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MATERNAL MORTALITY

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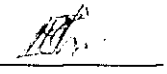
STATEMENT

I HEREBY STATE THAT THIS DISSERTATION IS ENTIRELY THE RESULT OF MY OWN PERSONAL EFFORT. THE VARIOUS SOURCES TO WHICH I AM INDEBTED HAVE BEEN CLEARLY INDICATED IN THE BIBLIOGRAPHY AND ACKNOWLEDGEMENTS.

SIGNED: 

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ABSTRACT

MATERNAL MORTALITY AT UTH IN 1996

Maternal mortality in developed countries has declined dramatically over the last 60 years, and is now very low. Women in industrialized countries have an average lifetime risk of dying from pregnancy-related causes of between 1 in 4000 and 1 in 10,000 pregnancies whereas women in developing countries have a risk that is between 1 in 10 and 1 in 50. In the developing world where maternal mortality is very high, the excess is likely to be due to a high mortality associated with haemorrhage and infection and reductions are most likely to come from reductions in these deaths (Duley, 1992). This study was undertaken to determine the number and causes of maternal mortalities at UTH in 1996 and also to study in depth factors leading to deaths due to haemorrhage.

There were a total of 13,065 deliveries with 12 279 livebirths at UTH. In a hospital based retrospective audit of the 1996 files of maternal mortalities at UTH, it was found that there were 107 maternal mortalities in 1996 The 107 maternal deaths represent a maternal mortality ratio of 871 per 100,000 livebirths for UTH.

There were 44 direct causes of maternal deaths and 63 indirect causes (41% and 59% respectively). The majority of the direct causes were due to haemorrhage (16 out of 44 - 36%) with pre-eclampsia/eclampsia accounting for 10 of the 44 direct deaths (23%). The overwhelming number of indirect causes were attributed to malaria (32 out of 63 - 51%). Respiratory tract infection and TB accounted for 17 cases (27% of indirect causes). It was felt a number of indirect deaths could be attributed to AIDS.

There was no statistical difference between the mean age and parity of those who died due to direct causes compared to indirect causes. However the gestation was higher among cases who died of direct compared to indirect causes of maternal death (31.8 weeks vs 26.9 weeks, p=.006). Among the indirect cases, the mean age and parity of those who died due to malaria was less than those who died of causes other than malaria. This reflected the susceptibility of young nulliparas.

The 16 cases of death due to haemorrhage included 5 antepartum and 11 postpartum haemorrhage. Those who died of haemorrhage were older than those who died of other direct causes (30.4 vs 24.0 years, p=.001). However there was no statistical difference in the mean gestations (although those who died of haemorrhage tended to have higher parity). In most of the 16 cases, an important avoidable factor was determined to be the lack of blood for transfusion.

Malaria and haemorrhage are still the leading causes of maternal death at UTH. A review of antimalarial prophylaxis and strengthened case recognition and management of malaria is needed. Availability of blood transfusion remains a cornerstone of preventing deaths due to haemorrhage.

CONTENTS

TABLES AND APPENDICES

ABBREVIATIONS

APH	Antepartum haemorrhage
ARF	Acute renal failure
BID	Brought in dead
CI	Confidence Interval
C Malaria	Cerebral Malaria
CXR	Chest X-Ray
DIC	Disseminated intravascular coagulopathy
FSB	Fresh stillborn/stillbirth
GBS	Guillian Barre Syndrome
Hb	Haemoglobin
HIV	Human immunodeficiency virus
ICD	International Classification of Diseases
ICU	Intensive care unit
IV	Intravenous
MVA	Manual vacuum aspiration
NR	Not recorded
OR	Odds ratio
POC	Products of conception
PPH	Postpartum haemorrhage
PTB	Pulmonary Tuberculosis
RPOC	Retained products of conception
RTI	Respiratory tract infection
TAH	Total abdominal hysterectomy
TB	Tuberculosis
UTH	University Teaching Hospital
WHO	World Health Organisation

INTRODUCTION

Definition of maternal mortality

The World Health Organisation (WHO) definition of a maternal mortality is :

Death of a woman while pregnant or within 42 days after termination of pregnancy irrespective of the duration and site of the pregnancy from any cause related to or aggravated by pregnancy or its management but not from accidental or incidental causes (WHO, 1991).

Maternal deaths are divided into direct and indirect deaths.

Direct deaths are those resulting from obstetric complication of the pregnancy state (pregnancy, labour and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

Indirect deaths are those resulting from previously existing disease that developed during pregnancy and which was not due to obstetric causes, but which was aggravated by the physiologic effects of pregnancy.

Measures of maternal mortality

There are two different measures of maternal mortality, which are used interchangeably : the maternal mortality ratio (MMR) (maternal deaths per 100,000 livebirths) and the maternal mortality rate (maternal deaths per 100,000 women in the reproductive age group). The ratio is preferred because it specifically measures the risk of dying during pregnancy, whereas the

rate measures the combined risk of becoming pregnant and of dying during pregnancy (Rosenfield, 1989). The proportional maternal mortality rate expresses the proportion of deaths in the reproductive period due to pregnancy related causes. (Walraven et al, 1994)

In the literature review that follows, there is wide variation in the maternal mortality ratio and the risk of dying during pregnancy in different countries of the world.

Although published studies in Zambia are scarce, institutional figures have been periodically collected at the University Teaching Hospital in Lusaka.

This study aims to establish the number and causes of maternal mortalities at the University Teaching Hospital (UTH).

LITERATURE REVIEW

About 500,000 women die each year of complications related to pregnancy and childbirth. 99 percent of all maternal deaths occur in developing world (Seipel, 1992). The most common causes include obstructed labour and ruptured uterus, postpartum haemorrhage, eclampsia, postpartum infection and unsafe abortion.

Even though up to 15% of pregnant women in the developed countries experience complications, rapid intervention minimizes fatalities and accordingly maternal mortality is up to 200 times lower than in the developing world (see Table 1 overleaf). For many women in Sub-Saharan Africa the nearest obstetric care may be several days travel away from where they live.

In Zambia the total fertility rate per woman was 6.4 in 1992 as reported in the 1992 Zambia Demographic and Health Survey (Gaise et al, 1993) and 6.1 as reported in the 1996 Zambia Demographic and Health Survey (ZDHS) (Central Statistical Office et al, 1997). The 1996 DHS in Zambia estimated the maternal mortality ratio to be 649 per 100,000 livebirths based on a Sisterhood Method of enquiry. In rural areas it is quite common for a woman to have given birth to eight live babies and to have been pregnant on several more occasions. These women have a lifetime risk of at least 1 in 14 of dying from pregnancy-related causes (see Table 1 overleaf).

