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A review of maternal death records of HIV + women in Sedibeng District, Gauteng

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A Review of Maternal Death Records of HIV+ Women in Sedibeng District, Gauteng

A research report submitted to the School of Public Health, Faculty of Health Sciences, University of the Witwatersrand, in partial fulfillment of the requirements for the degree of Master of Public Health in the field of Health Systems and Policy

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Johannesburg, May 2012

DECLARATION

I, Senate Betty Sejake declare that this research report is my original work. It is submitted in partial fulfillment of the requirements for the degree of Master of Public Health, in the field of Health Systems and Policy, in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Signature ……..

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ABSTRACT

Introduction

The maternal mortality ratio in Sedibeng District, Gauteng Province, from 2002 – 2004 was 220/100000. For the past decade HIV has been identified as a factor that has slowed the decline in maternal deaths in South Africa. The purpose of this study was to describe personal and service level factors contributing to maternal mortality of HIV positive women. It is hoped that the results of this study will be useful in developing interventions that will assist to curb the maternal mortality ratio.

Methodology

Maternal death records were reviewed for the period 2004-2009. Data was collected on antenatal care, hospital care after admission and access to HIV services. The data were analysed using Stata 10. The results were compared with the national guidelines for the care of HIV positive pregnant women so as to identify discrepancies between the two.

Results

One hundred and twenty five maternal death records were reviewed. Of these, 90% booked late for antenatal care i.e. beyond 20 weeks gestation. The majority (60.8%) of the women were HIV positive. Of the HIV positive women, 37.5% had CD 4 counts less than 200, which made them eligible for antiretroviral therapy. Of those that were eligible for antiretroviral therapy, 50.0% did not access the antiretrovirals due to late booking and loss to follow-up. Another main finding was that 36% died during the postnatal period.

Conclusion

The antenatal bookings occurred after 12 weeks gestation which limited the time for starting patients on antiretroviral therapy. The high number of deaths during the postnatal period may indicate poor postnatal care and follow-up; as antiretroviral therapy could have been started during the postnatal period.

Recommendations

Early antenatal booking and early HIV testing should be encouraged in communities. Antenatal services should be integrated so that HIV positive pregnant women are treated comprehensively and that the focus is not only on HIV, but also on other conditions such as TB, pneumonia, anaemia and hypertension. All pregnant HIV positive women must be done CD 4 counts; and all those found to be eligible for antiretroviral therapy should be given antiretrovirals timeously. Such women should be followed up and monitored closely. Postnatal check-up at 3 days should be strengthened for the mother-and-baby pair.

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TABLE OF CONTENTS

	Page No.
TITLE PAGE	i
DECLARATION	ii
ABSTRACT	iii
ACKNOWLEDGEMENTS	iv
TABLE OF CONTENTS	v
LIST OF TABLES	xi
CHAPTER 1: INTRODUCTION	1
1.1.Introduction	1
1.2.Background	2
1.3.HIV testing and counseling in antenatal care	3
1.4.Comprehensive care, management and treatment for HIV positive pregnant women	4
1.5.Antenatal care	6
1.6.Objectives of the study	6
CHAPTER 2: LITERATURE REVIEW	8
2.1. Introduction	8
2.2. Epidemiology of maternal mortality	8
2.3. Factors associated with maternal mortality	11
2.3.1. Demographic characteristics	11
2.3.2. Obstetric history	11
2.3.3. Levels of maternity care	11

2.3.4. Antenatal care services 12

2.3.5. HIV testing in pregnancy 13

2.3.6. Intrapartum care 13

2.3.7. Timing of event leading to a maternal death 14

2.4. Causes of death 15

2.5. HIV and maternal mortality 16

2.6. Antiretroviral therapy in pregnancy 16

2.7. Facilities where maternal deaths occur 21

2.8. National Committee on Confidential Enquiries into Maternal Deaths 21

2.9. Process of notifying a maternal death 22

2.10. Confidential enquiries into maternal deaths 22

2.11. The ten key recommendations for saving mothers 23

2.12. Health systems factors in maternal mortality 24

2.12.1. Service delivery 24

2.12.2. Health workforce 25

2.12.3. Health information system 26

2.12.4. Medical products, vaccines and technologies 26

2.12.5. Financing 27

2.12.6. Leadership and governance 27

2.13. Summary and conclusion of literature review 28

CHAPTER 3: METHODOLOGY 29

3.1. Introduction 29

3.2. Study design 29

3.2.1. Study site 29

3.2.2. Study population 30

3.3. Sampling strategy and the sample 30

3.4. Method of data collection 30

3.5. Pilot study 32

3.6. Data management and analysis 32

3.7. Ethical considerations 33

CHAPTER 4: RESULTS 34

4.1. Introduction 34

4.2. Description of the women who died 34

4.2.1. HIV status 34

4.2.2. Demographic characteristics 34

4.2.3. Obstetric history 37

4.3.Description of the facilities where the women died 38

4.3.1. Hospitals and numbers of maternal deaths 38

4.3.2. Level of hospital care received 39

4.3.3. Qualifications of attending doctors 39

4.4. Antenatal care received by the women 40

4.4.1. Antenatal care attendance by HIV status 40

4.4.2. Gestational age at first antenatal visit 40

4.4.3. Number of antenatal visits by HIV status 41

4.4.4. Level of antenatal care attended 41

4.4.5. Timing of HIV test of the women who were tested 42

4.5. Follow-up care received by HIV positive women 43

4.5.1. Determination of eligibility for antiretroviral therapy 43

4.5.2. Access to antiretrovirals 43

4.6. Hospital care received by the women 44

4.6.1. Condition on admission to hospital 44

4.6.2. Pregnancy status on admission to hospital 45

4.6.3. Co-morbidity with HIV 45

4.7. Causes of death 47

4.7.1. Primary causes of death 47

4.7.2. Secondary causes of death 47

4.7.3. Contributory causes of death 51

4.8. Comparison of study results with the PMTCT guidelines 2008 51

CHAPTER 5: DISCUSSION 54

5.1. Introduction 54

5.2. Personal and facility level factors among HIV positive pregnant women 54

5.2.1. Personal factors of HIV positive women 54

5.2.2. Facilities where maternal deaths occurred 57

5.2.3. Antenatal care attendance 58

5.3.4. Level of antenatal care 59

5.3.5. Access to antriretrovirals 59

5.2.6. Condition on arrival at the hospital 59

5.2.7. Pregnancy status at the time of death 60

5.2.8. Co-morbidity with HIV 60

5.3. Causes of death 61

5.3.1. Primary causes of death 61

5.3.2. Secondary and contributory causes of death 62

5.4. Study limitations 62

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS 63

6.1. Introduction 63

6.2. Conclusion 63

6.3. Recommendations 64

6.3.1. Integration of services 64

6.3.2. Heath policy implementation and monitoring thereof 64

6.3.3. Training of health care workers 64

6.3.4. Community mobilization 65

REFERENCES

66

ANNEXURES

Appendix A: Letter of request for permission to conduct the study 70

Appendix B: Checklist for maternal death record reviews 71

Appendix C: Letter of permission from the Ethics Committee to conduct the study 75

LIST OF TABLES

Table 1: HIV status of the women who died 33

Table 2: Age group by HIV status 34

Table 3: Marital status of the women by HIV status 35

Table 4: Employment status and household income by HIV status 36

Table 5: Gravidity and parity of the women who died 37

Table 6: Hospitals and numbers of maternal deaths 38

Table 7: Level of hospital care received 38

Table 8: Qualifications of attending doctors 39

Table 9: Antenatal clinic attendance by HIV status 39

Table 10: Gestational age at first antenatal booking 41

Table 11: Number of antenatal visits by HIV status 41

Table 12: Level of antenatal care attended by HIV status 41

Table 13: Timing of HIV test of the women who were tested 42

Table 14: Determination of eligibility for antiretroviral therapy (ART) 43

Table 15: Access to antiretrovirals (ARVs) for women who were eligible 44

Table 16: Condition on admission to hospital 45

Table 17: Pregnancy status on admission to hospital 45

Table 18: Co-morbidity with HIV 46

Table 19: Primary causes of death 48

Table 20: Secondary causes of death 50

Table 21: Contributory causes of death 51

Table 22: Comparison of study results to 2008 PMTCT guidelines 52

Abbreviations and acronyms

AIDS	Acquired immunodeficiency syndrome
ARVs	Antiretrovirals
ART	Antiretroviral therapy
AZT	Azidothymidine (Zidovudine)
CCF	Congestive cardiac failure
CVA	Cerebrovascular accident
DHIS	District Health Information System
HAART	Highly active antiretroviral therapy
HAST	HIV, AIDS, STIs and TB
HELLP	Haemolysis, Elevated Liver enzymes, Low Platelet count
HIV	Human immunodeficiency virus
INH	Isoniazid
IPT	Isoniazid prophylactic treatment
MCWH	Maternal, Child and Women's Health
MDG	Millennium Development Goal
MMR	Maternal mortality ratio
MOU	Midwife Obstetric Unit
NCCEMD	National Committee on Confidential Enquiries into Maternal Deaths
NVD	Normal vertex delivery
PCP	Pneumocystic Carinii Pneumonia

PMTCT	Prevention of mother to child transmission of HIV
PPH	Post-partum haemorrhage
STI	Sexually transmittable infection
TB	Tuberculosis
UNFPA	United Nations Population Fund
WHO	World Health Organization

Definitions

Maternal mortality	Death of a woman while pregnant or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes[1,2,3]
Maternal mortality ratio	Annual number of maternal deaths per 100 000 live births[1]
Direct maternal deaths	Deaths that result from obstetric complications of pregnancy, labour or the puerperium, from interventions, omissions, incorrect treatment or from a chain of events resulting from any of these[3, 14]. Examples of these deaths are those that are due to hypertensive disorders of pregnancy, obstetric haemorrhage, early pregnancy deaths, pregnancy-related deaths, anaesthetic deaths and acute collapse and embolism
Indirect maternal deaths	Maternal deaths that result from pre-existing disease which was aggravated by the physiological effects of pregnancy.[3] Examples of pre-existing medical disease are cardiac, respiratory, haematological, endocrine, immune, gastrointestinal and skeletal
Coincidental deaths	Deaths from unrelated causes which happen to occur in pregnancy or the puerperium. An example of these is a death due to violence against the woman.[1,2,3,]
Unknown cause of death	Deaths during pregnancy or the puerperium where an underlying cause was not identified.[3]

CHAPTER 1: INTRODUCTION

1.1. INTRODUCTION

The maternal mortality ratio (MMR) in South Africa is far higher than in other countries with similar gross domestic products such as Portugal and Brazil; and a significant number of maternal deaths are preventable.[4] Estimations of the population based MMR for South Africa vary between 150/100000 live births, 181/100000 live births; 240-400/10000 live births and 542/100000 live births (based on 2001 census population estimates).[3,5,6,] These reports are estimates because the confidential enquiries into maternal deaths systems are not carefully designed epidemiological surveys, and therefore cannot report accurate maternal death ratios for the country or province.[1] Some of the deaths occurring outside health facilities are not reported, especially in rural areas, and this lack of reporting can result in lower MMR estimates.[3] HIV prevalence in South Africa is high with nearly one in three pregnant women testing HIV positive.

Millennium Development Goal (MDG) number 5 specifically focuses on reduction of maternal mortality. This MDG focuses on improving maternal health, thus saving mothers. The World Health Organization (WHO) has been set a target of reducing MMR by 75% by 2015.[7,8,9,10,11] This target seems to be possible for many countries if there is a combination of factors such as long-term investment in midwifery training and referral hospitals, accessible health services, control and supervision of the medical professions, and progress reports.[12] In addition to these, achieving the fifth MDG will require political participation, resources and suitable strategies.[7]

In South Africa, since the year 2000, there has been a steady increase in the proportion of maternal deaths due to non-pregnancy related infections; and in the triennium 2004-2007 these non-pregnancy related infections have been found to be the leading contributor to maternal deaths.[3] The most commonly occurring infections were acquired immunodeficiency syndrome (AIDS), pneumonia, tuberculosis (TB) and meningitis. Others include malaria and pyelonephritis. The results of the 2007 annual antenatal survey revealed that 31% of pregnant women in South Africa had Human Immunodeficiency Virus (HIV).[8] In 2008 this figure dropped to 29.3% (95% CI: 28.5% -30.2%) and in 2009 it was 29.4% (95% CI: 28.5% - 30.1%).[3] HIV/AIDS has been identified as a contributory factor in maternal deaths.[3]

According to the Saving Mothers Report, 2002-2004 report on confidential enquiries into maternal deaths 3406 maternal deaths were reported, and 37% of these deaths were found to be avoidable.[2] Of the 3406 maternal deaths, 662 (20.1%) were attributed to Acquired Immune Deficiency Syndrome (AIDS).[2] In the triennium 2005-2007, 4077 maternal deaths were reported for this period.[3] Nearly half (46.2%) of the women who died in this period were HIV positive. This was higher than had been reported in the 2002-2004 period where 36% of women who died were HIV positive.[3] Deaths due to HIV related conditions were evaluated according to the following criteria: a positive HIV test; and either a CD4 count of less than 200; or an AIDS defining condition such as tuberculosis (TB).[3,8]

Maternal mortality rate is a health indicator of a country, thus a reduction in maternal morbidity and mortality is a national priority. Since AIDS defining conditions contribute to maternal deaths it would be useful to identify the factors that contribute to the deaths of pregnant women who have tested HIV positive. Until there is an understanding of the discrepancies in antenatal care and barriers that exist for accessing antiretrovirals, it will be difficult to provide programmes that will reach all HIV positive pregnant women, thus reducing maternal mortality.[11]

The current study is an investigation into the personal and service related factors among HIV positive women who died during the period April 2004 to March 2009 in public health facilities in Sedibeng District, Gauteng Province, South Africa.

1.2. Background

In Sedibeng District of Gauteng Province, South Africa, where the researcher is in charge of maternal health services, the MMR for 2004/5 was 183/100 000 and in 2005/6 it was 161 per 100 000 live births, and in 2006/7 it went up to 200 per 100 000 live births.[13] West Rand and Metsweding are two other non-metropolitan areas in Gauteng. According to the data from the District Health Information System (DHIS)[13] from Gauteng Department of Health, the MMR in West Rand in 2005/6 to 2007/8 was 167, 142 and 150 per 100 000 live births respectively.[13] Metsweding District had no maternal deaths reported during 2004 – 2009 from their MOU, which is the only facility doing deliveries there.[13] Sedibeng therefore had a higher MMR than similar districts in Gauteng Province.

