One important result of this study is the lack of information on the situation of women who are admitted for delivery. It is urgent to improve the registration of the findings of examination on admission for delivery. From the present data it can not be determined whether lack of registration is due to failure to examine altogether or only to lack of routine and follow-up on registration. In any case a shortage of staff is likely to be one important culprit. It might be added that during a visit to MDH a clinical officer complained that often little information on work-up comes along with labouring women who have been referred from MBCH to MDH and the reason for referral is often missing as well.

Clinical diagnosis is considered to be a poor predictor of anemia<sup>46</sup>. This claim harmonies well with the results of only two women being registered as anemic following examination on arrival although hemoglobin analysis earlier in pregnancy showed that 81% of the women were anemic.

### **Delivery**

Almost half of the women were registered as being seen in the second stage of labor. Sometimes this was the case as they did not come to the hospital earlier; yet in other instances the women had been at the hospital for some time but were not attended to by a midwife until the delivery had progressed into the second stage.

The outcome of four pregnancies was stillbirth. In two instances the presentation was breech which carries a higher risk of perinatal mortality than cephalic presentation<sup>47</sup>. Possibly these children could have been saved if facilities for cesarean section had been available at MBCH. This finding, as well as the fact that the majority of the women who were referred to MDH were referred because of an impending cesarean section (data not shown), indicates a real need for such an up-grading of services in Monkey Bay. It is currently on the ICEIDA agenda to build an operation theatre at MBCH.

Low birthweight is an important contributor to neonatal death<sup>10</sup>. More than half of babies born in the developing world are not weighed at birth<sup>48</sup> which unfortunately corresponds well with only 53% of newborn babies being weighed in Malawi<sup>16</sup>. All infants born during the study period were weighed at birth. This is not surprising since babies delivered by health workers can be expected to be more likely to be weighed than those delivered by traditional birth attendants or at home. Nevertheless this is a positive finding and a practice that should be encouraged to continue.

Nine percent of the babies had a low birthweight (< 2500g) which is much lower than the national estimate of 16%<sup>48</sup>. Overall the median birthweight was 3056 g, somewhat higher than the 2818 g found in a hospital-based study in rural Malawi<sup>22</sup>. Low birthweight can result from intrauterine growth retardation as well as preterm birth. According to fundal palpation the median gestational age at delivery was 36 weeks. This is surprisingly low in light of the good birthweight registered. Verhoeff *et al.* constructed smoothed birth-weight-for-gestational-age curves for Malawian newborns. According to these curves the overall median birthweight at 36 weeks should be 2649 g which is much lower than the median birthweight found in the current study population<sup>22</sup>. These findings suggest that fundal palpation does not provide a reliable estimate of gestational age.

### **Third Stage of Labor**

A quarter of all maternal deaths are due to postpartum hemorrhage (PPH) which makes it the most common cause of maternal mortality<sup>2</sup>. Active management of the third stage of labor consists of administering an oxytocic drug within 1 minute of the baby being born, clamping and cutting the umbilical cord soon after birth and applying controlled downward tension on the umbilical cord<sup>49</sup>. Active management of the third stage of labor reduces the risk of PPH compared to physiological

management; administration of an oxytocic drug is the component that has the greatest effect in preventing PPH<sup>49</sup>. In light of the importance of administering oxytocic drugs during the third stage it is a positive finding that all the women received an injection of ergometrine or oxytocin.

### **Breastfeeding Practices**

Breastfeeding is an efficient and effective way to reduce neonatal mortality<sup>11</sup>. Health workers in Malawi advocate exclusive breastfeeding for the first six months of life. The results of this study indicate that breastfeeding started off well. All the women except one (98%) initiated breastfeeding within an hour of delivery but on the national level only 74.6%<sup>16</sup> of women who receive assistance of a health professional during delivery initiate breastfeeding within an hour. At discharge all the women were breastfeeding and only two neonates had been given something else than breastmilk. These are positive results but it must be taken into account that they are subject to a certain bias as the information was collected by midwives, either directly or indirectly through translation, and they also advocate exclusive breastfeeding. The results only reflect the very beginning of breastfeeding but the MDHS has found that only 63%<sup>16</sup> of children under 4 months of age are breastfed exclusively. A study carried out in the Lungwena area in Mangochi district showed even less encouraging results; at the age of one month only 19% of children were exclusively breastfed and none at the age of 4 months<sup>50</sup>. Ways to improve the continuation of breastfeeding need to be sought.