Table 1 **Country estimates of maternal mortality ratios and lifetime risk of maternal death (1990 estimates, revised 1996) (WHO, 1996)**

Country	Maternal Mortality Ratio (deaths per 100,000 livebirths)	Lifetime risk of maternal death, 1 in :
Angola	1500	8
Botswana	250	65
Malawi	560	20
Mozambique	1500	9
Tanzania	770	18
Zaire	870	14
Zambia	940	14
Zimbabwe	570	28
Bangladesh	850	21
China	95	400
Cuba	95	490
Egypt	170	120
Ethiopia	1400	9
India	570	37
Kenya	650	20
Russian Federation	75	620
South Africa	230	85
Sweden	7	6000
Thailand	200	180
Uganda	1200	10
United Kingdom	9	5100
USA	12	3500
Yemen	1400	8

High Maternal Mortality in Developing Countries

At a meeting of the Society of African Gynaecologists and Obstetricians in Yaunde in December 1994, evidence was presented that the maternal mortality rate in many parts of Africa was not falling (Kelly, 1996). The worldwide recession has had more severe effects in the developing world resulting in many being denied essential basics for example, antenatal care because of increasing fees and oxytocics for postpartum haemorrhage.

The high level of maternal mortality in developing countries, and in Africa in particular, stems from a complex array of factors as described by Chiwuzie et al, (1995). In addition to the inadequacy of health services there may be social, cultural, economic and logistic problems, coupled with very high fertility. By and large such women, having been neglected as children and married when adolescent, are poor, illiterate, underfed, overworked, subjected to harmful traditional practices, and usually lack adequate family planning and maternal health services and cannot get their views heard where they matter.

The process of obtaining medical care for women with obstetric complications begins with the recognition of danger signs. Access to such information and understanding of the gravity of symptoms, such as bleeding or prolonged labour, help a woman and her family to seek timely treatment. Even when women and their families recognize danger signs, and understand fully well that a woman with obstetric complications needs to receive medical care, they are also aware of another fact: namely, that there is not much the medical facility can do for her when there is no trained doctor or nurse-midwife, when blood shortages are

regular and when they know equipment is frequently broken. People do not bother to seek care when they know that they probably will not be cured, that they are even likely to die in the hospital. Unfortunately, and despite the efforts of many dedicated and hardworking health providers, this is the state of affairs in many facilities in the developing world. Under such circumstances, there is validity in people's decision not to use the health facilities available to them (Thaddeus and Maine, 1990).

A community based study in an urban and rural setting in Zimbabwe addressed the issue of preventable factors, access to health care, transport problems, risk factors and other social factors (Mbizvo et al, 1994). The authors suggested community and primary-based care interventions before, during and after pregnancy as strategies to reduce maternal mortality.

Determinants of health seeking behaviour

The literature clearly shows that health-care-seeking behavior is strongly influenced by the characteristics of the illness as perceived by individuals. To begin with, prospective health care users must recognise that an abnormal condition exists. The perceived severity and the perceived etiology of the disorder then shape the decision to seek care. The studies that were reviewed describe one or more of these illness factors without necessarily drawing conclusions about their role in the health-care-seeking process (Thaddeus and Maine, 1990).

A survey conducted in six of Senegal's ten regions (reported by Thaddeus and Maine, 1990) indicated that women in these regions lack basic information on signs and symptoms of

obstetric complications. One-quarter of the women interviewed could not name a single complication. Only 13 percent recognised fever, and 10 percent antepartum haemorrhage, as important danger signals. Some women even said that fever, dizziness and pallor were signs of a normal pregnancy.

Pregnancy and childbirth are ubiquitous events. Although acknowledged as potentially risky, pregnancy, labour and delivery are commonly considered natural and normal for women. In other words, they are often not seen as illnesses for which medical expenses are justified and a hospital room booked (Auberback et al, 1982). Furthermore, just as pregnancy is considered a normal event, death during labour and delivery may sometimes be considered a 'normal' event or 'inevitable'. Such fatalistic views can lead to the perception that the condition is not amenable to treatment, and can thus act as effective barriers to a timely decision to seek care.

In parts of Africa, prolonged obstructed labour is taken to be a sign of the woman's infidelity (Kargbo, 1984). Obstructed labour is thus interpreted as punishment for adultery and not perceived as a medical problem. It is believed that the woman must 'confess her sins' so that the delivery will progress smoothly, thus precluding the decision to seek medical care for the complications.

Mention should be made of situations in which a health problem is recognised, but care not sought because of the fear of social or legal sanctions. For instance, definition of a condition

as shameful or stigmatising may not preclude the recognition of seriousness and the need for care. Yet the punishment and ostracism can effectively bar the decision to seek appropriate care. To illustrate, stigmatising diseases like venereal diseases, are often denied, unreported and untreated (Kloos et al, 1987).

Unsafe induced abortion often remains unreported, therefore untreated, because of ostracism and fear of sociolegal sanctions (Bleek, 1978; Murphy, 1981; Harrison , 1983; Tahzib, 1983;Figa-Talamanca, 1986). Certainly in the case of unwanted pregnancy, the condition and the need for care are both recognized. However, fear, shame and desperation can act as powerful barriers and lead to disastrous consequences as women seek illicit and unsafe abortion, attempt to self-abort, and in extreme cases commit suicide (Kwast et al., 1984; Mhango et al, 1986).

Sharp et al (1983) in the USA, developed a model that includes a variable indicating illness severity. The model was also tested empirically by means of a telephone survey among a sample of 618 Illinois residents. Data were analysed to examine the effects of sociodemographic, attitudinal and symptom variables on physician visits. The results indicated that the combination of having symptoms and evaluating them as serious had the largest positive effect on the utilisation of physician services.

Maternal deaths - avoidable or unavoidable

In addition to identifying the diagnoses in cases of maternal death, some hospital-based studies determine whether or not the deaths are avoidable. They generally find that while a small number of maternal deaths are unavoidable, the large majority is either entirely or probably preventable. For example, 98% of institutional deaths studied in Tanzania (Mtimavalye et al, 1984); 94% of maternal deaths studied in Cali, Colombia (Rodriguez et al., 1985); 80% of those studied in Jamaica (Walker et al, 1985) and 52 % in Lusaka, Zambia (Hickey and Kasonde, 1977) were judged preventable by the respective investigators.

In the institution based study of maternal mortality at the University Teaching Hospital (UTH) in Lusaka, Zambia, the authors state that the most worrying finding was that an avoidable hospital factor was present in 52 percent of cases (Hickey and Kasonde, 1977). Hospital factors identified included poor intrapartum assessment, failure to correct anaemia, missed diagnosis of ruptured ectopic pregnancy and unavailability of the anaesthetist. The investigators argue that all these factors could be 'reduced or eliminated'.

A study conducted five years later at Lusaka's UTH estimated that 85% of maternal deaths between 1982 and 1983 were avoidable (Mhango et al, 1986). In this study as in Hickey and Kasonde's study of 1977, half of the deaths were judged to be due to inadequate or inappropriate medical management of the patient. Mhango et al (1986) identified health care provider and institutional deficiencies, including a lack of trained obstetricians, as major health care problems associated with maternal mortality.