Sedibeng has a total of 33 primary health care clinics, 10 mobile clinics, four community health centres and three hospitals. The mobile clinics are provided in order to increase access to health care services by reaching out to remote and rural areas of Sedibeng. Each of these facilities provides antenatal care services. All the four community health centres have midwife obstetric units (MOUs), where women with low risk pregnancies may deliver their babies. The health care professionals at the MOUs are midwives and advanced midwives. All clinics, mobiles and community health centres provide health care services at the primary level. Of the three hospitals, two are level one facilities and have maternity wards. These are also primary level facilities but because of the presence of doctors and patients having moderate risks, are referred to as level one facilities. They deliver low risk and moderate risk women. The health care professionals in these hospitals are midwives, advanced midwives and doctors who are general practitioners. The third hospital is a level two facility, which also has a maternity ward. At this hospital it is mainly high risk women who are supposed to deliver, although other low risk women go to the hospital as self-referrals for delivery. The health care professionals in this facility are midwives and advanced midwives, general practitioners and specialists in obstetrics and gynaecology.[14]

Referral routes are available for all maternity services. Clinics, mobiles and MOUs generally refer to the level one hospitals or level two hospital according to the women's pregnancy risk.[14,15] Ambulances are available for transferring these patients to the appropriate level of care, according to the health risks presented by their pregnancies.

1.3.HIV testing and counseling in antenatal care

All pregnant women are offered routine voluntary and confidential counseling and testing for HIV.[16,17] At antenatal clinics women are first given health education on HIV about what it is, modes of transmission, the HIV test, and the implication of the test results. The counselors in the clinics then take them for individual counseling on HIV and ask them if they would like to be tested. The importance of knowing one's HIV status is emphasized. No client should be forced to

take the test; it is completely voluntary.[16,17] It is mandatory by the Department of Health that should a client agree to be tested, pre-test counseling is offered as a basis for psychological preparation for a positive test result.[18] The client is then tested by a nurse. Most of the clinics do rapid tests, where the results are available after about 15 minutes. As soon as the results are available, the client is informed thereof. This is followed by post-test counseling where the results, either negative or positive, are explained to the client. The results remain confidential. It is the client's prerogative to decide if and to whom she will disclose the results.[19]

1.4. Comprehensive Care, Management and Treatment (CCMT) for HIV positive pregnant women

Should the client test HIV positive, she is advised about taking a CD4 count test. This is also on a voluntary basis. If she agrees then a specimen of blood is taken from her for the test. The blood should reach the laboratory within six hours in Gauteng Province. The results are available after six days. If the CD4 count is above 200, the patient is put on dual therapy of AZT as from 28 weeks gestation, and a single dose of Nevirapine at the onset of labour.[16, 18] If her CD4 count is less than 200, she is then counseled for antiretroviral therapy (ART). This is also on a voluntary basis. If she agrees to take antiretrovirals, the procedure will start with adherence counseling, which can take up to four weeks.[20] The patient will also be eligible for ART if she has an AIDS defining condition such as Karposi's sarcoma, even if the CD4 count is above 200 as these conditions are an indication that the client is immuno-compromised even if she may not be ill yet.[21] Adherence counseling is important to enable the patient to understand the importance of compliance to treatment even if they experience some uncomfortable side effects initially. Those who do not comply with treatment have a possibility of developing a resistant virus, and may spread the same resistant virus to other healthy people. After the adherence counselling the patient will commence ART.[9]

According to the Department of Health and the Population Council the following are the challenges of putting patients on Highly Active Antiretroviral Therapy (HAART):

- Side effects, which may be temporary or even permanent, requiring a change of treatment. Examples of the temporary side effects are vomiting and fatigue; whereas the permanent ones are neuropathy and metabolic dysfunction.[2]
- Patients take 16 to 20 pills a day as triple therapy, which may be burdensome to some people, leading to poor compliance to therapy.
- ART also has food and fluid restrictions e.g. in case of certain medication the patient must take them one hour before meals, and drink 1.5 litres of water per day to prevent the formation of kidney stones.
- Lifelong therapy as chronic medication discourages the patients. Some do not understand that even if HIV can no longer be detected in their blood it is still existent in the sanctuary sites as it cannot be completely eliminated; and emerges again when ART is discontinued.[24]

Women who are found to be eligible for ART are informed.[24] They are then told about the importance of adherence to therapy and undergo adherence counseling sessions. They need to understand that the goal of ART is to suppress the viral load in the blood to an undetectable level, and therefore it is important to take their medication daily as prescribed.[25] Several other strategies are used to enhance adherence to therapy. According to the Population Council, the strategies are: use of pill boxes for measuring the daily doses, use of electronic devices for reminders, telephone reminders by the health care workers, medication diaries, 'buddy' system and pill charts. There is also the DOT (Directly Observed Treatment) system as used in tuberculosis treatment; and use of incentives for proper adherence.[26]

It is also important to have appropriately skilled personnel so that the required service can be rendered. The Department of Health has made a special effort to train health care workers in the use of antiretroviral therapy.[24] This training is continuing in Sedibeng as well. In addition to the antiretrovirals, the Department of Health also recommends good nutrition to boost the immune system.[24]

The Department of Health in South Africa has developed guidelines and protocols which need to be followed whilst caring for pregnant women so as to save their lives and those of their babies. These apply to all levels of care.

1.5. Antenatal care

The WHO Safe Motherhood Initiative identifies antenatal care as a pillar of safe motherhood. Coverage of antenatal care in South Africa is very high, with 94% of women attending at least one visit.[27] However, the timing, number, and content of these visits are not optimal for all women. Antenatal care attempts to ensure, by antenatal preparation, the best possible pregnancy outcome for women and their babies.[28,29] The South African national antenatal care policy states that all pregnant women need to visit an antenatal clinic before 20 weeks gestational age. According to the Guidelines for Maternity Care in South Africa (2007), a woman should visit her health care provider as soon as she suspects pregnancy, even as early as the first missed menstrual period; and women who are found to be pregnant must be issued with an antenatal card and receive first visit antenatal care.[26,29]

1.6 Objectives of the study

The overall aim of this study was to describe personal and service level factors contributing to maternal mortality of HIV positive women in Sedibeng District so as to curb the maternal mortality ratio.

The specific objectives of the study are as follows:

1. To describe personal and facility level factors among HIV positive pregnant women including: age, relationship status, employment status, household income, parity, gravidity, level of facility and professional category of attending health care provider.
2. To describe the antenatal care of HIV positive pregnant women who died.
3. To describe the hospital care received by HIV positive pregnant women who were admitted to hospital.
4. To describe co-morbid conditions with HIV/AIDS and causes of death among women who died

5. To compare the antenatal care that was received by the HIV positive women who died maternal deaths with the National Department of Health guidelines for care of HIV positive pregnant women.
6. To identify gaps in the postnatal care of the women who died.

CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

This chapter provides a current review of available literature on the maternal mortality and HIV. The WHO and the National Department of Health websites were also used so as to identify the policies available for saving mothers and available publications. The literature review is presented starting with global trends in maternal mortality and later, trends in South Africa. The same approach is used for literature on maternal mortality and HIV.

2.2. Epidemiology of maternal mortality

According to the World Health Organization (WHO), 210 million women worldwide become pregnant every year and almost 60 million of these pregnancies end in death of the mother or the baby.[2] An unknown number of women survive after pregnancy but remain weakened for life with their lives cut short.[2] It is estimated that globally more than 500 000 women die daily due to complications of pregnancy or child birth;[7,28] and half of them live in Sub-Saharan Africa.[7] The highest maternal mortality rate is in Africa, which averages 940 per 100000 live births. In South Africa, at least 1600 mothers die due to complications of pregnancy and childbirth each year. [29]

In the triennium 2005 – 2007 the leading causes of maternal deaths in South Africa, referred to as the "big five" were:

- Non-pregnancy related infections (43.7%)
- Complications of hypertension (15.7%)
- Obstetric haemorrhage (12.4%)
- Pregnancy related sepsis (9.0%)
- Pre-existing maternal disease (6.0%)[3]

South Africa needs to address the "Big 5" in order to meet the Millennium Development Goals for maternal survival by 2015. The main challenge for maternal mortality is HIV/AIDS. Poverty has been identified as an important underlying cause of death that is related to each of the big five challenges.[29] A high maternal mortality rate results in low economic development as the lives of women who could be productive and looking after others as well is cut short, resulting in low gross domestic product.[28] The main risk factors for maternal mortality include illiteracy,

poverty, poor nutrition, low weight in pregnancy, minimal weight gain in pregnancy, first pregnancy or higher than the fourth (excessive fertility), maternal age younger than twenty or older than thirty four years, poor outcome of previous pregnancies, infections (e.g. STIs and HIV) and illnesses during pregnancy (e.g. anaemia, cancer of the cervix) female genital mutilation, unintended pregnancies and unsafe abortions, smoking and inadequate health care during pregnancy and delivery.[28]

A high percentage of avoidable factors for maternal mortality occurs within the community.[31] These community-based modifiable factors are predominantly delays in recognizing the danger signs in pregnancy, such as per vaginal bleeding or severe headache, and seeking health care timeously, even though antenatal care coverage is generally high in South Africa.[27]

It is recommended that to save mothers in South Africa requires everyone to have a role to play in providing every woman with essential care: government officials and policy makers, health managers, health care providers and communities.[28] The inequity and socio-economic factors that exist for women need to be addressed urgently. That can be attained by raising the socioeconomic status of women; education for women; functional and accessible primary health care; and effective communication for behavior change.[28] Better care for the women requires improvement in both coverage and quality of care. Highly effective interventions that address the big five health challenges already exist as health care packages in policy in the country.[29] An ideal health care package to address pregnancy and childbirth complications should have the following elements:

- At the family and community level, women should be empowered with knowledge of danger signs and family planning.
- An integrated package of basic antenatal care, which includes PMTCT, should be implemented.
- Intrapartum care should be rendered by a skilled attendant.
- Obstetric emergencies should be managed correctly
- Postnatal care should include counseling on maternal and newborn danger signs.
- Clean and safe delivery for all women
- Essential obstetric care should be implemented

- Choice on termination of pregnancy services should be available [29]

Coverage of health care services such as contraception and antenatal services in South Africa is good and policies are in place. However, there are still gaps that need to be strengthened; such as referral routes and quality of care.[29] To address these gaps, the policies that are in place need to be implemented consistently. A continuum of care in the life cycle of women, such as good antenatal care, safer delivery and good postnatal care is important.[29] Women need to know that attending the antenatal clinic once at any time will have much less effect than a first visit before 20 weeks and attending at least four times at appropriate intervals with high impact interventions included in each visit.[29] There should also be a link between the community and all the levels of care; and delays in between should be avoided at all cost.[29] Since HIV is a major challenge, the HIV package should be integrated with all other packages.[29] All should be educated about dual protection during sexual intercourse to prevent HIV infection.[29] This should be encouraged by provider-initiated counseling and testing, and antiretroviral therapy if required. The malnutrition package should also be integrated into all other packages by the promotion of healthy diet among women.[29]

In 1996 the South African government passed legislation on choice on termination of pregnancy. This piece of legislation gave women the right to terminate their pregnancies on demand before 13 weeks gestation. This Act aimed to reduce maternal morbidity and mortality due to septic abortions after unsafe abortions.[30] In 1998 deaths due to puerperal sepsis increased by 20.4% but reduced by 2.2% in the period 2002-2004. During this period, data on HIV was recorded, even though this had not been done before. Seropositivity rate was found to be 72.5% in 40 cases of septic abortion and 68.0% of 128 cases of puerperal sepsis. Maternal mortality due to septic abortions dropped from 3.8% to 3.4% to 2.7% in subsequent reporting periods.[30]

2.3. Factors associated with maternal mortality

2.3.1. Demographic characteristics

The age of the pregnant woman is an important risk factor in maternal mortality. Maternal age younger than 18 years or older than 34 years are risk factors for maternal mortality.[28] Women who are 18 years old or less are a particularly vulnerable group as they are still adolescent.[31] They are at greater risk of dying due to complications of hypertension, whereas women 35 years and older are at greater risk of dying of obstetric hemorrhage, ectopic pregnancies, embolism, acute collapse, pre-eclampsia and pre-existing medical disease.[3,28]

Many women do not plan their pregnancies and some pregnancies are unwanted.[3] Among young women, a 'hidden' pregnancy presents the women with higher risks than those with planned pregnancies.[3] Maternal deaths also peak at 25 – 30 years of age due to abortion and pregnancy related sepsis.[3]

2.3.2. Obstetric history

The first pregnancy or higher than the fourth (excessive fertility), and poor outcomes of previous pregnancies, such as fresh stillbirths and neonatal deaths, have been identified as high risk factors for the current pregnancy.[28]

2.3.3. Levels of maternity care (including antenatal care)

Different levels of care are required in order to have efficient functioning of the health care service for pregnant women and all other patients.[15] For the health system to be effective, clinics and hospitals need to share the patient load, where clinics manage low risk cases and hospitals the more difficult cases, which might need admission to hospital.[15] The hospitals are classified as level one, two or three, based on the services provided at the different levels of care.[14,15] A referral system is therefore necessary to ensure efficiency of the health services.[15] The doctors in level one hospitals therefore generally refer difficult cases to the specialists in level two hospitals.[15]

The following are the levels of maternity care in South Africa:

- Primary health care level
    - Clinic: Clinic normally functioning on weekdays, mainly doing antenatal care for low and intermediate risk women, postnatal care, referral of problems to hospital and management of emergencies, done by midwives and other nurses.
    - Community Health Centre: Functions like a clinic but has 24 hour delivery services (midwife obstetric unit/MOU) managed by midwives and advanced midwives and sometimes a visiting medical officer
- Level 1: District Hospital: Functions like a midwife obstetric unit but has medical officers and a visiting specialist
- Level 2: Secondary/Regional hospital: Has a fully functional maternity unit with medical officers, specialists and an intensive care unit (ICU)
- Tertiary, central or teaching hospital: Has all the above-mentioned facilities and super-specialists[15]

2.3.4. Antenatal care services

The United Nations, scientific societies and non-governmental organizations (NGOs) that are involved in the field of maternal health emphasize that the most efficient way of reducing the high MMR is by ensuring an acceptable level of antenatal care aiming at the early detection of pregnancy complications.[31] Early antenatal booking should be emphasized and strengthened at all times.[3] Pregnant women must be encouraged to book early i.e. before 20 weeks gestation, into antenatal care or as soon as they believe they are pregnant and receive routine antenatal care.[16,17]

Primary health care facilities in South Africa generally have high use, with 94% of pregnant women attending the antenatal clinic at least once.[33] However, non-attendance and delayed attendance at health institutions have been found to be a factor linked to MMR.[3] In the triennium 2005 – 2007, 17.7% of women who died did not attend antenatal care as compared to 18.1% in the previous triennium 2002 – 2004. Infrequent antenatal care was shown in 6% of the women as compared to 5.9% in 2002 – 2004.[3] Late antenatal booking i.e. first antenatal booking after 20 weeks gestation has also been found to be an important factor related to MMR. [27] An additional problem to these is delay in seeking medical help; and this was identified in 26.7% of the women in 2005/7.[3] Lack of transport to a health care facility during an acute episode is also a factor for

poor people.[33] The quality of antenatal care may need to be improved so as to avoid missed opportunities and prevent such deaths, especially in women with hypertension and/or HIV.[3]