### **Discharge**

It would be desirable to weigh and take the temperature of all children on discharge. Weight at birth is a good indicator to follow when monitoring the health of the child during the hospital stay and a good starting point for subsequent child health surveillance. Further, the blood pressure of all women should be measured before discharge.

### **Limitations of the study**

The main weakness of this study is the small size of the study population. Although data were collected on all the women who delivered during a one month period at MBCH still only 68 were enrolled. Therefore conclusions must be drawn with caution. It was not possible to add women retrospectively to the study population

for two main reasons: Insufficient time and because some of the data could only be collected while the women stayed at MBCH such as that obtained from ANC cards and with questioning. It might influence the results that during the study period five medical assistant students were in training at MBCH and they took on some of the duties of the midwives.

## **Conclusion**

Some aspects of the maternity services provided by MBCH proved to be acceptable. All women were given an oxytocic drug during delivery, all children were weighed at birth, breastfeeding started off well and the coverage of malaria prophylaxis during pregnancy was excellent. Further, it seems that more women have health passports than two years ago. The results may also suggest that primigravidas are more likely to deliver in the hospital than elsewhere, which is encouraging.

Some services intended for pregnant women are not utilized to their full potential. This applies to tetanus toxoid immunization, VDRL testing and transfusions. Further, considering the high prevalence of anemia it is desirable to measure hemoglobin levels sooner in pregnancy and increase their coverage of such services.

Registration routines for health information can be improved. This applies in particular to the findings of examination on arrival to MBCH and the registration of risk factors in health passports. The proportion of women seen in the second stage of labor needs to be lowered.

The failure of registration and incomplete coverage of services can probably to some extent be attributed to lack of motivation among midwives and a shortage of staff. During the study period four midwives ran the 24 hour service in the maternity ward. All too often the youngest members of staff do not receive full payment for many months after they start working. To provide high quality service it is necessary to have adequate manpower that is fully motivated. Without proper salaries that arrive on time, this will be difficult to achieve.

Although the data presented here do not allow a thorough evaluation of the costs and benefits of offering cesarean sections at MBCH some of the results indicate that the need for such a service exists. If the procedure had been available during the study period fewer women would have been referred to MDH and possibly two stillbirths could have been averted. In addition MBCH does not seem to fully function as the referral unit it is intended to be. The hospital would probably be better capable of

standing up to such a role if cesarean sections were made available and laboratory services were improved as well. Such services are also in line with the Millennium Development Goals to support activities that aim to lower maternal and neonatal mortality rates in the long run.

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# APPENDIX 1

## Opinion of Midwives Collaboration of ICEIDA/MBCH and the Medical Faculty of Iceland

ID  Health center  Date of interview

### General information

Age  Sex  Profession   
Year of graduation  Been working at this health center since

### Working conditions

Are you satisfied or not satisfied with the delivery room? Why?

Are you satisfied or not satisfied with the delivery bed in the HC? Why?

Are you satisfied or not satisfied with the sanitation in the delivery room? Why?

Do you use analgesics for deliveries, if yes wich ones?

What analgesics are usually available at your HC?

Are the following available at your health center:

Cord clamps  yes  no

Comments on cord clamps

## Opinion of Midwives

Collaboration of ICEIDA/MBCH and the Medical Faculty of Iceland

Gloves  yes  no

Comments on gloves

Sutures  yes  no

Comments on sutures

Syringes  yes  no

Comments on syringes

Needles  yes  no

Comments on needles

Forceps  yes  no

Comments on forceps

Does the sterilization unit function?  yes  no

What is most positive about working conditions/workplace?