Findings from two separate studies in rural Tanzania revealed that a large proportion of hospital deaths could have been prevented (Mtimavalye et al, 1984). A study in four regions of the country indicated that delayed diagnosis, wrong action or both were implicated in 36% of maternal deaths. Price (1984) reviewing maternal mortalities in 3 rural regions of the Tanzania's South Highlands, found that lack of attention to risk factors, errors in judgment or lack of expertise on the part of hospital staff were associated with 43% of deaths.
In Malawi, medical staff factors (e.g. shortage of staff, failure to use a cervicograph), and failure of the nursing staff to recognize the severity of the condition were identified as major avoidable factors in 30 and 26 of 109 maternal deaths, respectively (Bullough, 1981).

As stated by Hickey and Kasonde (1977) 4 out of 80 maternal deaths at Lusaka's UTH were related to staff delays in taking the patients to the operating room. The authors state that the seriousness of the patients' condition may... not have been fully appreciated.

Even if facilities are staffed with competent providers, shortages of drugs and supplies can hamper the timely provision of care (Thaddeus and Maine, 1990).

A lack of equipment and supplies plagues health facilities in most regions of the developing word. There is little question that this situation is due in part to the very real issue of limited resources. But it is often perpetuated by poor management and organization of the available resources.

Maternal mortality and blood transfusion services

Difficulty in obtaining blood for transfusion assumes paramount importance in the management and organization of the available resources. The need for blood transfusion is important in the management of several major obstetrics complications, and is often identified as an avoidable factor delaying the provision of adequate care (Thaddeus and Maine, 1990).

A multidisciplinary team set up in the University of Benin, Nigeria, to look into ways of dealing with pregnancy-related complications that often lead to maternal deaths found out that although the people had a degree of general knowledge about the dangers of haemorrhage during pregnancy and delivery and of the possibility of maternal mortality caused by haemorrhage, the following factors resulted in women failing to benefit fully from modern obstetric care (Chiwuzie et al, 1995) :

- There was a lack of knowledge of the warning signs and risk factors of haemorrhage during pregnancy and delivery, and of the potential danger of bleeding after delivery.
- Certain food taboos were potentially disadvantageous for pregnant women.
- A belief existed that some cases of haemorrhage in pregnancy and delivery could be caused by supernatural forces.
- There was a lack of knowledge about when to seek help in modern obstetric health institutions.
- There was a tendency to continue relying on the care provided by traditional birth attendants even when haemorrhage developed.
- Transport difficulties occurred.

- There were negative perceptions of the quality of care provided in modern obstetric institutions, relating in particular to:
    a. bureaucracy;
    b. lack drugs and other supplies;
    c. nonfunctioning equipment;
    d. absence of doctors, especially at night;
    e. apparently unfriendly attitude of staff towards patients.
- Referral from one level of care to another was not well organized.

At Korle-Bu Teaching Hospital in Ghana, antepartum hemorrhage was an indication for nine percent of the cesarean sections performed in 1971. The investigators argue, however, that patients who might be treated conservatively if blood were available are sectioned as the quickest way of stopping the bleeding. They maintain that the situation would improve considerably if the maternity unit had its own bank (Klufio et al, 1978).

The difficulty of obtaining blood was responsible for 35% of hospital maternal deaths in rural Tanzania (Price, 1984). Shortages of blood for transfusions were implicated in 39% of hospital maternal deaths in Malawi (Bullough, 1981). Megafu (1985) calculated a 57% survival rate for the cases of ruptured uterus for which blood transfusion was unavailable, compared to 76% for patients who received adequate preoperative treatment.

Causes of maternal mortality in developed and developing countries

There is marked variation in causes of maternal mortality between developed and developing countries. Representative of causes of maternal mortality in developed countries is the Triennial Report on Confidential Enquiries into Maternal Deaths in the United Kingdom. The last published report covers the years 1990-1993 (HMSO, 1996). Table 2 summarises the direct causes and enumerates the indirect causes :

Table 2 Causes of maternal mortality, United Kingdom, 1991-93

Cause	Number	Percentage
Hypertensive disorders	20	8.8
Haemorrhage	15	6.6
Thrombosis and Thromboembolism	35	15
Amniotic fluid embolism	10	4.4
Early pregnancy deaths	18	7.9
Genital tract sepsis	9	4
Genital tract trauma	4	1.8
Anaesthesia	8	3.5
Other direct deaths	9	4
Other indirect deaths	63	28
Cardiac disease	37	16
Total	**228**	**100**

By contrast, published and unpublished institutional causes of maternal mortality in a developing country setting as in Zambia show quite different causes as illustrated in Table 3 below :

Table 3 Historical Trends in Maternal Mortality in Lusaka (1974-93)

	1974-76[1]			1982-83[2]			1989[3]			1993[4]	
Diagnosis	**n**	**%**		**n**	**%**		**n**	**%**		**n**	**%**
Abortion	7	13		14	23		24	24		50	31
Toxaemia	20	37		12	20		12	12		9	6
Haemorrhage	13	24		10	17		10	10		10	6
Puerperal sepsis	8	15		9	15		15	15		18	11
AIDS	-	-		0	0		8	8		19	12
Malaria	-	-		-	-		13	13		22	14
Meningitis	-	-		-	-		3	3		8	5
Others	6	11		15	25		16	15		24	15
Totals	**54**	**100**		**60**	**100**		**101**	**100**		**160**	**100**

References:

1. Grech, 1978.
2. Mhango et al, 1986.
3. Cerne and Odeback , 1991.
4. Ahmed, Department of Obstetrics and Gynaecology, UTH, unpublished, 1993.

The trends are not strictly comparable for UTH figures because of the different types of data collection and classification. Nevertheless the figures for UTH are at marked variance to those of the United Kingdom in a number of categories.

It is important to have an idea of causes of maternal mortality in a locality to be able to track common causes and identify strategies to reduce such mortalities. Hence the justification of this study.

AIMS AND OBJECTIVES

To determine the number and causes of maternal mortality at the University Teaching Hospital, Lusaka in 1996.

Specific objectives:

1. Enumerate and identify causes of maternal mortality at UTH in 1996.
2. Review all maternal mortalities due to haemorrhage.

METHODOLOGY

1 Identification of causes of maternal mortality at UTH in 1996

A retrospective survey was conducted of all maternal deaths at UTH between January 1, 1996 and December 31, 1996.

All maternal mortalities are notified to the Consultant in charge and then to the Head of Department of Obstetrics and Gynaecology. All documentation (case notes, antenatal card, laboratory results etc) is collected. Some cases are discussed at a weekly maternal mortality meeting.

For purposes of this study, the following information was retrospectively collected for each case :

Date of death

Age

Gestation

Parity

Cause of death (for classification Appendix I)

The cause of death was determined by adopting a dual classification of death, allowing for two levels of causes as described in Appendix I. The author first determined the cause(s). This was then audited by the Chairman of the Maternal Mortality Review Committee (Head of Department) and a consensus reached.