2.3.5. HIV testing in pregnancy

Since HIV/AIDS is a major challenge for maternal deaths in South Africa, every pregnant woman should be offered an HIV test on the first antenatal visit or at subsequent visits if she was not tested during the first visit.[17] HIV testing and counseling services must be rendered ethically and involve development of support for efforts to improve the awareness and benefits of HIV counseling and testing[32] Confidentiality about the patient's HIV status must always be maintained among the team attending to the pregnant woman.[32] In South Africa, primary level services, such as antenatal care and prevention of mother-to-child transmission of HIV (PMTCT), are provided by nurses.[29] This includes early identification of pregnancy risks and supportive treatment for HIV and AIDS.[16,17,33] Antenatal care must be able to identify risk factors and manage them appropriately to prevent maternal deaths. These include HIV testing, and providing AZT from 28 weeks gestation or lifelong antiretroviral therapy (ART) depending on clinical indications.[17] There should be consistent commitment and ethical support to encourage partner participation and disclosure to significant others.[34]

The NCCEMD data show that 68% of women who died of infections unrelated to pregnancy (such as AIDS) attended antenatal care, and women who did not attend antenatal care had a four-fold risk of maternal death compared with the overall pregnant population.[27]

2.3.6. Intrapartum care

All deliveries should have skilled health care providers attending to them.[27] The partogram should be used for all women during labour for monitoring the wellbeing of the woman and that of the foetus. It is essential that HIV positive women be monitored vigilantly while in labour by use of the partogram as well. HIV positive women should continue with the antiretroviral regimen on which they are so as to prevent vertical transmission of HIV. Invasive procedures such as artificial rupture of the membranes, frequent per vaginal examinations, and episiotomies

should be avoided as they are risk factors for vertical transmission of the virus.[17] Supervision and audit with feedback to health care providers is important in order to improve quality.[27]

2.3.7. Timing of event leading to maternal death (postpartum period)

A high percentage of women arrive at a health facility already critically ill and moribund.[3] With regard to timing of a maternal death, it has been found that between 11% and 17% happen during childbirth; and between 50% and 71% happen in the postpartum period.[7] In South Africa in 2005- 2007, a high percentage (45.4%) of women died in the postpartum period, compared to 9% in early pregnancy, 36.7% antenatally and 8.7% intrapartum.[3] Postnatal care in South Africa has low coverage and has few data elements, unlike other maternity care services.[27] The fifth recommendation for saving mothers in South Africa is strengthening postnatal care as most of the deaths occur during this period.[3] Women and children need to be examined six hours post postpartum; and go to a health care facility within 6 days and again at six weeks postpartum for further examination;[3,16,31] and this should be incorporated into key performance areas of appropriate managers.[3] Services should be integrated in such a manner that the woman and her baby can be examined by the same health care practitioner at the same consultation.[40] Contraception should be emphasized at these examinations as a way of integrating reproductive health services.[3]

Maternal deaths in the postpartum period may be even more than those recorded, since some deaths occur outside the facility and cannot be known, unless a relative comes to report at the facility that the woman has died. Such deaths are not recorded as they are generally not reported.[3] There is also no postnatal follow-up by health care workers; and if these women do not present at the health care facility and die at home, they are not counted.[3]

Specifically, management of HIV positive women should continue in the postnatal period.[3] A holistic approach to treating these women should be ethical and include nutritional support.[3] All visits, including postnatal visits should be recorded on the DHIS.[3] The lack of postnatal care, especially for HIV positive women, may be a contributory factor to maternal deaths, as many women arrive at health facilities moribund postpartum.[3] This may be due to home based care, which may delay their arrival at a health facility; since HIV positive people are generally cared for at home.[3] The set of interventions for dealing with HIV positive pregnant and postpartum

women should include access to antiretrovirals.[11] The associated stigma and limited continuity of care means that often a patient's HIV status remains unknown, resulting in little or no crucial follow-up, e.g. antiretroviral therapy.

2.4 Causes of death

Maternal mortality remains the highest in Sub-Saharan Africa and Asian countries.[35] In 2005 the global maternal mortality rate was 400 per 100,000 live births, with the highest rate in Sub-Saharan countries.[35] Of these, 20% were due to indirect causes such as HIV/AIDS, malaria, anaemia and cardiovascular disease. HIV may affect pregnancy directly by resulting in AIDS and death. It may aggravate puerperal infection. Pregnancy may aggravate anaemia, TB and HIV progression,[12,36] as seen in Bangladesh and India, where a high percentage of pregnant women die during the first day of giving birth, and others die within two years of giving birth.[12] TB in postpartum women is associated with maternal mortality. Active screening for TB and INH prophylaxis should be implemented to prevent these maternal deaths.[36]

Another factor that plays an important role in the lives of pregnant women in Sub-Saharan Africa, coupled with AIDS, is gender power relations that keep the status of women low and render them powerless to make decisions about their own lives.[31] These women cannot demand better care or the right to control their own fertility.[31] Access to contraceptives is also poor for both married and unmarried women. Involvement of men is important to promote safe motherhood.[2,31]

The high maternal mortality rate in combination with the low prevalence of contraceptive methods is increasing the lifetime risk of maternal death.[31] It is also stated that young African women do not have optimal access to family planning services.[31] The first pregnancy or higher than the fourth pregnancy (excessive fertility) are also risk factors for maternal mortality.[28]

In South Africa, during 2005-2007 a total of 4077 maternal deaths were reported countrywide. This was an increase of 20.1% from the 3406 that was reported in the previous triennium 2002-2004.[3] Nearly forty four percent (43.7%) of all deaths were due to non-pregnancy related infections. Of these, HIV/AIDS accounted for 20.1%. Hypertension in pregnancy remains the highest direct cause of maternal deaths (19.1% of all deaths), followed by postpartum haemorrhage, antepartum haemorrhage and pregnancy related sepsis.[3] Among the indirect causes

of maternal deaths, the leading cause was non-pregnancy related infections, followed by AIDS and pre-existing maternal diseases.[3] The most common non-pregnancy related infections were AIDS, pneumonia, TB, and meningitis.[3] Integration of HIV and AIDS programs was recommended to be most important in seeing to the wellbeing of the patients.[27] All HIV positive pregnant women should be screened for TB and treated accordingly.[1,27] For pregnancy-related complications different interventions are recommended for the community, basic antenatal care (BANC), basic intrapartum care, emergency obstetric care and postnatal care.[27] There is no single intervention that will significantly decrease maternal mortality. However, there is consensus that a strong health system, skilled delivery attendants, and women's rights are necessary to do so.[7]

2.5. HIV/AIDS and maternal mortality

HIV/AIDS contributes to maternal mortality in much of the developing world. In Latin America and the Caribbean, where two million people live with HIV/AIDS, a programme of action has been started so as to reduce maternal deaths due to HIV/AIDS.[17] In India, TB co-infection with HIV was found to double the risk of death in pregnant women.[19] Prophylaxis with Isoniazid (INH) greatly reduces the risk.[23] In the African Region, maternal mortality rate is very high and the main risk factors for these deaths include HIV/AIDS and STIs.[28] Malawi has the highest maternal mortality rate in the world, at 807 per 100 000 live births, where the main cause of death is HIV/AIDS. Maternal deaths due to HIV/AIDS are classified as avoidable as both the community and the health system can intervene to prevent HIV infection and also to manage the condition as soon as it is detected.[20] The community is advised that everybody should know their HIV status and lead healthy lifestyles.[12]

Since HIV has reached epidemic levels in South Africa, annual antenatal HIV and syphilis seroprevalence surveillance is conducted to monitor the prevalence of the diseases. It is conducted at selected sentinel sites and is anonymous. The 2009 findings from the antenatal surveillance suggest that HIV prevalence among pregnant women may be plateauing but is still high.[43] The province with the highest prevalence was KwaZulu Natal at 39.5%, followed by Mpumalanga and Free State at 34.7% and 30.1% respectively.[8]

In South Africa, the Saving Mothers Report 2005-2007 states that AIDS contributed to 55.9% of maternal deaths due to non-pregnancy related infections, and 22.5% of all maternal deaths.[3] These results are corroborated by other studies, for example, one conducted in Charlotte Maxeke Hospital, Johannesburg, which found HIV/AIDS to be the most common cause of maternal deaths, accounting for almost half of all maternal deaths.[4]

In South Africa, from 2005 to 2007, HIV infection among pregnant women was associated with almost a ten times increase in the risk of maternal death.[3] Many women still find out about their HIV status when they are already pregnant.[15] It is also likely that by the time they present at a health facility, they are already ill.[3] HIV testing among pregnant women remains the most important programmatic weakness.[4]

The maternal mortality ratio in South Africa for HIV negative women in 2005-2007 was 34 per 100000 live births, similar to middle income countries such as Brazil, Argentina and Thailand. In South Africa, HIV prevalence among pregnant women has been stable from 2006 – 2009.[8] However, in 2005-2007, AIDS was the leading cause of maternal deaths, accounting for 52.9% of the deaths.[3] To decrease the maternal deaths, the top priorities are HIV prevention and care and improvement of obstetric care.[32] HIV testing remains a critical factor among pregnant women. If the woman's HIV status is unknown, many opportunities for preventing maternal deaths are missed. Hence, recommendation 3 for saving mothers states that all pregnant women should be offered information on screening for, and appropriate management of non-pregnancy related infections, such as HIV/AIDS and TB.[3] Tuberculosis is often associated with AIDS. The associated stigma and no continuity of care means that often a patient's HIV status remains unknown, resulting in little crucial follow-up e.g. Antiretroviral drugs and continual treatment for mothers.[27]

In South Africa in 2005-2007 of all maternal deaths, 22 (17.6%) had an unknown HIV status.[3] If the HIV status is unknown, women who are HIV infected miss the opportunity of effective therapy that will save their lives.[3] There is a possibility that many of the untested women were in fact HIV positive.[3] The increasing availability of antiretroviral therapy makes many of the deaths due to AIDS clearly avoidable.[3]

In South Africa from 2005 to 2007 it is women in the 19-34 years age group who were mostly infected with HIV.[3,11] According to Carrera, 2008, young African women have a poor education and limited economic opportunities. Moreover, they do not have access to family planning services.[35] Knowledge of HIV/AIDS and prevention methods is consistently high among South African adolescents, but coverage of interventions for HIV/AIDS prevention and treatment decrease along the continuum of care.[28]

2.6. Antiretroviral therapy in pregnancy

According to UNICEF, in 2007 more than 2 million people in low and middle-income countries were receiving antiretrovirals. Eleven percent of HIV positive pregnant women were receiving antiretrovirals. This was largely attributed to low uptake of testing for HIV globally.[35] Countries in different regions of the world are increasing access to antiretrovirals. For example, in December 2006 1.3 million people (28% of those who need antiretrovirals) in Sub-Saharan countries were receiving them.[37] Coverage varied from region to region. For example 6% in North Africa and the Middle East, 15% in Eastern Europe and Central Asia and 72% in Latin America.[35]

All HIV positive pregnant women require additional services in addition to routine antenatal care. These include additional procedures such as CD4 count, HIV clinical staging, clinical screening for TB and STIs, alanine aminotransferase and initiation of antiretroviral prophylaxis or treatment.[16] As soon as a woman tests HIV positive, a CD4 count must be done on the same day. A follow-up visit needs to be done after a week so as to ensure prompt initiation of ART if eligible.[17]

The Department of Health introduced Comprehensive Care Management and Treatment (CCMT) for people living with HIV and AIDS in 2004.[23] Part of this programme was the provision of antiretrovirals to all people living with HIV who were eligible for ART. The therapy provides a specific regime for pregnant women. Antiretroviral drugs slow down the progression of HIV and the course of disease. These drugs have also been used in pregnancy to prevent HIV transmission from the mother to her baby.[12] They inhibit viral replication so that the virus causes less immune

damage.[12] Antiretroviral drugs must be prescribed and taken strictly as directed to be effective.[12,14]

In South Africa, since 2002, the government has provided single dose Nevirapine (sdNVP) prophylaxis to pregnant women in the public health facilities and highly active antiretroviral therapy (HAART) was made available from 2004 for pregnant women with a CD 4 count of less than 200.[37] UNICEF also recommends that services for preventing mother to child transmission of HIV should be scaled up so as to increase the testing rate and access to antiretrovirals by HIV positive pregnant women.[35]

It is believed that more aggressive antiretroviral therapy for the mother, which allows for viral suppression to undetectable levels, may be safe and provide significant additional benefits. Prevention of opportunistic infections and psychosocial support is important.[39] In 2001 more than 160 000 women in the USA were infected with HIV.[38] Initially screening was aimed at preventing HIV from mother to child. In South Africa, in 2002 the treatment activists advocated successfully in the Constitutional Court that the South African government should make nevirapine available to pregnant women for preventing mother to child transmission of the virus.[40] For the mother to receive nevirapine she must be tested positive for HIV first. This is already a pathway for her to receive antiretrovirals if she is eligible.[41] Antiretroviral therapy (ART) for the mother has been found to be beneficial for both the mother and the baby as it prevents transmission from mother to child as well. Antiretroviral drugs are given during the antenatal period, intrapartum period and postpartum as well for the survival of the mother.[17] In a study conducted in Cape Town, South Africa, it was found that the lack of knowledge of serostatus prior to conception, reluctance to test in pregnancy, fear of disclosure and denial post-diagnosis; and under-utilization of antenatal care, were the most important patient driven barriers to accessing antiretrovirals.[33] Another barrier identified was loss to follow-up after a patient was diagnosed HIV positive, even though pregnant women are allowed to start antiretrovirals earlier than the general population.[43] The loss to follow-up generally occurred when a patient would not come back for a CD 4 count; or come back to the clinic to commence antiretroviral therapy.[43]

It is anticipated that rapid assessment of a pregnant woman's eligibility for antiretroviral therapy and accelerated preparation and initiation of this treatment will improve maternal survival among HIV positive pregnant women and consequently reduce overall maternal mortality.[4] It is

important to avoid unnecessary delays in initiating lifelong ART. Expansion of antiretroviral treatment to primary health care facilities was an important milestone for reducing unnecessary referrals to hospitals, and bringing HIV care closer to patients.[4] Pregnant women should be staged to determine indication for ARV prophylaxis, according to WHO clinical staging and CD4 cell count.[16] According to the PMTCT Guidelines, 2008, antenatal Zidovudine (AZT) was to be initiated at 28 weeks gestation to reduce mother-to-child transmission of HIV, or as soon as possible thereafter, unless the woman is severely anaemic i.e. Hb 8g/dl or if the woman is clinically pale. Iron and folate supplementation should be provided to all antenatal women routinely. Women should return monthly for AZT.[16,17] HIV positive pregnant women who are eligible for ART should start lifelong ART as early as possible and continue throughout pregnancy, delivery and for the rest of their lives.[14] Lifelong ART benefits maternal health and contributes to maternal survival and reduces mother-to-child transmission.[16,42] The initial framing of the PMTCT programme as a paediatric issue may have lowered its acceptability for women who did not perceive such programmes as beneficial for themselves. Other commonly cited barriers to uptake of PMTCT are weak health systems, poor communication among health workers and pregnant women, and fear of stigma.[3,6]