## Opinion of Midwives

Collaboration of ICEIDA/MBCH and the Medical Faculty of Iceland

What is most negative about working conditions/workplace?

Other opinion

Comments

## APPENDIX 2

### Opinion of Delivering Mothers Collaboration of ICEIDA/MBCH and the Medical Faculty of Iceland

ID  MBCH nr  MBCH year  Date of interview

Why did you decide to deliver at MBCH?

Is it better to delivery at the hospital than at home?

How where you received and treated by the personnel? Were you happy with the way you were recieved?

Did the midwife introduce herself?

Do you know the name of the midwife that delivered the baby?

Midwife who delivered baby

**Opinion of Delivering Mothers**  
Collaboration of ICEIDA/MBCH and the Medical Faculty of Iceland

Did you always have a bed while staying at MBCH, if not at what point of time didn't you have a bed?

If assigned to the floor, what do you think about it?

Who was with you during labour? If alone how did you feel when you were alone?

Who delivered

midwife  cleaner  alone  aunt  midwife and cleaner

Was the person who was with you helpful?

What was positive about delivering at MBCH?

**Opinion of Delivering Mothers**  
Collaboration of ICEIDA/MBCH and the Medical Faculty of Iceland

What was negative by delivering at MBCH?

How was the treatment of the child? Where your happy with the treatment the child got?

Do you have any recommendations for improvement?

Would you recommend MBCH to friends?

Will you come here again to deliver? (and reasoning for answer)

Have you used home made medicines?

## APPENDIX 3

### General information on mother

ID	Number of ANC visits	MBCH Nr.	MBCH year
Village		Health center area	
Ethnicity <input type="radio"/> Chewa <input type="radio"/> Yao <input type="radio"/> Ntonga <input type="radio"/> Tumbuka <input type="radio"/> Nkhonde <input type="radio"/> Other, ...			
Other Tribe			
Age	Gravida	Para	Alive

### Pregnancy

LMP	EDD	Information on LMP og EDD comes from	<input type="radio"/> Partogram	<input type="radio"/> Form
Form of ANC registration			<input type="radio"/> ANC registration	
Health passport	<input type="radio"/> yes <input type="radio"/> no	ANC sheet	<input type="radio"/> yes <input type="radio"/> no	Exercise book
				<input type="radio"/> yes <input type="radio"/> no
No registration	<input type="radio"/> yes <input type="radio"/> no	Form inapplicable	<input type="radio"/> yes <input type="radio"/> no	Other, ...
Dates for ANC				
I	II	III	IV	
V	VI	VII	VIII	
IX				
High risk classification		Risk factors registered in ANC card	<input type="radio"/> yes	<input type="radio"/> no
I	II			
III	IV			
Previous C sectio	<input type="radio"/> yes <input type="radio"/> no	Problems this pregnancy		
Haemoglobin analysis	Date I	Hb1	Date II	Hb2
				Date III
				Hb3
VDRL	<input type="radio"/> yes <input type="radio"/> no	SP2	<input type="radio"/> yes <input type="radio"/> no	TT2
				<input type="radio"/> yes <input type="radio"/> no
Transfusion	<input type="radio"/> yes <input type="radio"/> no	Iron	<input type="radio"/> yes <input type="radio"/> no	Deworming
				<input type="radio"/> yes <input type="radio"/> no

### Admission

SSS	<input type="radio"/> yes <input type="radio"/> no
Admission hour	Admission date
	BP syst
	Diastol
Onset hour	Onset date
	Temp
Onset	<input type="radio"/> Am hours <input type="radio"/> Pm hours
Membranes ruptured on arrival	<input type="radio"/> yes <input type="radio"/> no
Home made medicines	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> ?
Preclampsia	<input type="radio"/> yes <input type="radio"/> no
Height	Information on height comes from:
	<input type="radio"/> Partogram <input type="radio"/> ANC registration <input type="radio"/> Form
Anemia	<input type="radio"/> yes <input type="radio"/> no
Oedema	<input type="radio"/> yes <input type="radio"/> no
Fundus	
Presentation	<input type="radio"/> cephalic <input type="radio"/> breech
	<input type="radio"/> transverse <input type="radio"/> other, ...