2 Review of maternal deaths due to haemorrhage

Those maternal mortalities attributed to haemorrhage were identified and further information was sought from the files as follows :

Age

Gestational age

Gravidity

Parity

Referral source (self referred or referred from a clinic)

Clinical problem

Mode of delivery

Baby (liveborn or stillborn)

Estimated blood loss

Amount of blood transfused

Factors leading to death (avoidable / unavoidable)

Where relevant, descriptive and comparative data analysis was performed using Epi Info version 6. A 'p' value of less than 0.05 was considered significant.

Description of the Lusaka maternity services

The UTH is the only referral hospital for maternity care in Lusaka. Lusaka is believed to have a population in excess of 1.3 million. There were over 36 000 deliveries in Lusaka in 1996 of which 13 000 were at UTH, while over 24 000 deliveries were conducted in ten Urban Maternity clinics which are staffed exclusively by midwives. Apart from normal antenatal, intrapartum, and postpartum care, all complications at any stage of pregnancy, labour or puerperium are referred to UTH from these clinics. An ambulance service operates 24 hours a day for transfer of cases.

RESULTS

1. Number of Maternal mortalities at UTH in 1996

There were 107 maternal deaths notified which occurred at UTH between January 1, 1996 to December 31, 1996. Of these 44 (41%) were direct causes and 63 (59%) were indirect. The results are presented as follows :

- Causes of maternal mortality

  Direct obstetric causes

  Indirect causes

- Age distribution of maternal deaths (including direct and indirect causes)
- Parity distribution of maternal deaths (including direct and indirect causes)
- Gestational age distribution of maternal deaths (including direct and indirect causes)
- Comparison of age, parity and gestation between direct and indirect maternal mortalities
- Age difference in indirect causes of maternal deaths, (malaria or no malaria) (n=63)
- Parity difference in indirect causes of maternal deaths, (malaria or no malaria) (n=63)

Causes of maternal mortality at UTH in 1996 - Direct causes

Appendix II shows the full list of the 44 direct maternal mortalities and Appendix III shows the 63 indirect maternal mortalities. **(These are presented in Appendix II and III by age ranking).** The classification used was of dual causes as previously described, listing Level 1 (essential causes) and level 2 (specific causes). These are summarised in Table 4 below. The commonest direct obstetric cause of maternal mortality was haemorrhage (16 cases out of 44 i.e. 36%) and there were far more PPH than APH (11 vs 5). All 7 early pregnancy deaths were due to septic abortion of which one may have been a self-induced abortion. There were no deaths from ectopic pregnancy. Of the 10 cases due to pre-eclampsia / eclampsia, 8 were due to complications after eclampsia.

Table 4 Direct Obstetric causes of maternal mortality at UTH, 1996, using a classification of Dual Causes (n=44)

Level 1 essential	**Number n (%)**	**Level 2 specific**
Haemorrhage	16 (36)	APH, 5 ; PPH, 11
Pre-eclampsia / Eclampsia	10 (23)	Eclampsia, 8; Pre-eclampsia, 2
Sepsis	8 (18)	Puerperal sepsis, 8
Early pregnancy Death	7 (16)	Septic abortion,7; (self induced,1)
Unknown	2 (5)	
Sudden Death	1 (2)	
Total	**44 (100)**	

Causes of maternal mortality at UTH in 1996 - Indirect causes

Over half the number of indirect maternal deaths were attributed to malaria (32 out of 63 - 51%) (see Table 5). Respiratory tract infection (RTI) and TB accounted for 18 cases (28%) and a number of them had a chronic illness and stigmata of AIDS. Therefore, although there were only 2 cases directly attributed to AIDS, many others had clinical stigmata that would allow a clinical classification of AIDS (see full list in Appendix III). Other causes included : ascending paralysis, thought to be Guillain Barre Syndrome; suicide in a patient with TB and possibly AIDS; gastroenteritis in the puerperium; road traffic accident; perforated appendix.

Table 5 Indirect causes of maternal mortality at UTH, 1996 (n=63)

Indirect Cause	**number**	**%**
Malaria	32	51
RTI	11	17
TB	7	11
Anaemia	3	5
Meningitis	3	5
AIDS	2	3
Others	5	8
Total	**63**	**100**

Age distribution of maternal deaths

In Table 6 are presented the age distribution for all deaths and are also segregated as to whether they were direct or indirect. The distribution is also compared with all deliveries at UTH in 1996.

Table 6 Age distribution of maternal deaths at UTH in 1996 (n=107) (Direct and Indirect, n=44 and 63)

Age range (years)	Direct Causes n (%)	Indirect causes n (%)	All causes n (%)	% of all UTH 1996 deliveries*
< 16	2 (5)	2 (3)	4 (4)	3.9
17 - 19	4 (9)	9 (14.3)	13 (12)	16.0
20 - 24	12 (27.3)	17 (27)	29 (27)	29.9
25 - 29	12 (27.3)	15 (24)	27 (25)	22.9
30 - 34	5 (11.4)	13 (21)	18 (16.8)	13.8
35 - 39	8 (18)	4 (6)	12 (11)	8.4
40 +	0 (0)	2 (3)	2 (1.8)	2.2
NR	1 (2)	1 (1.6)	2 (1.8)	2.8
Total	**44 (100)**	**63 (100)**	**107 (100)**	**100**

* Age distribution of all 1996 UTH deliveries M Med Thesis (Dr P Kasonde, 1998), Department of Obstetrics and Gynaecology, UTH.

Parity distribution of maternal deaths

In Table 7 are presented the parity distribution for all deaths and also segregated as to whether they were direct or indirect. The parity was as determined at the time of pregnancy, rather than after the delivery (as applicable in postnatal cases).

Table 7 Parity distribution of maternal deaths at UTH in 1996 (n=107)

Parity	number	%
0	22	20
1	22	20
2	17	16
3	14	13
4	10	9
5	5	5
6	5	5
7	2	2
8	1	1
9	0	0
10	1	1
not recorded	8	7.5
Total	**107**	**100**

As shown in Table 8, there was no difference between nulliparas and multiparas as to whether they had a direct or indirect cause for the maternal death in this series.

Table 8 Contingency Table of Parity related to maternal deaths at UTH in 1996 (N=107) (Direct, n=44; Indirect, n=63)

	Direct n (%)	**Indirect n (%)**	**All N (%)**
Para 0 (nullipara)	8 (18)	14 (22)	22 (20.6)
Para 1 + (multipara)	32 (73)	45 (71)	77 (72)
NR*	4 (9)	4 (6.3)	8 (7.5)
Total	**44 (100)**	**63 (100)**	**107 (100)**

***NR** =not recorded

Odds Ratio (OR) 0.80 (95% CI 0.27 < OR < 2.36). Chi square = 0.04, p=.84

Gestational age distribution of maternal deaths

These are illustrated in Table 9 below. The majority of the direct maternal mortalities were in the third trimester, whereas indirect maternal deaths were spread throughout the trimesters.