According to the second South African report to the United Nations General Assembly special session: Declaration of Commitment, the South African government had committed to creating a socio-political context within, that aims to mitigate HIV infections and AIDS defining conditions.[26] This is done so that if any person, including pregnant women, is found to be HIV positive they should be identified and provided with appropriate care, treatment and support.[17,23] This service is provided at antenatal clinics in the public service. Voluntary counseling and testing, condom use, prevention of mother to child transmission of HIV (PMTCT), and combination antiretroviral therapy have also been recommended as interventions within the Millennium Development Goals (MDGs) for reducing maternal deaths.[25,26] Millennium Development Goals (MDGs) involve the reduction of maternal deaths (MDG 5) and reduction of HIV transmission (MDG 6).[3]

The Department of Health in South Africa started providing the community with condoms free of charge, as well as antiretrovirals (ARVs) for those that already had HIV and were eligible for

ART in 2000.[20] In Sedibeng ARVs for pregnant women were introduced in 2002 as a single dose of nevirapine.[13]

2.7. Facilities where maternal deaths occur

A large number of maternal deaths occur in hospitals.[27] The highest in the world is in Africa.[27] In South Africa, in 2005-2007, 1707 maternal deaths in hospitals were due to non-pregnancy related infections, which was an increase from 1223 deaths in 2002-2004. Deaths that occurred outside health facilities were not recorded since none were reported.[3] In 2005-2007, a large proportion of deaths due to non-pregnancy related infections occurred in level 1 and level 2 hospitals, as an increase from 2002-2004. In level 3 hospitals, these deaths accounted for 21.8% as compared to 31.1% in 2002-2004. The lack of skills in caring for these women may contribute to the women being transferred to level 2 hospitals, hence higher numbers of deaths at that level of care.[3] It may also be that women with non-pregnancy related infections are not deemed necessary for transfer to a higher level of care.[3] The lack of facilities for intensive care in level 1 facilities for intensive care and monitoring may be a reason for increased maternal mortality in those facilities.[3] "It may be that by the time these women access health facilities they are already critically ill and not fit for higher transfer, especially in the light of home based care. The paucity of documentation and clinical care may relate to a greater concern; that these women may have been abandoned in the belief that death was inevitable and there was no possibility of reversing that" (p.180).[3] Such women could have been saved had they received timely interventions such as antiretrovirals. They are generally admitted for normal delivery and then complicate.[27]

2.8. National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD)

South Africa has a National Committee on Confidential Enquiries into Maternal Deaths (NCCEMD), which was appointed and established in October 1997 by the then Minister of Health.[1] This was in recognition of the need to reduce maternal mortality in South Africa. Maternal deaths were made notifiable events on 1 October 1997, in terms of the National Policy

Health Act, number 116 of 1990.[1] The NCCEMD is responsible for the confidential enquiries into maternal mortality in South Africa, and in so doing has developed a reporting system for maternal deaths. The enquiries are conducted by a multi-disciplinary team in a systematic and anonymous manner to identify the numbers, causes and avoidable or remediable factors associated with the maternal deaths. The lessons learnt from each maternal death provide evidence of where the main problems lie in overcoming maternal mortality. The task of the NCCEMD is to make recommendations, based on the confidential study of maternal deaths to the Minister of Health such that the implementation of the recommendations will result in a decrease in the maternal mortality. Health sector response to these, guidelines and community action are then required to prevent and reduce maternal mortality.[3]

2.9. Process of notifying a maternal death

This is a defined process which starts as soon as a maternal death has occurred. A maternal death notification form is completed and sent to the provincial office with a copy of the woman's death records within seven days of the maternal death. The provincial Maternal, Child and Women's Health (MCWH) co-ordinator informs the secretariat of the NCCEMD that a death has occurred and a unique identification number is allocated to the death. The documents are then forwarded to a provincial assessor team, who will produce the assessor report. This team will then provide information on the primary, final and contributory causes of death. They will further identify if there were avoidable factors, missed opportunities or any other aspects of sub-standard care in the maternal death. The assessors must complete and return all documentation to the Province within 30 days. All documentation is then sent to the NCCEMD for collation and analysis, from which the Saving Mothers reports are produced. Once a report is accepted, all data is destroyed. The NCCEMD produces detailed reports every three years, which are then distributed throughout the country.[1,2,3]

2.10. Confidential enquiries into maternal deaths

Every three years the Department of Health publishes a report compiled by the NCCEMD on the Confidential Enquiries into Maternal Deaths, in which the leading causes of maternal deaths are discussed.[1,2,3] The reports are derived from the maternal death notifications, which are produced by each facility where the death has occurred. Each report provides the recommendations for

saving mothers. Currently there are 10 key recommendations for saving mothers. One of these is recommendations sets as a target that "all institutions that perform maternity care should provide comprehensive care management and treatment of HIV and AIDS patients".[3]

Through the lessons learnt from each woman's death, and through aggregating the data, confidential enquiries provide evidence of where the main problems in overcoming maternal mortality lie and an emphasis of what can be done in practical terms, and highlight the key areas requiring recommendations for health sector and community action as well as guidelines for improving clinical outcomes.[20]

2.11. The ten key recommendations for saving mothers

The NCCEMD has developed the following ten key recommendations for saving mothers:

1. Protocols on the management of important conditions causing maternal deaths must be available and utilized appropriately in all institutions where women deliver. All midwives and doctors must be trained on the use of these protocols.
2. Training should be provided for all health professionals working in maternity units in practical obstetrical and surgical skills. Skills should be provided in anaesthesia, especially in level one institutions.
3. All pregnant women should be offered information on screening for, and appropriate management of non-pregnancy related infections and common medical disorders.
4. Criteria for referral and referral routes must be established and utilized appropriately in all provinces. Emergency transport facilities must be available for all pregnant women in need (at any site).
5. Postnatal care must be strengthened.
6. Staffing and equipment norms must be established for each level and for every health institution concerned with the care of pregnant women.
7. Blood for transfusion must be available at every institution where Caesarian Sections are performed.
8. Contraceptive use must be promoted through education and service provision.
9. The number of deaths from unsafe abortions must be reduced.

10. Women, families and communities must be empowered, involved and participate actively in activities, projects and programmes aiming at improving maternal and neonatal health as well as reproductive health in general.[1,2,3]

2.12. Health systems factors in maternal mortality

For any health system to function optimally, different parts of the system need to be closely linked and work harmoniously. The following are the building blocks of an ideal health system,[46] and can be applied to improving all health outcomes, including maternal mortality reduction:

2.12.1. Service delivery

Good health services are those that deliver effective and efficient quality personal and non-personal health services to those who need them.[43] Globally, HIV/AIDS and poor implementation of existing packages of care are the main reasons for the lack of progress towards the MDGs [33] For the health MGDs to be achieved, in particular, MDG 5, for reduction of maternal mortality, the following factors within a health system are considered:

- Packages: Primary health care level service packages that exist for maternal health care are contraception, antenatal care, PMTCT and antiretroviral therapy for those that are eligible, supervision of deliveries, and postnatal care. These facilities generally have high use, with 94% of pregnant women attending antenatal care at least once.[33] However, the timing, number and content of these visits are not optimal for all women.[27] Postnatal care is very limited even though many women die during this period. [31] Little information exists in the postnatal period and for the characteristic cascade of HIV interventions through the years.[27] The health care packages form a basis for continuum of care throughout the life cycles of mothers, babies and children.[27] Routine care during the postnatal period is scarce in South Africa, like in most developing countries.[27] This needs strong links between the community and the health facility to encourage healthy practices during this period in the home.[27] The present policy promotes a facility visit within six days of birth and again at six weeks, but a few health care providers are aware of this policy.[27]

- Management: Although guidelines and training packages have been developed, their implementation is not monitored.[33] Larger shifts in health system need government stewardship, district level management, monitoring and an expressed focus on addressing inequity. Intersectoral collaboration is also necessary with commitment from Education, Transport and financial stakeholders.[27] A functioning supervisory and management system have been common factors in local interventions that have improved the performance of health care workers.[27]
- Safety and quality: Despite a high coverage of health care packages for women and children in South Africa, including antenatal care, coverage of some important effective interventions and quality of care within existing packages is low.[27] Hence, closing the coverage gap is important and there are opportunities to save lives of those that are already receiving care.[25] Audits are therefore helpful in improving quality.[27] Quality care is also dependent on the number of staff with the appropriate skills mix. South Africa has a shortage of health professionals and inequitable deployment of existing staff, with people moving to areas where they are comfortable, mostly private sector or urban areas.[27]
- Demand for care: This can be achieved if at community level promotion of healthy behaviours, such as safe sex and knowing ones's HIV status and that of their partner, and appropriate care seeking are regarded as important. This is currently happening but has not been resourced in a systematic way.[33] Contracting with NGOs and the private sector, and other government organizations with a focus on service delivery for saving mothers can be beneficial as well.[46] Social marketing to change behaviours and use of health products such as condoms would be beneficial for community empowerment.[46]

2.12.2. Health workforce

National workforce policies and investment plans: The scarcity of human resources, health facility infrastructure, and supply systems can be so fundamental that although local processes can be improved, the effect at the population level can be restricted.[27] In recent years, one of the strategies for improving health services and strengthening the health system was to improve rewards to health care workers to improve productivity; such as performance-related pay and

incentives, along with deploying community health workers and engaging communities in their health care. [45,46] Re-organizing outreach workers, including changing the use of home-based and health post workers, and changing their professional requirements or volunteer status.[47] Saving mothers requires skilled birth attendants and therefore in-service training is necessary.[47]

2.12.3. Health Information Systems

Information on the direct causes of maternal mortality as well as the underlying and avoidable causes is important in reducing maternal mortality.[33] Currently in South Africa there is no reliable data for births, deaths and causes of deaths.[76] However, according to the Saving Mothers Report 2005-2007, 46% of maternal deaths were due to non-pregnancy related infections, of which HIV was the highest.[3] Hence, to decrease maternal mortality the top priority is to prevent HIV infection.[33] Other maternal deaths are due to community factors at family level. Examples of these are delays in recognizing the danger signs and seeking care. This calls for education of mothers and families so that many lives can be saved.

- Facility and population-based information and surveillance systems: Maternal deaths are counted through the process of the NCCEMD and are an important source of data for action in South Africa.[27] Currently South Africa is the only developing country to have such a process, which is regarded as crucial for maternal survival and quality of care.[27] The process identifies trends and areas for improvement.[25] Saving Mothers Reports are produced from these.
- Global standards. The WHO sets global standards that need to be observed by all. An example of these is the Millennium Development Goals, where goals 4, 5 and six focus on health. In particular these goals focus on saving mothers and children. The WHO has further developed guidelines such as the antiretroviral guidelines in adults and adolescents for saving pregnant women who are HIV positive.

2.12.4. Medical products, vaccines and technologies

- Norms: Quality maternal health services are dependent on adequate infrastructure and equipment, and supplies such as drugs and disposables.

- Policies: New legislation and policy such as the Choice on Termination of Pregnancy Act had an almost immediate effect on women's health by reducing maternal mortality from unsafe abortions.[33] Previously there were large and mostly uncounted numbers of maternal deaths due to septic abortions; and this indicates some of the ways in which women bore the brunt of effects of apartheid in South Africa.[33]
- Equitable access: To increase access to service, in South Africa 1300 primary health care clinics were built and user fees were removed for maternal and child health services at primary health care level and in district hospitals.
- Quality: Administrators need to have a quality improvement mindset and process (with appropriate norms and standards), pre-service and in-service training, and supervision.

2.12.5. Financing

National health financing policies: After 2004, public sector expenditure on health has increased significantly and this has had a real impact on maternal health.[33] Removal of user fees was implemented for increasing service access for the poor.[46] Subsidies for the poor have also been recommended,[46] but in South Africa this would mainly apply to babies and children.

2.12.6. Leadership and governance

- Health sector policies: The almost unabated spread of HIV can be attributed to weak political leadership, underlying social dislocation and inequality and an uneven and fragmented health system. These are the underlying reasons for persistently high maternal mortality rates with avoidable causes.[46] The National Department of Health has distributed guidelines for maternity care in South Africa since 2007. These guidelines contain protocols for maternity care as well, which should be followed for saving mothers.[15] All facilities rendering maternity services should have them, but from time to time these are not followed.
- Harmonisation and alignment: Referral systems are mostly sub-optimum, and many patients bypass lower levels and access higher levels of care. This leads to secondary and tertiary levels of care providing a high proportion of care that could have been provided by district hospitals.[46]

- Oversight and regulation: Delegation of authority for setting priorities, allocating and managing financial and human resources, and taking other key decisions to provincial, district and local health authorities can improve oversight and regulation of health services.[46] Community engagement, including new ways to involve communities in the oversight, planning and management systems rather than on technical programmes or specific conditions, approaches to give voice to community concerns, and public disclosure of information can improve transparency and accountability.[46]

South Africa has three important gaps in health care. These are coverage gap, quality gap and equity gap.[27] Achievement of the health MDGs in South Africa cannot be achieved without addressing inequity. Some modifiable factors outside the health facilities are an indication that the health care system alone is not sufficient to save lives; wider accountability is required.[27] Audits are especially useful for quality improvement, but can also be used to identify and target inequities in direct provision of care. However, addressing inequity and social determinants requires high level commitment and intersectoral action.[27] Knowledge of HIV/AIDS and prevention methods among South African adolescents is high, but coverage of interventions decreases along the continuum of care. The associated stigma and no continuity of care means that often a patient's HIV status remains unknown, resulting in little crucial follow-up e.g antiretroviral therapy.[27]

2.13. Summary and conclusion of literature review

Maternal mortality is a health indicator of every nation. The WHO is leading the process in the reduction of maternal mortality. An example of its initiatives is the Millennium Development Goals, especially MDG 5. The target set is reduction by 75% from the year 2000 to 2015. There has not been a reduction in MMR in South Africa since the late 90s. The high prevalence of HIV/AIDS has been the main factor in the continued high-levels of MMR.

South Africa has established a National Committee for Confidential Enquiries into Maternal Deaths. This committee has provided a framework for the process of notifying a maternal death. For every maternal death there is a process of confidential enquiry into the death, which should provide a learning curve for all health care workers so that such an incident does not recur.

Furthermore, this committee has developed ten key recommendations for saving mothers, which should be observed by all.

The WHO has also prescribed health systems factors that should be observed for better health outcomes and eventual reduction in maternal mortality. These include the management of all available resources for saving mothers. The modifiable factors in the reports produced when using facility data draw attention to family knowledge contributing to unhealthy behaviours and delay in seeking care.[27] Health care providers, administrators and policy makers can strengthen links with the community, including solutions involving empowerment and addressing equity issues.[27] The importance of engaging the community in care in a partner-defined quality process, rather than limiting the solutions to the health facility, can be effective.