### Referral

Referral to MBCH from	<input type="radio"/> TBA	<input type="radio"/> HC	What HC	<input type="text"/>
Reason for referral	<input type="radio"/> 1st pregnancy	<input type="radio"/> Preeclampsia	<input type="radio"/> Retention of placenta	<input type="radio"/> Bleeding after delivery
	<input type="radio"/> Para 5-	<input type="radio"/> Prolonged labour	<input type="radio"/> Bleeding before delivery	<input type="radio"/> Other, ...
Referral from MBCH				
Date	<input type="text"/>	hour	<input type="text"/>	Place <input type="radio"/> Mangochi
Reason for referral text	<input type="text"/>			
	<input type="radio"/> 1st pregnancy	<input type="radio"/> Preeclampsia	<input type="radio"/> Retention of placenta	<input type="radio"/> Bleeding after delivery
	<input type="radio"/> Para 5-	<input type="radio"/> Prolonged labour	<input type="radio"/> Bleeding before delivery	<input type="radio"/> Other, ...

### 2nd Stage Labour

Delivery date	<input type="text"/>	Delivery hour	<input type="text"/>	Multiple	<input type="radio"/> yes	<input type="radio"/> no
Apgar 1 min	<input type="text"/>	5 min	<input type="text"/>	Outcome	<input type="radio"/> Live fullterm	<input type="radio"/> Macerated still birth
					<input type="radio"/> Live preterm	<input type="radio"/> perinatal death
					<input type="radio"/> Still birth	
Sex	<input type="radio"/> Male					
	<input type="radio"/> Female					
Anomalies of baby	<input type="text"/>					
Weight	<input type="text"/>	Length	<input type="text"/>	Head circumf.	<input type="text"/>	

### 3rd Stage Labour

Placenta delivery hour	<input type="text"/>	date	<input type="text"/>	Ergometrine	<input type="radio"/> yes	<input type="radio"/> no	Blood loss	<input type="text"/>
Placenta weight	<input type="text"/>	Placenta condition	<input type="text"/>	Perineum	<input type="radio"/> intact	<input type="radio"/> episiotomy	<input type="radio"/> other	
					<input type="radio"/> teared	<input type="radio"/> cracks		

### Nursery

Nursery	<input type="radio"/> yes	<input type="radio"/> no	Nursery admission date	<input type="text"/>
Admission hour	<input type="text"/>	Admission Nr.	<input type="text"/>	
Reason for admission	<input type="text"/>			

### Discharge of mother

Date	<input type="text"/>	Hour	<input type="text"/>	BP syst	<input type="text"/>	BP diastol	<input type="text"/>
If mother stayed for much more than 48 hours at MBCH please specify reason:							
<input type="radio"/> Fever	<input type="radio"/> Lochia profuse	<input type="radio"/> Lactational problems	<input type="radio"/> BP	<input type="radio"/> Other, please specify:	<input type="text"/>		

### Discharge of child

Date of discharge	<input type="text"/>	Hour	<input type="text"/>	Weight	<input type="text"/>
Temp	<input type="text"/>	Cord	<input type="radio"/> Normal	<input type="radio"/> Bleeding	<input type="radio"/> Other,...
Did breastfeeding begin within one hour of delivery	<input type="radio"/> yes <input type="radio"/> no				
Lactation on discharge	<input type="radio"/> yes <input type="radio"/> no				
Was baby given something else than breastmilk while staying at MBCH?	<input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> If yes what: <input type="text"/>				
Given what else than breastmilk	<input type="text"/>				
Did the mother receive health education while attending ANC	<input type="radio"/> Yes <input type="radio"/> No				
If, yes what does she remember?	<input type="text"/>				