Table 9 Gestational age distribution of maternal deaths at UTH in 1996 (n=107)

Gestation (weeks)	Direct n (%)	Indirect n (%)	All N (%)
0 - 12	0 (0)	5 (7.9)	5 (4.7)
13 - 24	8 (18.2)	20 (31.7)	28 (26.2)
> 25	30 (68.2)	36 (49.3)	66 (61.7)
NR*	6 (13.6)	2 (3.2)	8 (7.5)
Total	**44 (100)**	**63 (100)**	**107 (100)**

***NR** =not recorded

Comparison of age, parity and gestation between direct and indirect mortalities

For the above three variables, student's 't' test was used to determine the difference between the means and the results presented in Table 10 below. Gestation was the only significantly different variable:

Table 10 Comparison of age, parity and gestation between direct and indirect maternal mortalities at UTH in 1996 (n=107)

		Direct	Indirect	All*
Age (yrs)	**n**	43	62	105
	Range	15 - 38	16 - 42	15 - 42
	Mean	26.6**	26.1**	26.3
	SD	6.4	6.2	6.3
Gestation	**n**	38	61	99
	Range	14 - 44	5 - 43	5 - 44
	Mean	31.8***	26.9***	28.8
	SD	8.0	8.8	8.8
Parity	**n**	40	59	99
	Range	0 - 7	0 - 10	0 - 10
	Mean	2.4****	2.2****	2.3
	SD	2.0	2.2	2.1

n = number, SD = standard deviation

* Note numbers do not add up to 107 as some data were not available.

Comparison using Student's 't' test (direct vs indirect)

****Age** 26.6 years vs 26.1 years (not significant p>.05)

*****Gestation** 31.8 weeks vs 26.9 weeks (significant, p=.006)

******Parity** 2.4 vs 2.2 (not significant p=.56)

Age difference between maternal mortalities due to malaria or other indirect causes

For the 63 indirect maternal mortalities, 62 had their ages recorded. Of these, 31 died of malaria and 31 of other indirect causes. The mean age difference between the two groups is illustrated in Table 11.

Table 11 **Age difference in indirect causes of maternal deaths, (malaria or no malaria) (n=63)**

	Malaria	No Malaria
number	31*	31*
age (years)	24.1	28.1
S.D.	5.3	6.5
Range	16 - 33	16 - 42

*note 1 case due to malaria did not have the age recorded.

The mean age of cases of maternal deaths due to malaria (24.1 years) was significantly less than the mean age of cases of maternal deaths due to other indirect causes (28.1 years) (Student t test, p=.012)

Parity difference between maternal mortalities due to malaria or other indirect causes

For the 63 indirect maternal mortalities, 59 had their parity recorded. Of these 31 died of malaria and 28 of other indirect causes. The mean parity difference between the two groups is illustrated in Table 12.

Table 12 Parity difference in indirect causes of maternal deaths, (malaria or no malaria) (n=63)

	Malaria	No Malaria
number	31*	28*
Parity	1.5	2.9
S.D.	1.7	2.4
Range	0 - 8	0 - 10

*note 1 case due to malaria and 3 cases due to other indirect causes did not have the parity recorded.

The mean parity of cases of maternal deaths due to malaria (1.5) was significantly less than the mean parity of cases of maternal deaths due to other indirect causes (2.9) (Student 't' test, p=.014).

2. Maternal deaths due to haemorrhage

There were 16 direct obstetric causes of maternal deaths identified that had haemorrhage as the Level 1 (essential) cause. These are summarised in Table 13 .

Table 14 shows the age difference between those who died as a result of haemorrhage compared to another direct cause.

Similarly, Table 15 illustrates the parity difference between those who died as a result of haemorrhage compared to another direct cause.

Table 13 Summary of 16 cases of maternal deaths due to haemorrhage

No.	Age	Gravida	Para	Gestation (weeks)	Referral	Diagnosis	Mode of delivery	Viability	Blood loss (ml)	Blood given	Comments : avoidable / unavoidable
1	20	3	1	31	Clinic	PPH, RPOC	Vaginal	Alive	NR	2 units	Avoidable, not enough blood
2	23	3	1	32	Clinic	PPH, DIC	Vaginal	FSB	NR	3 units	Avoidable, not enough blood
3	26	1	0	37	Self	PPH, Genital trauma	Vaginal	Alive	150	4 units	Avoidable, not enough blood
4	25	5	3	28	Self	PPH, Retained placenta	Vaginal	FSB	NR	2.5 units	Avoidable, not enough blood
5	26	3	2	37	Clinic	Abruptio placentae	Caesarean section	Alive	700	1 unit	Avoidable, not enough blood
6	27	4	3	37	Clinic	APH, Placenta praevia	Cesarean section	FSB	600	Nil	Avoidable, not enough blood
7	30	6	4	32	Clinic	Locked twins	1.Vaginal 2.caesarean section	FSB	NR	1 unit	Avoidable, not enough blood
8	34	8	6	40	Self	PPH, cervical tear	Vaginal	Alive	450	1 unit	Avoidable, not enough blood
9	34	5	4	30	Self	PPH, Retained placenta	Vaginal	Alive	300	1 unit	Avoidable, not enough blood
10	35	5	3	40	Self	PPH, Retained placenta	Vaginal	Alive	NR	Nil	Avoidable, not enough blood

Table 13 continued on next page....

Table 13 (continued)

No.	Age	Gravida	Para	Gestation (weeks)	Referral	Diagnosis	Mode of delivery	Viability	Blood loss (ml)	Blood given	Comments : avoidable / unavoidable
11	34	6	2	44	Self	PPH, Placenta praevia	Vaginal	Alive	300	4 units	Avoidable, Intervention delayed
12	35	6	5	30	Clinic	Abruptio placentae	Vaginal	FSB	700	2 units	Avoidable, not enough blood
13	35	2	1	32	Clinic	Abruptio placentae	Vaginal	FSB	250 (plus)	1 unit	Avoidable, not enough blood
14	36	5	4	34	Self	PPH, Placenta praevia	caesarean section	Alive	700	1 unit	Avoidable, not enough blood
15	36	9	7	43	Self	PPH, Ruptured uterus	Vaginal	Alive	NR	Nil	Avoidable, not enough blood
16	NR	NR	NR	NR	Clinic	PPH, Retained placenta	Vaginal	Alive	NR	Nil	Avoidable, took 7.5 hours to bring patient to hospital from the community

Table 14 Age difference in direct causes of maternal deaths, (haemorrhage or no haemorrhage) (n=44)

	Haemorrhage	No Haemorrhage
number	15*	28
mean age (years)	30.4	24.0
S.D.	5.4	5.5
Range	20 - 36	15 - 38

* Note 1 case due to haemorrhage did not have the age recorded.

Mean age of cases of maternal deaths due to haemorrhage (30.4 years) greater than mean age of cases of maternal deaths due to other direct causes (24.0 years) (Student t test, p=.001)

Table 15 Parity difference in direct causes of maternal deaths, (haemorrhage or no haemorrhage) (n=44)

	Haemorrhage	No Haemorrhage
Number	15*	25*
Parity	3.5	2.2
S.D.	2.1	2.0
Range	0 - 7	0 - 6

* Note 1 case due to haemorrhage and 3 cases due to other direct causes did not have the parity recorded.