CHAPTER 3 METHODOLOGY

3.1. Introduction

This chapter describes the way the study was conducted. It describes study design, which includes study site and study population. The sampling strategy and the sample are also described. A description of the data collection strategy and the data collected is provided. It explains how the pilot study was conducted and how the data was managed and analysed. Finally, the ethical considerations for the study are described.

3.2. Study design

A cross-sectional, descriptive study was carried out. All records of maternal deaths were reviewed from a five year period (April 2004 – March 2009), at three hospitals in Sedibeng District, Gauteng Province. The national antenatal care policy and guidelines on maternity care in South Africa were reviewed to identify the key components of the required care for HIV positive pregnant women. These were used as criteria against which the results of the study were compared.

3.2.1. Study site

Sedibeng District was identified because the researcher is responsible for maternal health services in the district and can therefore easily access the records. Sedibeng is situated in the southern part of Gauteng Province, South Africa, with the Vaal River as the border between Gauteng and Free State Province. Sedibeng has a population of 897325 people, of which 83% of the population is uninsured and therefore use public health services.[13] The district is divided into three sub-districts, namely, Emfuleni, which is the biggest of the three, Midvaal and Lesedi sub-districts. There are seven facilities where women deliver in the district, three hospitals (two at level 1 [one] and one at level 2[two]) and four midwife obstetric units (MOUs). Two hospitals (level 1 and level 2) and all four MOUs are in Emfuleni Sub-District. One hospital (level 1) is situated in Lesedi Sub-District. Furthermore, there are 37 clinics in Sedibeng, of which 36 provide antenatal care services, and their clients deliver in the MOUs and hospitals. There are

also ten mobile clinics, which also provide antenatal care services.[13] Any complicated pregnancies are referred from MOUs to hospitals for delivery. Therefore maternal deaths from the three hospitals, Sebokeng, Kopanong and Heidelberg are included in this study.

3.2.2. Study population

The study population was all maternal death records from April 2004 to March 2009. All records of maternal deaths from the three hospitals were eligible for inclusion in the study. All maternal deaths over this study period occurred at three hospitals: Sebokeng, Kopanong and Heidelberg.

3.3 Sampling strategy and sample

All maternal death records of women from the three hospitals during the identified period were included in the study. There were 145 maternal deaths at these three facilities over the study period. One hundred and twenty-five records were used in the final analysis, since the records from the other 20 could not be located. The inclusion criteria for selecting the records were that they should be classified as a maternal death. The death of the woman should have occurred while pregnant or within 42 days of termination of pregnancy from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

3.4 Method of data collection

The data collection was conducted by the researcher. In two hospitals, clerks pulled the records for the researcher, but in another she had to go and pull them herself, with the assistance of one of the clerks. The reason for this was that despite the request, the files had not been pulled and kept aside for her to use. Records from each facility were identified based on the patient identification number linked to the death record. Unique identification numbers were used for identifying the records so as to maintain confidentiality.

The researcher completed a checklist for each record (see Appendix B). The checklist captured the following data from the records:

- Date and cause of death
- Qualifications of attending provider Socio-demographic characteristics of the women e.g. age, employment, household income
- Obstetric history e.g. gravidity and parity
- Mode of delivery i.e. Normal vertex delivery (NVD)/ assisted delivery/ Caesarian Section
- Antenatal care
- HIV management
- Co-morbidity

3.5 Pilot study

A pilot study was conducted with the research supervisor, on five maternal death records from Thembisa Hospital to test the face validity of the data collection tool. As a result of the pilot study several items were changed or omitted. For example, the initial tool included an item on the educational attainment of the women but this data was not available in the patient files.

3.6 Data management and analysis

Data from the record review was entered into an Excel spread sheet. Once entered the data were cleaned. Errors in data entry were identified and corrected by going back to the original data collection tool. The data were primarily analysed in Excel and some additional analysis was conducted using Stata 10. Basic descriptive statistics such as proportions were generated to describe the characteristics of the HIV positive women. Characteristics of the women were described by their HIV status. Continuous data such as age and income were later recoded into categories (e.g. ≤18 years. 19-34 years and ≥ 35 years). Other categorical data included HIV status, relationship status, cohabitation with partners and employment status.

The data were compared to the PMTCT guidelines for 2008. The extent to which there was coverage for each aspect of care is described. This classification assisted in identifying missed

opportunities, which were identified as areas of focus for improving the antenatal care of HIV positive pregnant women.

3.7 Ethical considerations

Ethics approval was obtained from the Ethics Committee at the University of Witwatersrand. The clearance number for the study is M081151 and is available in Appendix C. The Research Ethics Committee of the Gauteng Department of Health was also asked to provide permission for the study to continue. (See Appendix A for a copy of the letter to request permission to conduct the study. The letter was adapted for distribution to all the above-mentioned relevant stake holders). The CEOs of Sebokeng, Kopanong and Heidelberg Hospitals gave permission to review the maternal death records for the identified period. No identifying information about the patient was captured on the data coding sheet. A unique ID number was generated and used. All data was kept in a locked cupboard and only the researcher and supervisor had access to the completed data coding sheets.

CHAPTER 4: RESULTS

4.1. Introduction

This chapter provides a description of maternal deaths in Sedibeng District between April 2004 and March 2009. All the data has been disaggregated by HIV status so that the focus can be on those who were HIV positive. The antenatal and hospital care received by the women before they died is described. There were a total of 145 maternal deaths during the period of study, of which 20 records could not be located. Results are presented on 125 records.

4.2. Description of the women who died (maternal deaths)

One hundred and twenty-five of the 145 maternal deaths records could be located in Sedibeng District from April 2004 to March 2009 and were included in the analysis. A further breakdown of the deaths is reported in the sections that follow.

4.2.1. HIV status

Table 1 shows the HIV status of the women who died. Twenty-seven (21.6%) women were HIV negative 76 (60.8%) were HIV positive, and the remaining 22 (17.6%) had an unknown HIV status.

Table 1: HIV status

HIV status	n	Percentage (%)
Negative	27	21.6
Positive	76	60.8
Unknown	22	17.6
TOTAL	125	100

4.2.2 Demographic characteristics of the women

The following tables describe the demographic characteristics of the women who died by HIV status.

4.2.2.1. Age group by HIV status

Table 2 shows the age groups of the women who died by HIV status. Of the HIV negative women, half (51.9%) were 19-34 years of age and the remainder (48.1%) were 35 years and older. Of the women who were HIV positive, two (2.6%) were aged 18 years or younger, 56 (73.7%) were 19-34 years old and 18 (23.7%) were 35 years old and above. Of the women with an unknown HIV status, one (4.5%) was 18 years or younger, 14 (63.7%) were 19-34 years old and seven (23.7%) were 35 years old and more.

Table 2: Age group by HIV status

Age group	**HIV-**		**HIV+**		**Unknown**		**Total**	
	n	**%**	n	**%**	n	**%**	n	**%**
18 years and below	0	0	2	2.6	1	4.5	3	2.4
19 – 34 years	14	51.9	56	73.7	14	63.7	84	67.2
35 years and older	13	48.1	18	23.7	7	31.8	38	30.4
TOTAL	27	21.6	76	60.8	22	17.6	125	100

4.2.2.2. Marital and cohabitation status of the women by HIV status

Table 3 shows that more than half (54.7%) of the HIV positive women and those with an unknown HIV status (61.9%) were married. By contrast nearly three-quarters (73.1%) of the HIV negative women were unmarried. Of the HIV negative women, 22 (84.6) were cohabiting with their partners. Of the HIV positive women, 42 (57.5%) were cohabiting with their partners. Of the women with an unknown HIV status, 12 were cohabiting with their partners and 9 (42.9%) were not.

Table 3: Marital status of the women by HIV status

Marital status	HIV-		HIV+		Unknown		Total	
	n	%	n	%	n	%	n	%
Married	7	26.9	41	54.7	15	61.9	63	50.4
Unmarried	19	73.1	34	45.3	9	38.1	62	49.6
Cohabitation status								
Cohabiting	22	84.6	42	57.5	14	57.1	78	62.4
Not cohabiting	4	15.4	31	42.5	12	42.9	47	37.6

4.1.2.3. Employment status and household income by HIV status

Table 4 shows the employment status and household income of the women who died. Of the HIV negative women, three (11.1%) were employed and 24 (88.9%) were unemployed. Of the HIV positive women, 14 (18.7%) were employed and 61 were unemployed. Of the women with an unknown HIV status, four (17.4%) were employed and 19 (82.6%) were unemployed. In total, 21 (16.8%) women were employed.

Of the HIV negative women, 14 (51.8%) reported no household income. Of the HIV positive women, 23 (30.7%) reported no household income. Of the women with an unknown HIV status, six (26.1%) had no household income. Of the HIV negative women, 11 (78.6%) had a household income of R1.00 – R1000.00, two (14.3%) had a household income of R1001.00 – R5000.00, one (7.1%) had a household of R5001 – R10000.00. Of the HIV positive 43 (79.6%) had a household income of R1.00 – R1000.00, eight (14.8%) had an income of R1001.00 – R5000.00 and one (1.9%) had an income of R5001.00 – R10000.00. Of those who had an unknown HIV status, 14 (82.4%) had a household income of R1.00 –R1000.00 and three (17.6%) had an income of R1001.00 – R5000.00.

Table 4: Employment status and household income by HIV status

Employment status	**HIV-**		**HIV+**		**Unknown**		**Total**	
	n	**%**	n	**%**	n	**%**	n	**%**
Employed	3	11.1	14	18.7	4	17.4	21	16.8
Unemployed	24	88.9	61	81.3	19	82.6	104	83.2
Household income								
Income	14	51.8	52	69.3	17	73.9	83	66.4
No income	13	48.2	23	30.7	6	26.1	42	33.6
R1 – R1000	11	78.6	43	79.6	14	82.4	68	81.9
R1001 – R5000	2	14.3	8	14.8	3	17.6	13	15.7
R5001 – R10000	1	7.1	1	1.9	0	0	2	2.4

4.2.3. Obstetric history

Table 5 shows the gravidity and parity of the women who died.

4.1.3.1. Gravidity and parity of the women by HIV status

Of the HIV negative women, one (3.8%) was in her first pregnancy, ten (37.0%) were in their second pregnancies, another ten (22.2%) in their third and six (37.0%) were in their fourth or more pregnancies. Of the HIV positive women, 14 (18.4%) were in their first pregnancies, 28 (36.8%) in their second, 18 (23.7%) in their third and 16 (21.1%) in their fourth or more pregnancies. Of the women who had an unknown HIV status, six (27.2%) were in their first pregnancies, eight were in their second (36.4%), four (18.2%) in their third and another four in their fourth and more pregnancies.

Of the women who were HIV negative, 42.3% (N=28) had one child, 38.5% (N=18) had two children, 7.7% had three children and 11.5% had four or more children. Of the HIV positive women, 45.2% had one child, 29.0% had two children, 17.7% had three and 8.1% had four or more children. Of those who had an unknown HIV status, 56.2 women had one child, 18.8% had two children, 18.8 had three children and one 6.2% had four or more children.

Table 5: Gravidity and parity of the women

Gravidity	**HIV-**		**HIV+**		**Unknown**		**TOTAL**	
	n	%	n	**%**	n	**%**	n	**%**
1	1	3.8	14	18.4	6	27.2	21	16.8
2	10	37.0	28	36.8	8	36.4	46	36.8
3	10	37.0	18	23.7	4	18.2	32	25.6
4+	6	22.2	16	21.1	4	18.2	26	20.8
TOTAL	27	21.6	76	60.8	22	17.6	125	100
Parity								
0	1	3.7	14	18.4	6	27.3	21	16.8
1	11	40.7	28	36.8	9	40.9	48	38.4
2	10	37.0	18	23.7	3	13.6	31	24.8
3	2	7.4	11	14.5	3	13.6	16	12.8
4+	3	11.1	5	6.6	1	4.5	9	7.2
TOTAL	27	21.7	76	60.7	22	17.6	125	100

4.3. Description of the facilities where the maternal deaths occurred

4.3.1. Hospitals and numbers of maternal deaths

Table 6 shows that of the HIV negative women, 88.9% (n=24) died in Sebokeng Hospital and 11.1% (n=3) in Kopanong Hospital. Of the HIV positive women, 77.4% (n=59) died in Sebokeng Hospital, 9.2% (n=7) in Kopanong Hospital and 13.2% (n=10) in Heidelberg Hospital. Of the women with an unknown HIV status, 90.9% (n=20) died in Sebokeng Hospital and 9.1% (n=2) in Heidelberg Hospital.

Table 6: Hospitals and numbers of maternal deaths

Hospital	HIV-		HIV+		Unknown		TOTAL	
	n	%	n	%	n	%	n	%
Sebokeng	24	88.9	59	77.6	20	90.9	103	82.4
Kopanong	3	11.1	7	9.2	0	0.0	10	8.0
Heidelberg	0	0	10	13.2	2	9.1	12	9.6
TOTAL	27	100	76	100	22	100	125	100

4.3.2. Level of hospital care received

Table 7 shows the level of health care received by the women before they died. Of the HIV negative women, 11.1% were in a level one hospital and 88.9% in a level two hospital. Of the HIV positive women, 22.4% were in a level one hospital and 77.6% in a level two hospital. Of the women with an unknown HIV status, 9.1% were in a level one hospital and 90.9% in a level two hospital.

Table 7: Level of hospital care received

Hospital level	HIV-		HIV+		Unknown		TOTAL	
	n	%	n	%	n	%	n	%
1	3	11.1	17	22.4	2	9.1	22	17.6
2	24	88.9	59	77.6	20	90.9	103	82.4
TOTAL	27	100	76	100	22	100	125	100

4.3.3. Qualifications of attending doctors

Table 8 shows the qualifications of the doctors who attended to the women before they died. Of the HIV negative women, 7.4% were attended by the general practitioners and 92.6% were

attended to by Obstetrics and Gynaecology (O&G) specialists. Of the HIV positive women, 22.7% were attended to by general practitioners and 77.3% by O&G specialists. Of the women with an unknown HIV status, 9.5% were attended to by general practitioners and 90.5% by O&G specialists.

Table 8: Qualifications of attending doctors

Qualification	**HIV-**		**HIV+**		**Unknown**		**TOTAL**	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
MBChB	2	7.4	18	22.7	3	9.5	23	18.4
O&G	25	92.6	58	77.3	19	90.5	102	81.6
TOTAL	27	21.6	76	60.8	22	17.6	125	100

4.4. Antenatal care received by the women

The following tables describe whether the women who died attended antenatal care (ANC) and the details of the ANC received by the women if they attended a clinic. The description is indicated by their HIV status.

4.4.1. Antenatal clinic attendance by HIV status

Table 9 shows the antenatal clinic attendance of the women. Of the 125 women who died, 36% did not attend ANC. Among women who did not attend ANC, 14.8% were HIV negative, 28.0% were HIV positive and 90.0% had an unknown HIV status. Nearly three-quarters (72%) of the HIV positive women attended ANC.

Table 9: Antenatal clinic attendance by HIV status

Antenatal clinic attendance	**HIV-**		**HIV+**		**Unknown**		**Total**	
	n	**%**	n	**%**	n	**%**	n	**%**
Did not attend	4	14.8	21	28.0	20	90.0	45	36.0
Attended	23	85.2	55	72.0	2	100	80	64.0
TOTAL	27	100	76	100	22	100	125	100

4.4.2. Gestational age at first antenatal booking

Table 10 shows that no women booked for antenatal care in their first trimester of pregnancy. Of the HIV negative women, 15 (77.1%) booked in the second trimester and eight (22.9%) booked in the third trimester. Of the HIV positive women, 29 (58.1%) booked in the second trimester and 26 (41.9%) in the third trimester. Of the women with an unknown HIV status, one (50%) booked in the second trimester and one in the third trimester.

Table 10: Gestational age at first antenatal booking

Trimester when ANC booking was made	**HIV-**		**HIV+**		**Unknown**		**Total**	
	n	%	**n**	%	**n**	%	**n**	%
First trimester	0	0	0	0	0	0	0	0
Second trimester	15	65.2	29	52.7	1	50	45	65.3
Third trimester	8	34.8	26	47.3	1	50	35	34.7
TOTAL	23	100	55	100	2	100	80	100

4.4.3. Number of antenatal visits by HIV status

Table 11 shows the number of antenatal visits by HIV status. Of the HIV negative women, (26.1%) attended the clinic just once. Three (13.0%) women attended the clinic twice. Another three (13.0%) attended three times. Five (21.8%) women attended the clinic four times and six (26.1%) women attended the clinic five or more times. Of the HIV positive women, 16 (29.6%) attended the clinic once. Seventeen (31.5%) women attended the clinic twice. Eleven women (20.4%) attended the clinic three times. Eight (14.8%) women attended the clinic four times and two attended five times or more. Of the women with an unknown HIV status, one (50%) attended the clinic once and the other one (50%) attended the clinic five or more times.

Table 11: Number of antenatal visits by HIV status

Number of antenatal visits	HIV-		HIV+		Unknown		Total	
	n	%	n	%	n	%	n	%
1	6	26.1	16	29.6	1	50.0	23	28.8
2	3	13.0	18	31.5	0	0	21	26.2
3	3	13.0	11	20.4	0	0	14	17.5
4	5	21.8	8	14.8	0	0	13	16.3
5+	6	26.1	2	3.7	1	50.0	9	11.2
TOTAL	23	100	55	100	2	100	80	100

4.4.4. Level of antenatal care attended

Table 12 shows the level of antenatal care attended by the women. Of the women who attended antenatal care at primary level, 18 were HIV negative, 53 were HIV positive and two had an unknown HIV status. There were five women who attended the clinic at secondary level and all of them were HIV negative. One woman who had attended the antenatal clinic at a private provider was HIV positive.

Table 12: Level of antenatal care attended by HIV status

Level of antenatal care	HIV-		HIV+		Unknown		Total	
	n	%	n	%	n	%	n	%
Primary	18	78.3	53	98.1	2	100	74	92.5
Secondary	5	21.7	0	0	0	0	5	6.3
Private	0	0	1	1.9	0	0	1	1.2
Total	23	100	54	100	2	100	80	100

4.4.5. Timing of HIV test of the women who were tested

Table 13 shows that of the HIV negative women 81.5% were tested for HIV on their first antenatal visit and 11.1% on their subsequent visits, the other 2% was tested in hospital. Of the

HIV positive women, 52.2% were tested for HIV on their first visit,13.2% on their subsequent visits and 34.2% after admission to hospital.

Table 13: Timing of HIV test of the women who were tested

Visit when tested	**HIV-**		**HIV+**		**TOTAL**	
	n	**%**	n	**%**	n	**%**
First visit	22	81.5	40	52.6	62	60.2
Subsequent visit	3	11.1	10	13.2	13	12.6
Tested after admission to hospital	2	7.4	26	34.2	28	27.2
TOTAL	27	100	76	100	103	100

4.5. Follow-up care of HIV positive women

The following tables indicate the follow-up care that was received by the HIV positive women.

4.5.1. Determination of eligibility for antiretroviral therapy (ART)

Table 14 shows the determination of eligibility for antiretroviral therapy, which includes a CD4 count for all HIV positive women, and referral to antiretroviral clinic of those with low CD4 counts. Of the 76 women who were HIV positive, 64 (84.2%) had CD4 counts. Of the 64 CD4 counts, 40 (62.5%) were above 200 and 24 (37.5%) were less than 200. The 24 were then referred for antiretroviral therapy.

Table 14: Determination of eligibility for antiretroviral therapy (ART)

CD4 count done	**n**	**%**
Done	64	84.2
Not done	10	13.2
Already on ARVs	2	2.6
TOTAL	76	100
CD4 count results		
>200	40	62.5
<200	24	37.5
TOTAL	64	100
Women given Nevirapine	38/76	50
Referred for antiretroviral therapy	24/76	3.6

4.5.2. Access to antiretrovirals (ARVs)

Table 15 shows the duration after which the women who were referred to the antiretroviral therapy clinic actually reached the clinic. Two (8.3%) women were already on antiretrovirals. Ten (41.6%) women went to the clinic within seven days of referral. One (4.2%) woman went to the clinic within 14 days of referral. Another one (4.2%) went to the clinic after more than 14 days of referral and ten (41.7%) women never accessed the clinic.

Table 15: Access to antiretrovirals (ARVs) for women who were eligible

Access	n	%
Women already on ARVs	2	7.7
Started on ARVs within 7 days of referral	10	38.5
Started on ARVs within 14 days of referral	3	11.5
Started on ARVs after more than 14 days after referral	1	3.8
Never started the ARVs	10	38.5
TOTAL	26	100

4.6. Hospital care received by the women

This section describes the care received by the women in hospital from the time of arrival until they died. The condition of the women on arrival and the co-morbid conditions they had are also described.

4.6.1. Condition on admission to hospital

Table 16 shows the condition of the women on admission to hospital. Of the HIV negative women, 65.3% were critically ill when they were admitted to hospital. Of the HIV positive women, 92.0% were critically ill. Of the women with an unknown HIV status, 85.7% were critically ill.

Table 16: Condition on admission to hospital

Condition	HIV-		HIV+		Unknown		TOTAL	
	n	%	n	%	n	%	n	%
Stable	10	37.0	7	9.2	1	4.5	18	14.4
Critically ill	17	62.9	69	90.8	19	86.4	105	84.0
DOA	0	0	0	0	2	9.1	2	1.6
TOTAL	27	100	76	100	22	100	125	100

4.6.2. Pregnancy status the at time of death

Table 17 shows that of the women who were HIV negative, 50.0% were still pregnant, 23.1% were intrapartum and 26.9% were postpartum. Of the HIV positive women, 38.7% were pregnant, 25.3% were intrapartum and 36.0% were postpartum. Of the women with an unknown HIV status, (40.9% were pregnant, 13.6% were intrapartum and 45.5% were postpartum.

Table 17: Pregnancy status at the time of death

Pregnancy status	HIV-		HIV+		Unknown		TOTAL	
	n	%	n	%	n	%	n	%
Pregnant	13	48.1	29	38.1	9	40.9	51	40.8
Intrapartum	6	22.2	19	25	3	9.1	28	22.4
Postpartum	8	29.6	28	36.8	10	45.5	46	36.8
TOTAL	27	100	76	100	22	100	125	100

4.6.3. Co-morbidity with HIV

Table 18 shows that of the HIV negative women, one (16.6%) was diagnosed with Tuberculosis (TB), another with meningitis and four (66.6%) with diabetes mellitus. Of the women who were

HIV positive, 20 (30.7%) were diagnosed with TB, 31 (47.7%) with anaemia, 11 (16.9%) with Pneumocystic carinii pneumonia (PCP) and three (4.7%) with meningitis. Of the women with an unknown HIV status, two (50%) were diagnosed with TB and two (50%) with anaemia. Of the women who had hypertension, 13 were HIV positive, seven were HIV negative and four had an unknown HIV status. Of the women who had cardiovascular disease, three were HIV negative, three were HIV positive and one had an unknown HIV status. The one woman who was HIV negative had asthma. Another HIV negative woman had advanced lymphoma. One woman who was HIV negative has cancer of the breast, another one had liver failure and another one had renal failure.

Table 18: Co-morbidity with HIV

Co-morbidity	**HIV-**		**HIV+**		**Unknown**	
	n	**%**	n	**%**	n	**%**
TB	1	4.4	20	87.0	2	8.6
Anaemia	0	0	31	93.9	2	6.1
PCP	0	0	11	100	0	0
Meningitis	1	25	3	75	0	0
Diabetes mellitus	4	100	0	0	0	0
Hypertension	13	54.2	7	29.2	4	16.6
Cardiovascular disease	3	42.9	3	42.9	1	14.2
Asthma	1	100	0	0	0	0
Advanced lymphoma	1	100	0	0	0	0
Ca. Breast	0	0	1	100	0	0
Liver failure	0	0	1	100	0	0
Renal failure	0	0	1	100	0	0

4.7. Causes of death

The following section outlines the causes of death and these are classified under primary, secondary and contributory causes according to HIV status.

4.7.1. Primary causes of death

Table 19 presents the primary causes of death of the women. The death certificates of 34 (19.2%) women indicated that they died of pneumonia. TB was identified as the primary cause of death of 14 women. Two of these women were HIV negative and the other 12 were HIV positive. Eleven women who were HIV positive had PCP and two who had an unknown HIV status were also diagnosed with PCP. HIV/AIDS was recorded as a primary cause of death in five women, who were all HIV positive. Of the women who died of PPH, eight were HIV negative, three were HIV positive and five had an unknown HIV status. Puerperal sepsis was found to be the cause of death of 5 (55.5%) HIV positive women and four (44.5%) women with an unknown HIV status. Postpartum haemorrhage was diagnosed in eight (50.0%) HIV negative women, three (20.0%) HIV positive women and five (30.0%) women with an unknown HIV status. Congestive cardiac failure was cause of death for one (16.7%) HIV negative woman, three (50.0%) HIV positive women, and two (33.3%) women with an unknown HIV status. Cryptococcal meningitis caused two deaths, both women were HIV positive. HELLP syndrome caused the death of three (75%) HIV negative women and one (25%) HIV positive women. Cardiac arrest was the main cause of death of two (50%) HIV negative women, one HIV positive woman and one (25%) woman of an unknown HIV status. Eclampsia caused the deaths of seven (87.5%) HIV negative women and one (12.5%) HIV positive women. Two women of an unknown HIV status were dead on arrival at the hospital.

Table 19: Primary causes of death

Primary cause of death	HIV-		HIV+		Unknown		TOTAL	
	n	%	n	%	n	%	n	%
Pneumonia	0	0	31	91.2	3	8.8	34	100
TB	2	14.3	12	85.7	0	0	14	100
PCP	0	0	11	84.6	2	13.4	13	100
HIV/AIDS	0	0	5	100	0	0	5	100
Puerperal sepsis	0	0	5	55.5	4	44.5	9	100
PPH	8	50.0	3	20.0	5	30.0	16	100
CCF	1	16.7	3	50.0	2	33.3	6	100
Cryptococcal meningitis	0	0	2	100	0	0	2	100
HELLP Syndrome	3	75	1	25	0	0	4	100
Cardiac arrest	2	50	1	25	1	25	4	100
Eclampsia	7	87.5	1	12.5	0	0	8	100
DOA	0	0	0	0	2	100	2	100
Pulmonary oedema	1	50	1	50	0	0	2	100
Sudden collapse	0	0	1	50	1	50	2	100
Meningococcal meningitis	0	0	1	100	0	0	1	100
APH	1	100	0	0	0	0	1	100
Other*	0	0	2	66.6	1	33.3	3	100

*Other: Advanced lymphoma, intracranial haemorrhage, dehydration.

4.2.2. Secondary causes of death

Table 20 shows that HIV/AIDS was listed as the secondary cause of death of five (100%) HIV positive women. Of the women who had multiple organ failure listed on their death certificates, two (50%) were HIV negative and two (50%) were HIV positive. Of the women who had PCP listed as a secondary cause of death, one (25%) was HIV positive and three (75%) had an unknown HIV status. Of the women who had hypovolemic shock listed, one (25%) was HIV positive and three (75%) had an unknown HIV status. Of the women who had PPH, one was HIV negative, one HIV positive and another one had an unknown HIV status. Of those who were diagnosed with cardiac arrest one woman was HIV positive and another one had an unknown HIV status. PPH was a secondary cause of the deaths of one (33.3%) HIV negative woman, one (33.3%) HIV positive woman, and one (33.3%) woman with an unknown HIV status. Cardiac arrest was a secondary cause of death in one (33.3%) HIV positive woman and two women with an unknown HIV status. Hypertension was a secondary cause of the death of one (100%) HIV positive woman. Other secondary causes of death included burst abdomen, Lobar pneumonia, Ca Breast, Renal failure, Puerperal sepsis, RVD encephalopathy, septic shock, CCF, bacterial meningitis, malaria, CVA, intracranial haemorrhage, HELLP syndrome, cardiomyopathy, haemorrhagic shock,

Table 20: Secondary causes of death

Secondary cause of death	HIV-		HIV+		Unknown		TOTAL	
	n	%	n	%	n	%	n	%
HIV/AIDS	0	0	5	100	0	0	5	100
Multiple organ failure	2	50	2	50	0	0	4	100
Meningitis	0	0	2	100	0	0	2	100
PCP	0	0	1	25	3	75	4	100
Hypovolemic shock	0	0	1	25	3	75	4	100
PPH	1	33.3	1	33.3	1	33.3	3	100
Cardiac arrest	0	0	1	33.3	2	66.6	3	100
Hypertension	0	0	1	100	0	0	1	100
Lobar pneumonia	0	0	0	0	1	100	1	100
Puerperalsepsis	0	0	1	100	0	0	1	100
Haemorrhagic shock	1	100	0	0	0	0	1	100
Septic shock	1	50	1	50	0	0	2	100
Intracranial haemorr.	2	100	0	0	0	0	2	100
RVD encephalopathy	0	0	1	100	0	0	1	100
HELLP syndrome	1	100	0	0	0	0	1	100
CCF	1	100	0	0	0	0	1	100
Cardiomyopathy	0	0	0	0	1	100	1	100
Other	1	33.3	1	33.3	1	33.3	3	100

Other*: Breast cancer, renal failure, burst abdomen

4.7.3. Contributory causes of death

Seventy six women had HIV as the main contributory cause of death. Of the women who were diagnosed with hypertension, six were HIV negative and one had an unknown HIV status.

Table 21 is a presentation of the contributory causes of the deaths of the women.