Mean parity of cases of maternal deaths due to haemorrhage (3.5) was greater than mean parity of cases of maternal deaths due to other direct causes (2.2) but did not quite reach significance (Student t test, p=.052)

DISCUSSION

In general, maternal mortality in the developing world is very high. It is particularly high in Africa. As illustrated in Table 1 in the Literature Review, considering the maternal mortality ratio among the eight neighbouring states, Zambia has the third highest maternal deaths ratio. In the absence of reliable civil registration or other population-based data, many researchers use hospital data to estimate maternal mortality. There are limitations to this approach and estimates calculated on hospital data alone tend to be unrepresentative as a result of under-reporting. Firstly, a large proportion of the women who die in hospitals are emergency admissions, women who had intended to give birth at home but who were transported to hospital when they developed a life-threatening condition. Secondly, if a referral system is working efficiently most high-risk women are referred to the hospital for delivery. This means that among the women giving birth at the hospital there is a disproportionate number with obstetric complications and hence of women who die there. Nonetheless, valuable information can be obtained from hospital studies which can shed light on avoidable factors and suggest specific interventions.

The 107 maternal deaths at UTH represents an institutional maternal mortality ratio of 855 per 100 000 livebirths. It is believed, from previous surveys, that at least another 50 maternal mortalities could be anticipated in Lusaka if a close scrutiny was made of death certificates and other registers. The Lusaka maternal mortality ratio would need to include all deliveries in Lusaka. These exceed 36 000 livebirths which would be the denominator. However, this study was strictly UTH hospital based.

Haemorrhage was the leading cause of direct obstetric deaths at UTH in 1996. This was mainly due to late referral of patients with APH/PPH and the non-availability of resuscitative measures especially of blood and IV fluids in some cases. One of the avoidable factors is PPH , which can be avoided by active management of the third stage of labour. Routine use of controlled cord traction, uterine massage and oxytocin / ergometrine reduce the incidence of PPH by more than 50% of the deliveries.

Haemorrhage was followed by pre-eclampsia/eclampsia as a leading cause of maternal mortality. However, reviewing the figures presented in Table 2 in the Literature Review describing maternal mortalities at UTH over the last 20 years, abortion accounted for a significant percentage of all maternal mortalities since 1982-3. This is not so based on the current results of 1996. It is noteworthy that obstructed labour and complications leading to maternal death did not feature in this series, perhaps reflecting the use of partogramme and the referral system that exists in Lusaka. Compared to figures in developed countries (e.g. United Kingdom, see Table 2), there were very different causes of maternal deaths at UTH. The population is different, disease patterns are different, quality of care is not the same - mainly because of lack of resources, and postmortems are more readily done in developed countries like United Kingdom.

It is noteworthy that malaria contributes so significantly to indirect causes of maternal mortality at UTH (Table 5). As illustrated in Table 11 and 12 these deaths occur to women who are younger and of less parity. This is in keeping with nulliparas (who are generally

young) being more susceptible to malaria. Cerebral malaria, which carries a mortality of 50%, and severe malaria due to unavailability of antimalarials and late referral to the hospital were the two main causes of death. However deaths due to malaria are not confined to the young or nulliparas as illustrated in the individual cases presented in Appendix III. Malaria is perennial in Lusaka, but there appear to be more cases in the rainy season.

A prospective study and also one supported by more serological testing for HIV may have yielded more indirect causes of maternal mortality due to AIDS. A clinical case definition could be attempted, this would require some more comprehensive notes than were available in many instances. The cases of RTI and TB were often in patients with a long-standing illness, who may have had AIDS.

Comparing the age, parity and gestation between those maternal mortalities due to direct or indirect causes, it is noted that indirect deaths were of a lesser gestation than those who died of direct causes. This could be attributed to the fact that most cases of direct deaths were in the third trimester (e.g. haemorrhage and eclampsia) whereas indirect causes (e.g. malaria) could be at any gestation.

An in-depth review of the 16 deaths due to haemorrhage showed that the main reason why nearly all of them were judged avoidable was the lack of blood to transfuse. There were cases where it was judged that institutional care was sub-optimal and even a case where the delay in transfer was deemed too long. The women who died of haemorrhage were older

than those who died of other direct deaths (30.4 vs 24.0 years, p=.001, see Table 14). However the parity was not significantly higher. Haemorrhage and malaria are major contributors to maternal mortality. These figures are important to know as they have enabled an audit of common causes to be determined to enable strengthening of the relevant services.

STUDY LIMITATIONS

This was a retrospective study. As such the quality of information obtained from notes was poor and some of the information which could have been relevant in the analysis was not collected e.g. age, parity, full past obstetric history.

A study that reviewed all maternal mortalities in Lusaka could have yielded a maternal mortality ratio. However, there are a number of deaths in women of reproductive age who could be classified as maternal deaths but may not have been recorded as such. A large community based survey would be required for this information as was illustrated by Mbizvo et al (1994) in Zimbabwe.

In only two out of 107 maternal deaths was a postmortem done. Accordingly, the final diagnosis was often a best guess based on clinical and other information. This is considered a major limitation in the study although a verbal autopsy method was used to arrive at a cause of death. Similarly, laboratory and X-ray facilities were not always available to enable a sound diagnosis to be made. This could have assisted in determining more accurately diagnoses on AIDS, Pulmonary TB, malaria,

It is believed that a number of postnatal mothers (within 42 days of delivery) get admitted to the medical wards and die there but are not entered as maternal deaths, thus distorting figures.

CONCLUSIONS

Haemorrhage and malaria were the leading causes of deaths at University Teaching Hospital in Lusaka in 1996. Most of the maternal deaths due to haemorrhage were judged to be preventable, mainly due to lack of blood. Recommendations are made based on these findings.

RECOMMENDATIONS

- A regular review and audit of all maternal mortalities ought to be carried out promptly to enable all involved to be able to effectively contribute.
- Staff should be encouraged to write comprehensive and accurate notes.
- Postmortems should be requested more often to support the cause of death cited.
- Staff should be made aware of the common causes of maternal mortality so as to be more vigilant in case management of those conditions.
- Referral protocols from clinics in Lusaka to UTH should be strengthened.
- Active management of the third stage should be practised.
- Malaria prophylaxis should be considered for pregnant women (or if necessary, primiparas).
- Rigorous case management of malaria should be initiated.
- The community should be alerted to the risks of malaria in pregnancy, seek ways to avoid contracting malaria (prophylaxis, bed nets etc) and to seek prompt treatment when they suspect they have malaria.
- Anaemia prevention and treatment should be intensified to ensure pregnant women have optimal reserves.

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APPENDIX I

Classification of causes of maternal mortality

(Adapted from Verbal Autopsies for Maternal Deaths, Report of a WHO workshop, London, 10-13 January 1994, WHO/FHE/MSM/95.15)

Aims of disease classification

In general, classifications of causes of death can be used to:

- establish the public health importance of different causes of death,
- identify priorities and appropriate interventions
- study trends in cause-specific mortality over time
- make comparisons in cause-specific mortality between groups (e.g. regions and countries)
- evaluate the effect of interventions on cause-specific mortality.