Table 21: Contributory causes of death

Contributory cause of death	**HIV-**		**HIV+**		**Unknown**		**TOTAL**	
	n	**%**	n	**%**	n	**%**	n	**%**
HIV	0	0	71	100	0	0	71	100
Anaemia	0	0	2	100	0	0	2	100
Retained placenta	1	50	1	50	0	0	2	100
Hypertension	13	81.3	0	0	3	19.7	16	100
Ruptured uterus	2	100	0	0	0	0	2	100
Caesarian Section	1	100	0	0	0	0	1	100
Abruptio placenta	1	100	0	0	0	0	1	100
Incomplete abortion	0	0	0	0	1	100	1	100
Liver cirrhosis	1	100	0	0	0	0	1	100
PPH	2	66.6	0	0	1	33.3	3	100
Septic shock	0	0	0	0	1	100	1	100
Inversion	1	100	0	0	0	0	1	100

4.8. Comparison of study results with the PMTCT guidelines 2008

Table 22 shows a comparison of the study results with the national guidelines for care of pregnant women. These include the PMTCT guidelines 2008[15] and the Guidelines for antiretroviral treatment in adults and adolescents.[16] All HIV positive women who died,

irrespective of their antenatal clinic attendance, are included in Table 21. One hundred and three women were offered HIV testing and given information on PMTCT. Of these women, two were already on antiretrovirals and therefore 101 women were tested for HIV. Seventy six of these women were HIV diagnosed HIV positive. Of these women, 84.2% were tested for CD4 count. Forty CD4 counts were above 200 and 38 of these women were given a single dose nevirapine prophylaxis in labour. Twenty four women were found to have CD4 counts less than 200 and were all referred for antiretroviral therapy. Of the 24 who were referred for antiretroviral therapy, 50%accessed the ART clinics.

Table 22 presents a comparison of the PMTCT guideline, 2008 to the actual care received by the women at the antenatal clinics

Table 22: Comparison of study results to 2008 PMTCT guidelines

Guidelines	**Actual**	**Results**
All women attending antenatal care should be given routine information about voluntary HIV testing and the PMTCT programme	Percentage of pregnant women given routine information about voluntary HIV testing and the PMTCT programme	80/125 (64%)
All women who have not been previously tested or those who require repeat testing should meet with a nurse or a counselor on a one-to-one basis and be offered an HIV test	Percentage of women tested for HIV	78/80 (97.5%)
Identify women who are HIV positive	Percentage of HIV positive women	76/125 (60.8%)
Women already on ARVs should be identified	Percentage of women already on ARVs	2/76 (2.6%)
All HIV positive women should be	Percentage of HIV positive	64/76 (84.2%)

offered a CD 4 count test, which should be done on the same visit	women offered a CD 4 count test	
	Percentage CD4 counts > 200	40/64 (62.5%)
Administer stat dose of nevirapine in first stage of labour	Percentage of women given Nevirapine stat dose in labour	38/40 (95%)
	Percentage CD4 counts < 200	24/64 (37.5%)
Antiretroviral therapy for women with indications for such treatment	Percentage referred for antiretroviral therapy	24/24 (100%)
	Percentage that accessed antiretroviral therapy clinic	12/24 (50%)

CHAPTER 5: DISCUSSION

5.1. Introduction

This section discusses the findings of this study and compares them with the literature. The implications of the findings are explained. The limitations of the methodology used are also mentioned. Section 5.1 addresses personal and facility level factors, the antenatal care received by the women, the hospital care received by the women. It also describes the co-morbid conditions with HIV that the women had and their causes of death. Section 5.2 describes the discrepancies between national guidelines for care of HIV positive pregnant women and the care received by these women.

5.2. Personal and facility level factors among HIV positive pregnant women

5.2.1. Personal factors of HIV positive pregnant women who died

This sub-section discusses the personal factors of the women that may have contributed to the maternal deaths and if these are modifiable or not in comparison with the available literature.

From April 2004 to March 2009 there were 145 maternal deaths that occurred in Sedibeng District. Of these, 20 records (13.8%) could not be found, thus 125 records were used for this study. This raises concern as the data from those records would also be included in the study and perhaps produce different results. It also raises concerns about record-keeping in the hospitals.

5.2.1.1. HIV status

Out of the 125 women for which data was available, 76 (60.8%) were HIV positive. This is similar to data from other provinces of South Africa, Sub-Saharan Africa and countries with high HIV infection rates, such as India, Pakistan and Afghanistan, where the leading cause of maternal deaths is HIV/AIDS.[1,2,3,9] HIV is a non-pregnancy related infection and maternal deaths due to HIV are classified as avoidable as both the community and the health system can prevent and manage the infection as soon as it is detected.[37] It may affect pregnancy directly by resulting in AIDS and death. The pregnancy of an HIV infected woman may aggravate anaemia, TB and HIV progression.[10] It is therefore very important for all women, especially HIV positive women, to plan their pregnancies so that they can know the best time to fall pregnant.[3] Unfortunately it

may be that many women only find out about their HIV status when they are pregnant already and sometimes already ill.[3] Some women are afraid to get tested for HIV because of the stigma attached to HIV. [4] In a study conducted in Cambodia, it was found that women had a perceived need for partner's permission to be tested for HIV. There was also lack of knowledge about HIV prevention and treatment. An added reason was lack of access to antenatal care services.[47]

It is possible that many of the 22 (17.6%) who had an unknown HIV status were in fact HIV positive.[3] If some of these women were actually infected with HIV, there were missed opportunities of effective therapy to save their lives.[3] HIV testing remains the most important programmatic weakness in maternal health care.[4] It is therefore important to intensify HIV and AIDS education in the community of Sedibeng, the importance of getting tested, and where to get tested. This should be part of emphasizing healthy lifestyles for all, whether HIV infected or not. Furthermore, services should be integrated so that all patients are treated comprehensively and not only for the conditions for which they came to the clinic.

Of the HIV positive women, 40 (78%) of the women were tested for HIV on their first antenatal visit as it is routinely offered.[14,15] This gave the health care providers a chance to start intervening so as to curb the progression of HIV. However, 11 (21.6%) of the women were tested on their subsequent visits. This is because the HIV test is voluntary and therefore nobody may be coerced into taking the test.[14,15] Since they were tested on subsequent visits, it is possible that they might have been tested late in pregnancy, when they were already ill.

5.2.1.2. Age

The results of this study show that the majority of women who died were in the age group 19 – 34 years. Most of the HIV positive women (73.3%) were in this age group. This is similar to the findings of the Saving Mothers Report 2005-2007[3], which found that for the country overall most maternal deaths occurred in the age group 25-34 years. While international research has shown that maternal deaths occur disproportionately in adolescents and older women this is not the case in South Africa.[29] The high prevalence of HIV/AIDS in South Africa contributes to this pattern. The results of the annual national antenatal sentinel HIV and syphilis survey in South Africa revealed that women aged 30 – 34 years had the highest HIV prevalence of 40.4% in 2008

and 41.5% in 2009.[3] Contrary to other literature, which identifies the less than 18 years old age group as the most infected with HIV[29], the current study had three teenagers, of which two (66%) were HIV positive.

5.2.1.3. Marital status and cohabitation with partners

More married women who died (54.7%) were found to be HIV infected than unmarried women and those with an unknown HIV status were the mostly married women. The results of this current study could not clearly indicate if all the married women were actually cohabiting with their spouses. A similar number of HIV positive women were cohabiting as those who were married. However, while about a quarter of the HIV negative women were married, more than three-quarters were cohabiting with a partner. In a study conducted in Indonesia, women were found to be at a high risk of HIV infection during heterosexual intercourse because of early marriage, polygamy and unfaithful partners. the unequal power relations between husband and wife made the women unable to negotiate condom use, even if her partner was not faithful. They were also more likely to be forced into non-consensual sex. Early marriage increased coital frequency and decreased condom use, putting the women at greater risk of being infected by their partners even if they remained faithful to them. Being married therefore does not guarantee safety from HIV if the woman's partner is not faithful to her.[48]

Delayed access to health care is a barrier to early treatment. Finding public transport to a health centre,[31] especially at night may lead to delays, rather than lack of knowledge and concern by the patient[3] The lack of authority of many young mothers to make direct decisions results in delayed care seeking as the disease progresses.[31] The delay in seeking timely and effective help can be attributed to women's lack of access and control of resources in the household; limited access to education; lack of decision-making power; and inaccessibility to regular transport facilities (including ambulance services) especially in the rural communities. Women are subject to a myriad of influences and controls and obstacles within households in accessing health care.[3] An example is the delay in seeking help. As long as women are subject to the financial support of the male partner and his family, women will not be able to exercise their rights independently and rationally.[3]

5.2.1.4. Socioeconomic status of the women

According to the results of the current study 82.6% of the women who died were unemployed. Among the HIV infected women 81.3% were unemployed. Household income was also low, with a third of households reporting no income. It may be that limited household income could have provided a barrier to women accessing health services for antenatal care and may delay help-seeking when women developed signs that needed immediate attention. Of the households that had an income, a high percentage (71.2%) earned less than R1000.00 a month. This was also identified among the women who were HIV infected at 79,6%. It therefore means that education and financial empowerment of women could provide women with more decision-making power. Poverty and significant socio-economic factors underlie the great majority of these deaths, which include sparse or no health monitoring during pregnancy and restricted access by the people.[29] Women in low socioeconomic areas may be living in remote areas, where they do not get information regarding ARV services. The distance to the facility, coupled with transport problems and long waiting times at health facilities, may be a serious problem for these women for accessing health services.[23] These problems may delay the woman starting HAART.[23]

5.2.1.5. Obstetric history

The first pregnancy or higher than the fourth pregnancy have been found to be risk factors for maternal mortality.[26] Contrary to this finding, more than 80% of HIV positive women in this study, were in their second to fourth pregnancy. Increased access to contraceptives is important, as is counseling HIV positive women about the risks associated with pregnancy. This would require the promotion of HIV testing among women before they become pregnant. Routine HIV testing and counseling at every contact with the health service needs to be recommended in addition to HIV testing during antenatal care. MDG 5, Safe Motherhood Initiative and the Ten Key Recommendations for Saving Mothers promote that women have access to contraceptives so that they can have control over their fertility.[7,13]

5.2.2. Facilities where the maternal deaths occurred

The National Department of Health Guidelines for Maternity Care prescribe that all complicated cases should be referred to hospital for admission.[16] The results from this study suggest that in Sedibeng these guidelines are being followed as there were no maternal deaths at MOUs, which are at the primary health care level.

Most of the maternal deaths (n=103) occurred in the level 2 hospital and more than half of these women were HIV positive. This suggests that women are being referred appropriately to level two hospitals when they have a high risk pregnancy. Most of the doctors in the level two hospital are specialists in obstetrics and gynaecology. More than three quarters of those that died in the level 1 hospitals were HIV positive. This suggest that while most women are appropriately referred some women who should be referred to level two facilities are being missed. All the hospitals in Sedibeng had antiretrovirals for the women.

While referrals are taking place, there may also be delays in referral, reflecting lack of recognition of the problem or lack of transport.[3,26] Healthcare workers in level 1 hospitals may believe that the deaths of HIV positive women are inevitable, and therefore they are not suitable for transfer to a higher level of care.[3]

Women who seek help come up against other barriers such as not knowing where to take her and therefore start at a primary health care clinic instead of going directly to a hospital, which causes delays for the woman receiving help. Poor transport facilities is a major problem in South Africa.[3] Women sometimes have to wait for long hours for an ambulance.[29] Lack of health care facilities and lack of appropriately trained staff are also major administrative problems.[3] In the health facilities there may be lack of qualified staff to take care of the woman or lack of appropriate technologies. Antenatal control and qualified professionals should be present at each birth.

5.2.3. Antenatal care attendance

The purpose of antenatal care is to identify risks among pregnant women and manage them timeously for the best pregnancy outcomes.[7,27] Antenatal clinic attendance seemed to be relatively high (64.8%) among the women who died. However, there were 45 (35.2%) women

who never attended the antenatal clinic. This figure of non-attendance of the antenatal clinic is higher than the national figure of 20.7%,[3] where about 32% of deaths were among women who delayed in seeking help. Presumably poverty, long distances, lack of knowledge, and income–generating responsibilities are all factors that could be contributory for women not attending antenatal care.[31]

Even though a high percentage of the women had attended the antenatal clinic, none of them had booked early i.e. in the first trimester, which gave the health care providers limited time to intervene in saving their lives, especially the HIV positive women.

The prescribed number of antenatal visits is five or six at the most.[27] Among the 55 HIV positive women 10 (18.5%) had attended the clinic four or more times. HIV positive women may have to go to the clinic more frequently to fetch their results of different tests. This may indicate missed opportunities for health care workers to manage the clients accordingly and save their lives. The finding that non-attendance of, or limited attendance of antenatal care may have become a more important factor over time might suggests that women eligible for antiretroviral treatment, who attend the clinic, are receiving such treatment and are less likely to die.[4] It may also be that there are barriers for these women to access antenatal services. Long distances and lack of transport may present a serious barrier for women in low socio-economic areas. This may be aggravated by long waiting times at the health facilities during the antenatal visits.[22]

5.2.4. Level of antenatal care

Fifty three (98%) of the HIV positive women attended antenatal care at the primary level and one (2%) attended privately.

5.2.5. Access to ARVs

In public health facilities antiretrovirals (ARVs) are provided for HIV positive pregnant women for prevention of mother to child transmission of HIV (PMTCT). This provides an entry point for them to be commenced on antiretroviral therapy (ART) for their own health if they are eligible.[14,15,20] The process of putting the pregnant HIV positive women on ART may not be immediate as some tests are performed, and adherence counseling is necessary before

commencing therapy. Therefore if such women book late for antenatal care, their prognosis is generally poor. This makes it difficult for the health care workers to save them as the disease progresses. In this study, among the HIV positive women, two were already on ARVs. All the other twenty two women who were eligible for antiretroviral therapy were referred for ART. However, of these, twelve actually accessed the antiretroviral clinics. Of these, ten accessed the clinics within seven days, one accessed the clinic within 14 days, and another one accessed the clinic after more than 14 days. The other ten (41.7%) never accessed the clinics for ARVs.

5.2.6. Condition on arrival at the hospital

In the current study, (92.5%) arrived at the hospitals in a critical condition. This figure is far higher than the national figure of 26.7% of the South African women in 2005/7.[3] The women were referred from the antenatal clinics to the hospitals for further management, or admitted directly from home because they were already critically ill.[3]

Of 28 women who were tested in hospital, 26 (92.9%) were HIV positive. These are women who arrived at the hospital already critically ill. This meant that health care workers had very little chance of intervening in trying to save them. Delay in seeking medical help may be due to failure of the pregnant woman and her family to identify risks or possible complications.[16,29] The gaps in family knowledge contribute to unhealthy behaviours and delay in seeking care.[29] Another reason may be cultural prejudice, which leads women to mistrust institutional or hospital childbirth and to prefer traditional birth attendance.[29] Carrera also states that women do not usually have decision-making powers, and that any move must be authorized by their husbands, hence women arrive at the hospital already critically ill.[29] Antenatal clinics therefore need to strengthen the way they give health education on pregnancy and HIV.