Classifying maternal deaths by cause is therefore primarily aimed at identifying priorities for intervention, and the classification used should follow a format that facilitates the identification of appropriate interventions.

Obstetric / medical and contributing factors

Identifying priorities for intervention implies identifying 'avoidable factors'. Hence it is important to define a classification for contributing factors of death in addition to a classification of obstetric/medical causes.

Multiple versus single obstetric / medical causes of death

There are advantages and disadvantages of a single versus multiple cause of death classification system. The main arguments are:

Support for a classification system indicating a single cause of death arises from a concern to abide by the international rules laid down in the International Classification of Diseases (ICD). According to the ICD, multiple causes of death are recorded in the sequence in which they occur and are classified as immediate, underlying or associated causes. In summary tabulations, however, only the single (underlying) cause of death is reported. A typical example for a maternal death would be antepartum haemorrhage caused by abruptio placentae, caused by pre-eclampsia. The last cause mentioned in this sequence, or the first condition to occur, becomes the underlying cause of death and the cause to be reported in a single cause of death classification (pre-eclampsia in the example above). Other causes would appear on the death certificate and could be elicited when needed.

Although the ICD gives clear definitions of what constitutes an underlying and what constitutes an immediate cause of death, there is marked concern about whether or not investigators could agree on the underlying cause. It is felt that attribution of a single underlying cause would remain very sensitive to subjective opinion. Terms such as underlying, contributory, immediate, associated, main originating, single and multiple causes of death are often used interchangeably, and it remains uncertain whether the terms consistently retain the same meaning.

The need to prioritize interventions also raises concern about the use of a classification system identifying a single cause of death. Death is usually preceded by a series of events, each of them deserving attention in their own right and in combination. One may wish to know, for example, how many women died after puerperal sepsis, how many women died after prolonged labour, and how many women died after a prolonged labour that was complicated by puerperal sepsis. Sepsis alone may indicate the need for improved case management (e.g. treatment with antibiotics once sepsis has occurred), whereas if the majority of sepsis cases follow obstructed labour, primary prevention and detection of women at risk for developing prolonged labour may be of higher priority. A single cause of death classification will miss these important combinations and it was suggested that a classification should allow for categories of multiple causes of death in their own right. Analysis could still be performed by single cause of death if needed.

A final concern about the single-cause ICD classification is that the single cause listing would reflect the quality of the cause of death ascertainment rather than a meaningful set of causes. In the example above, where a woman dies of pre-eclampsia followed by abruptio placentae and haemorrhage, the underlying single cause reported will depend on the degree of details achieved in the ascertainment of cause of death. In case A, where the woman dies at home unattended and on questioning the relatives, the underlying cause of death may be reported as antepartum haemorrhage. In case B, the same woman may be listed as dying from abruptio placentae because the relatives are better informed than those in case A. In case C, where the woman regularly attended an antenatal care clinic and an antenatal card

was available with the relatives, the underlying cause may be recorded as pre-eclampsia. A categorization of a single cause of death thus clearly raises issues of comparability between settings with different levels of cause of death ascertainment. A broad mortality classification encompassing a minimal list of causes that can be identified in all settings would overcome this problem. An example of such a classification is discussed below :

Suggestions for the classification of causes of maternal deaths

Direct obstetric causes. The International Classification of Diseases defines direct obstetric deaths as those resulting from obstetric complications of the pregnant state (pregnancy, labour, and puerperium), from interventions, omissions, incorrect treatment, or from a chain of events resulting from any of the above.

Three classifications of direct causes of maternal death

Three main options are left open on the final classification for direct causes of maternal death:

(1) the ICD classification of single causes of death,

(2) a classification of dual causes of death, and

(3) a classification of single causes of death and any of the combinations of the single causes.

1 ICD classification of single causes of death.

The classification consists of the single underlying cause of death. If multiple causes are recorded, they can be listed separately or in combination.

2 A classification of dual causes of death

This allows for two levels of causes: an essential level and a specific level. The essential level identifies a minimum list of causes that can be identified in all settings, whatever the level of sophistication of the cause of death reporting. The list of specific causes improves the degree of detail achieved. The list of causes is shown in the Table 1. All causes of maternal death have to be reported as dual causes (e.g. antepartum haemorrhage and placenta previa or antepartum haemorrhage and unknown). Some specific causes can be found under more than essential level. Retained placenta, for example, can be associated with haemorrhage or with sepsis. Although it is recognized that death can be the result of a complex and long chain of multiple events, and hence more than two levels can be determined, a dual cause listing is felt to be the most feasible approach.

Advantages are that dual causes are more meaningful, that comparisons between regions are standardized and that the potentially subjective qualification of a cause as underlying or contributory is avoided.

Table 16 : Suggested classification of dual causes of death

Level 1 (essential)	Level 2 (specific)
Haemorrhage (antepartum/postpartum)	Placenta previa Abruptio placentae Atonic uterus Retained placenta Prolonged labour Prior fetal death Unknown
Early pregnancy death	Sepsis and induced abortion Sepsis and spontaneous abortion Haemorrhage and induced abortion Haemorrhage and spontaneous abortion Haemorrhage and ectopic pregnancy Unknown
Sepsis	Prolonged rupture of membranes Obstructed labour Retained placenta Iatrogenic factors Prior fetal death
Eclampsia/convulsions	Pre-eclampsia
Obstructed labour/	Malpresentation
Sudden death	
Unknown	

3 A classification of single cases of death and any of the combinations of the single causes.

The minimum list of single causes includes:

- induced abortion and sepsis
- induced abortion and haemorrhage
- ectopic pregnancy
- spontaneous abortion
- antepartum haemorrhage
- postpartum haemorrhage
- sepsis
- eclampsia
- prolonged labour

Indirect obstetric causes

The International Classification of Disease defines indirect deaths as those resulting from previous existing disease or disease that developed during pregnancy and which was not due to direct obstetric causes, but was aggravated by physiologic effects of pregnancy.

Indirect maternal deaths may be relatively few in number and meaningful categorizations are difficult to establish. It is agreed that the broad ICD classifications by organ system were not very useful. Classifications should list the causes of importance according to the epidemiology of diseases. The diseases representing relatively large proportions should be listed as such rather than hidden in a broader category.

Indirect causes of maternal death of importance are: malaria, hepatitis, TB, anaemia, heart disease, AIDS, tetanus, injuries (assault, suicide, accidents).