5.2.7. Pregnancy status at the time of death

In this study, at the time of death, 38.7% of the HIV positive women were pregnant, 25.3% were in labour and 36% were postpartum. In Africa, the highest risk of maternal death is in the peripartum and immediate postpartum periods, which provides a significant target for intervention.[4] Post partum care should be strengthened for the mother–baby pair.[14.] In the Third

World, 61% of the women die in the puerperium.[29] In South Africa in 2005 – 2007, the postpartum period was the most common period resulting in death to occur, occurring in 45.4% of cases in South Africa.[3] Among all women who died, 44 (35.7%) died in the postnatal period, of which 27 (61%) were HIV positive. The lack of postnatal care may also contribute, as many deliver in the health care facilities but arrive at the health facility already moribund.[3] The numbers of those dying in the post partum period are probably more as many hospitals encourage people with AIDS to be cared for through the home based care program.[3]

5.2.8. Co-morbidity with HIV

The findings of this study reveal that the women came in critically ill. As shown elsewhere,[25] the majority of maternal deaths among HIV positive women were associated with advanced HIV disease.[4] According to the findings of the current study, the co-morbidity found among the women who died were the same as that found in South Africa generally as stated in the Saving Mothers Report 2005-2007.[3] These are TB (20), Pneumonia, and meningitis. Other conditions were PCP (11) and anaemia (30), which are also mentioned by Black, 2009.[4] Of the women who had hypertension, 13 were HIV negative, 12 were HIV positive and four had an unknown HIV status. Hypertension should be treated during the antenatal period at primary level. Complicated cases should be referred to hospital as per guidelines on maternity care in South Africa. There were six women who had cardiovascular disease and of these two were HIV negative, three were HIV positive and one had an unknown HIV status. The four women who had diabetes mellitus were all HIV negative. Data for maternal death gathered by the NCCEMD have shown that the largest cause of maternal death is non-pregnancy related infections, mainly HIV/AIDS, tuberculosis and pneumonia, accounting for at least 38% of all maternal deaths in South Africa.[24] Most of these deaths might have been avoided if antiretroviral treatment and cotrimoxazole prophylaxis had been initiated.[4] Further study is needed to assess systematically the provision of cotrimoxazole prophylaxis to HIV positive pregnant women.[4] Currently TB/HIV collaboration is being done in the clinics by testing all HIV positive patients for TB and those with TB, for HIV. The patients are then given the necessary treatment according to their ailments. However, this was routinely practiced at the time of the study. These findings indicate that integrating HIV services into all other programmes would be beneficial. For example all HIV positive women

should have been screened for TB and managed accordingly, but late attendance or non-attendance of antenatal care could have been a factor here, where the patients came when they were already ill.

5.3. Causes of death

The leading causes of maternal death among all women were pneumonia, postpartum haemorrhage, tuberculosis, PCP and puerperal sepsis The leading causes of death among HIV positive women were pneumonia, tuberculosis, pneumocystic carnii pneumonia, puerperal sepsis and post partum haemorrhage respectively. This was similar to the trend observed in the three previous Saving Mothers Reports. [2,3,4] Another observation that was made was that the pattern was the same for the women with an unknown HIV status. It may therefore be that those with an unknown HIV status were actually HIV positive.[3] Congestive cardiac failure and cryptococcal meningitis were also found in a few more women. Under normal circumstances pneumonia and tuberculosis are treatable, even if the patient is HIV positive. However, if pregnant women present themselves late to a health facility i.e. when they are already ill, that presents a little chance for health care workers to treat them.

HIV positive pregnant women, who are eligible for HAART are generally fast-tracked to start treatment within a week or two, so as to improve the health of the mother and to prevent vertical transmission. However, if they come to the health facility late in their pregnancies, then this becomes difficult for the health care providers to treat them accordingly. With their low socioeconomic conditions it may also be that they did not have good nutrition at home, whereas in a health facility they could have been provided with supplements in good time.

It is a concern that post-partum haemorrhage had claimed quite a few women as well. It may be that these women were anaemic. At antenatal clinics they could have received iron supplements to boost their haemoglobin, but the late or no antenatal attendance did not give the health care workers a chance to do so. Even though this may be a fact, it also begs the question of the skill of the attending health care professionals in managing post partum haemorrhage. Their attitude towards a bleeding HIV positive woman may also be questionable, even though they take

universal precautionary measures when managing patients.

While hypertension was not found to be one of the leading causes of death, it was a contributory factor in 13 deaths. Coupled with HIV in a pregnant woman, it increased the risks for the pregnancies of these women. All antenatal clinics in Sedibeng manage hypertension according to guidelines and protocols. Should the blood pressure not be controlled, then she is referred to a higher level of care. Late antenatal booking remains a major challenge among these women. The skills of health care professionals managing women in labour need to be strengthened on a regular basis so as to save many women postpartum. This calls for a further strengthening of postpartum care to ensure that the bleeding is controlled.

5.4. Study limitations

Study design is retrospective record review, which is highly dependent on the quality of the records. It was therefore impossible to address the problems of missing records and missing data. Since data on post-natal care was not available in the records reviewed it was impossible to draw conclusions about the quality of care rendered in this period, even though some of the deaths occurred in the postnatal period. In order to address these limitations, future studies should use prospective designs and include data on postnatal care.

CHAPTER 6 CONCLUSION AND RECOMMENDATIONS

6.1. Introduction

This chapter provides the conclusions made, based on the results of the study. It also provides recommendations, based on the conclusions made.

6.2. Conclusion

HIV/AIDS is a leading contributory factor in maternal mortality in Sedibeng and such deaths are preventable as both health care workers and the community can do something to prevent transmission of HIV and the management of HIV positive pregnant women. Even though knowledge about HIV is high among Sedibeng adolescents, many women discover when they are pregnant that they are HIV positive, as it is in the rest of South Africa. Many of these women come to the antenatal clinics late in their pregnancy, when they already have other conditions as well and are not feeling well. HIV co-morbidity with TB is common and has caused many maternal deaths. TB/HIV collaboration is encouraged as a way of strengthening integration of services.

The Department of Health has developed guidelines for the management of HIV positive pregnant women so as to curb the spread of HIV from the mother to her unborn baby, and to prevent unnecessary maternal deaths. The PMTCT guidelines were first published in 2008. Whilst this was mainly for the protection of the baby from HIV infection with single dose nevirapine and a course of AZT, it also provided an entry point for the mother into antiretroviral therapy if she was eligible. Health care professionals in Sedibeng were trained on the guidelines. In 2010 new PMTCT guidelines were published, which were an improvement on the 2008 guidelines. These guidelines increased access to prophylaxis i.e. 14 weeks gestation, for women that are not eligible for antiretroviral therapy; and earlier access to antiretrovirals i. e. CD 4 count less than 350, for those that are eligible. The antiretrovirals are available in the public health facilities and play an important role in reducing infant and maternal mortality. Doctors and nurses in Sedibeng are being trained to treat patients with HAART.

Since pneumonia is a leading primary cause of death among HIV positive women, health care professionals should be trained in the diagnosis and management of the condition in pregnant

women. Hypertension should be treated at a level one or level two hospital as it is also a leading cause of death among all women, irrespective of their HIV status. Diabetic women should continue to be managed in high risk clinics in hospitals as recommended in the Guidelines to Maternity Care in South Africa, 2007.

Based on the abovementioned observations, it is quite evident that some of the women who died in Sedibeng health facilities could have been saved.

6.3. Recommendations

6.3.1. Integration of services

HIV testing should be offered to all people coming to the heath care facilities, irrespective of their ailments, so as to increase the testing rate. It is important for people to know their HIV status at any given point in time. This can assist them in leading healthy lifestyles, whether they are infected or not. It is envisaged that in this way those that are infected will not spread the virus to healthy people, or re-infect others. This will also enable each woman to know her HIV status before falling pregnant. However, TB/HIV collaboration, as stated in the 2008 and 2010 PMTCT guidelines, needs to be strengthened by vigilant monitoring and reporting.

6.3.2. Implementation of health policy and monitoring thereof

The antenatal health care policy and PMTCT guidelines should be implemented in all health care facilities providing antenatal care. These policies should be communicated to all health care workers caring for pregnant women. Both MCWH and HAST programme managers should monitor the implementation of these policies and guidelines. Furthermore, guidelines to maternity care in South Africa should be available in all health facilities. The ten key recommendations for saving mothers should be monitored and reported on by the MCWH programme manager on a monthly basis.

All pregnant women should be tested for HIV. Those that are found to be HIV positive should be screened for TB and other opportunistic infections. CD 4 counts should be done on all women that are HIV positive. Those with high CD 4 counts should be put on AZT prophylaxis from 14 weeks gestation. Those with CD 4 counts less than 200 should be put on antiretroviral therapy.

6.3.3. Training of health care workers

Since the implementation of different guidelines for HIV management, there have been many changes to the management of HIV positive patients. It is for this reason that health care professionals and lay counselors should continually be trained on management of HIV positive patients and antiretrovirals. Currently nurses in South Africa are being trained on initiating antiretrovirals on patients that are eligible. This will scale up the process of reaching those that need the drugs and save many lives. Both nurses and counselors need to know the side effects of the medication so as to advise the patients appropriately. They should all keep abreast with the changes in management of the patients.

6.3.4. Community mobilization

All women, especially HIV positive women should plan their pregnancies so that they can know the best time to fall pregnant.[3] Women should book for antenatal care as soon as the pregnancy is confirmed so that they can be tested and treated for HIV and other risks, such as TB and hypertension early in pregnancy. Women are generally encouraged to visit the nearest antenatal clinic if they miss their menstrual period by two weeks, or as soon as they believe they are pregnant. Women who are planning to fall pregnant should study their menstrual cycle and do a pregnancy test if they think they are pregnant.

The following strategies can be used for social mobilization on reproductive health messages, with a special focus on early antenatal booking:

- Health talks in social groupings such as women's groups, organized men's groups, shopping malls and youth cubs.
- Information should be disseminated to political structures within the community, such as the mayoral committee and ward councilors. These structures should have easy access to the community for giving them these messages.

- Mass media such as newspapers, television and radio can be used for mobilisingthe community. Radio slots provides an excellent opportunity the community to ask questions.
- Celebrities invited to social events can have a great influence on young people as they may be their role models.
- Door-to-door campaigns, in partnership with NGOs can be very effective for disseminating information to communities; as people canask questions in the comfort of their homes.

6.3.5. Record management

The missing records are reason for concern. This is a medicolegal hazard. Maternal death records should be kept in a safe place, probably under lock and key, as they are confidential records.

6.3.6. Strengthening of postnatal care

Postnatal care should be provided according to the guidelines for maternity care. The women should be examined six hours after delivery, six days later and six weeks later. Those who are not able to come back to the health facility for whatever reason should be followed up by community health care workers. The community health care workers can then report to the clinic nurse about her visit. Reminders can also be sent to these women in the form of an sms.

Postpartum women, especially HIV positive ones, should not be discharged after six hours of delivery from the health facility,as some of them die within the early postpartum period. Those that have delivered at home should be encouraged to come to a health facility as soon as transport is available, immediately after delivery, for proper postnatal care.

6.3.7 Addressing barriers to accessing health services

Mass media should be used for informing the community about available health services and the times thereof. The community should also be made aware of telephone numbers for calling an ambulance. Where possible, there should be a dedicated ambulance for maternity cases, otherwise maternity patients should be prioritized over others. Waiting times at health facilities should be monitored and reported daily by dedicated queue marshals

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Appendix: A

12 Johannes Brill Street

CW 4

Vanderbijlpark

1900

The Head: Research Ethics Committee

Gauteng Department of Health

Johannesburg

2000

Dear Sir/Madam

Permission is hereby requested to conduct a study on the maternal deaths records of the deaths which occurred in Sebokeng, Kopanong and Heidelberg Hospitals from April 2004 to March 2008. Confidentiality will be maintained by not using names from the records, but just coding each of them. The aim of this research is to reduce maternal morbidity and mortality in Sedibeng and Gauteng Province by identifying factors that may be missed opportunities for pregnant women accessing antiretrovirals from the aforementioned data of April 2004 to March 2008. The motivation for this research is because a high percentage of maternal deaths in the Province in the 2004/5 to 2007/8 were due to HIV-related conditions.

I am currently working as the programme manager for Maternal, Neonatal and Reproductive Health in Sedibeng District Health Services. I am also an MPH student at the Wits Medical School. The study will be beneficial to my work by looking into the best practices for saving mothers and will also be used as a means to completing my studies, as it is one of the main requirements for doing so.

Yours sincerely

Senate Sejak**e**

Appendix B: Checklist for maternal death record review

1. Unique identification number	
2. Health care facility (at which the woman died)	Sebokeng……1 Kopanong…..2 Heidelberg….3
3. Date of death	Day/month/year
4. Final cause of death (stated)	
5. Secondary cause of death	
6. Contributory cause of death	
7. Qualifications of attending provider	MBChB……1 MBChB+Obs&Gynae..2 Midwifery…….3
8. Woman's date of birth	Day/month/year
9. Woman's age	
10. Woman's gravidity	
11. Woman's parity	
12. Mode of delivery	NVD…..1

	C/S…….2 Assisted…3 No delivery…4
13. Household income per month	0-R1000.00…….1 R1001.00-R5000.00…2 > R5000.00……..3
14. Marital status	Single……1 Married…….2 Divorced……..3 Widowed…….4
15. Cohabiting with husband/partner	Yes……1 No…….0
16. Gestational age at 1st antenatal booking in weeks	
17. Was HIV conselling offered at 1st antenatal visit?	Yes……..1 No……0
18. HIV testing conducted at this visit?	Yes……1. If yes skip to question 18 No…….2
19. If not offered or done at 1st visit was HIV test offered at a subsequent antenatal visit?	Yes……1 No……..2
20. Did she receive nevirapine?	Yes……1

	No…… 2
21. Gestational age when she was tested for HIV	
22. Gestational age when CD4 count done	
23. CD4 test result	<200……..0 >200……...1
24. Number of days after which CD4 count results were received by the woman	7 days……1 >14days……2
25. Did the woman have any of the following non-pregnancy related infectiontions related to HIV or exacerbated by HIV	TB…..Yes 1 No 2 Pneumocystics carinii pneumonia Yes 1 No 2 Cryptococcal meningitis Yes 1 No 2 Other
26. Received treatment for any of the above conditions	TB…..Yes 1 No 2 Pneumocystics carinii pneumonia Yes 1 No 2 Cryptococcal meningitis Yes 1 No 2 Other
27. Other obstetric conditions that the woman had	Hypertension … Yes 1 No 2 Preeclampsia ….Yes 1 No 2 Diabetes ……...Yes 1 No 2

	Cardivascular disease …….. Yes 1 No 2 Anaemia……Yes 1 No 2
28. Was she referred to the ART clinic?	Yes…1 No…2
29. After how many days was she referred to ART clinic?	7 days….1 14 days…2 More than 14 days…3
30. After how many days did she first attend the ART clinic	
31. Clinical stage when adherence counseling was commenced.	
32. Gestational age when adherence counseling was commenced.	
33. Clinical stage when adherence counseling was completed.	
34. Gestational age when adherence counseling was completed	
35. Gestational stage when ART was commenced.	