Appendix II

Direct Maternal deaths at UTH in 1996 (n=44)

(ranked by age)

Number	Age	gestation	Parity	Level	Cause : 1st and 2nd Level
1	15	29	0	1	Pre-eclampsia
				2	c/s for severe pre-eclampsia, post caesarean pneumonia
2	16	34	0	1	Eclampsia
				2	
3	19	36	0	1	Eclampsia
				2	
4	19	44	0	1	Sepsis
				2	Chorioamnionitis, puerperal sepsis
5	19	24	0	1	Early pregnancy death
				2	Sepsis and Septic abortion
6	19	NR	1	1	Sepsis
				2	Puerperal sepsis, secondary PPH
7	20	31	2	1	Haemorrhage
				2	PPH
8	21	40	2	1	Sepsis
				2	Peritonitis. 2 weeks post caesarean
9	21	41	1	1	Sudden death
				2	collapse in labour/suspected ruptured uterus
10	21	NR	0	1	Sepsis
				2	Puerperal sepsis
11	21	31	3	1	Unknown
				2	Premature labour
12	21	20	NR	1	Early pregnancy death
				2	Septic abortion and Acute Renal Failure
13	22	42	0	1	Eclampsia
				2	
14	23	32	2	1	Haemorrhage
				2	DIC, PPH, severe gastroenteritis
15	23	39	3	1	Eclampsia
				2	acute renal failure
16	23	17	1	1	Early pregnancy death
				2	Sepsis and Septic abortion
17	23	16	NR	1	Early pregnancy death
				2	Attempted self abortion

Appendix II continued on next page

Appendix II **Direct Maternal deaths at UTH in 1996 (continued)**

Number	Age	gestation	Parity	Level	Cause : 1st and 2nd Level
18	24	15	1	1	Early pregnancy death
				2	Septic abortion
19	25	NR	2	1	Sepsis
				2	Puerperal sepsis plus severe anaemia
20	25	28	4	1	Haemorrhage
				2	PPH
21	25	NR	3	1	Sepsis
				2	Chronically ill, puerperal sepsis, delivered at home
22	26	37	0	1	Haemorrhage
				2	PPH, Acute renal failure
23	26	37	3	1	Haemorrhage
				2	APH
24	26	24	NR	1	Early pregnancy death
				2	Sepsis and Septic abortion
25	27	37	4	1	Haemorrhage
				2	APH
26	27	14	5	1	Early pregnancy death
				2	Septic abortion
27	28	33	2	1	Eclampsia
				2	
28	28	29	5	1	Eclampsia
				2	
29	28	37	3	1	Eclampsia
				2	
30	29	NR	5	1	Sepsis
				2	Puerperal sepsis, suspected herbal use
31	30	32	6	1	Haemorrhage
				2	PPH
32	31	24	2	1	Sepsis
				2	Septic abortion
33	34	40	7	1	Haemorrhage
				2	PPH
34	34	32	3	1	Haemorrhage
				2	PPH
35	34	30	5	1	Haemorrhage
				2	PPH, retained placenta, severely anaemic
36	35	30	6	1	Haemorrhage
				2	PPH

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Appendix II **Direct Maternal deaths at UTH in 1996 (continued)**

Number	Age	gestation	Parity	Level	Cause : 1st and 2nd Level
37	35	32	2	1	Haemorrhage
				2	PPH
38	35	40	4	1	Haemorrhage
				2	PPH, DIC
39	36	34	5	1	Haemorrhage
				2	APH
40	36	43	0	1	Haemorrhage
				2	PPH, Ruptured Uterus
41	37	37	6	1	Pre-eclampsia
				2	subcapsular liver haematoma
42	37	39	5	1	Unknown
				2	Hypertension
43	38	28	5	1	Eclampsia
				2	
44	NR	NR	NR	1	Haemorrhage
				2	PPH, retained placenta

Appendix III

Indirect Maternal deaths at UTH in 1996 (n=63)

(ranked by age)

Number	Age	Gestation	Parity	Cause
1	16	12	2	Meningitis
				old Herpes Zoster - suspect AIDS
2	16	32	0	C. malaria
3	17	20	0	ascending paralysis
				Respiratory arrest
4	17	24	1	C. malaria
				anaemia, acute renal failure
5	17	28	0	Malaria
				acute renal failure
6	17	30	0	Malaria
7	17	26	0	C. malaria
8	18	28	0	Malaria
				Acute Renal Failure
9	18	20	2	C. Malaria
10	19	17	1	C. malaria
11	19	43	0	Malaria
12	20	29	0	PTB (CXR signs)
				chronic illness-suspect AIDS
13	21	36	0	Malaria
14	21	36	1	Malaria
				HIV +, chronic illness
15	21	36	4	Severe anaemia
				Hb2.0g/dl
16	22	8	2	Malaria
17	22	24	0	C. Malaria

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Appendix III Indirect Maternal deaths at UTH in 1996, continued

Number	Age	Gestation	Parity	Cause
18	22	34	1	RTI
19	23	8	1	Meningitis
20	24	20	0	C. malaria
21	24	18	2	PTB
22	24	40	3	Malaria
23	24	30	2	Malaria
24	24	36	2	RTI
				chronic illness-suspect AIDS
25	24	29	1	Severe anaemia
				(Hb 2.6g/dl), suspected malaria
26	24	29	0	malaria
27	24	36	1	Chronic RTI
				congestive cardiac failure
28	24	33	0	RTI
				chronic illness-suspect AIDS
29	25	38	3	Suicide
				TB
30	26	24	2	Chronic RTI
				oral thrush, suspect AIDS
31	26	26	NR	RTI
				chronic illness-suspect AIDS
32	26	27	1	C. malaria
33	26	24	3	C. malaria
34	26	38	1	malaria
35	27	16	NR	C. malaria
36	27	17	3	Sepsis
				Perforated appendix

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Appendix III Indirect Maternal deaths at UTH in 1996, continuation

Number	Age	Gestation	Parity	Cause
37	27	33	1	TB (CXR signs)
38	28	20	0	C. malaria
				acute renal failure, also HIV +
39	28	20	3	C. malaria
40	28	26	1	C. malaria
41	28	NR	5	TB
42	28	33	4	RTI
43	29	24	3	AIDS
				HIV +, chronic illness
44	30	33	2	malaria
45	30	24	3	malaria
46	30	NR	6	Gastroenteritis in puerperium
				clinically anaemic
47	30	5	3	AIDS
				cryptococcal meningitis
48	31	33	1	Meningitis
				HIV +
49	31	18	2	C. malaria
				Acute Renal Failure
50	31	12	3	C. malaria
51	31	21	1	Severe anaemia
				jaundiced, suspect malaria
52	31	33	4	malaria
53	31	34	2	PTB
				anaemia / acute renal failure

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Appendix III Indirect Maternal deaths at UTH in 1996, continuation

Number	Age	Gestation	Parity	Cause
54	33	39	2	malaria
				severe anaemia
55	33	32	2	C. Malaria
56	34	28	7	TB (CXR signs)
57	35	23	4	RTI
				chronic illness-suspect AIDS
58	35	20	NR	road traffic accident
				Head injury
59	36	17	6	RTI
				Suspect TB on CXR, clinically suspect AIDS
60	39	26	7	Miliary TB
61	41	40	NR	Chronic RTI
				suspect PTB
62	42	34	10	RTI
				chronic illness-suspect AIDS
63	NR	40	8	C. malaria