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ANALYSIS OF FACTORS UNDERLYING MATERNAL MORTALITY AT VICTORIA CHITEPO PROVINCIAL HOSPITAL: 2017-2022

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PUBLIC HEALTH IN THE COLLEGE OF HEALTH, AGRICULTURE AND NATURAL SCIENCES

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Abstract

Globally, maternal mortality rate is unacceptably high, with a maternal death occurring almost every two minutes and close to 800 reported every day. Sub-Saharan Africa and Southern Asia have the highest burden, accounting for 87.0% of the estimated global maternal deaths in 2020. Sub-Saharan Africa alone accounts for around 70.0% while Southern Asia accounts for around 16%. Within Sub-Saharan Africa, the West African region has the highest MMR. In Zimbabwe, a decrease in MMR by 31.0% from 525 in 2012 to 363 in 2022 and 63.0% of all maternal deaths occur in Central and Provincial Hospitals according to Ministry of Health and Child Care, 2021. Victoria Chitepo Provincial Hospital had the highest institutional maternal mortality ratio consistently over the past 6-year period (2017-2022), among all the hospitals in the country. The purpose of this study was to investigate the factors underlying high institutional maternal mortality at Victoria Chitepo Provincial Hospital. The study was done in Manicaland Province at the Provincial Hospital. Victoria Chitepo is the biggest referral facility in Manicaland, and it caters for a population of 2,037,703 people from 7 districts. The study was a retrospective correlational study. 143 maternal death notification forms and the corresponding maternal death patient's notes that occurred at the provincial hospital in the referred period were reviewed to identify the causes death (direct and indirect) and contribution of the 3 delays. Maternal death audit minutes were analysed and reviewed. The findings reveal that 90.9% (n = 130) of the individuals who died during childbirth were married, while 9.1% (n = 13) were single. In terms of education level, the highest percentage, 46.8% (n = 65), had completed secondary education, while the lowest percentage, 3.6% (n = 5), had reached tertiary education. Christianity accounted for the highest percentage at 46.4% (n = 77), followed by the Apostolic Sect with 23.5%. Regarding ANC visits, the average number of visits is 3, indicating that, on average, individuals made three antenatal care visits during their pregnancy. On causes of death PPH contributed 31.7%; eclampsia 16.9%; puerperal sepsis; cardiac disease and ruptured uterus contributed 7.7% to the cause of death. In this study 35.0% delivered by caesarean section and 44.3% had normal vaginal delivery. Pearson correlation between IMMR and CSR was conducted and a correlation coefficient of 0.818 was observed indicating a strong relationship between IMMR and CSSR. Chi-square test also examined the relationship between IMMR and CSR using a chi-square test at a significance level of 5.0% and maternal mortality occurred 22 times when caesarean was done and 68 times when caesarean section was not done.

Key words: Institutional Maternal Mortality; Maternal Mortality Ratio; Maternal death; Obstetric Care and Cause of death

Declaration

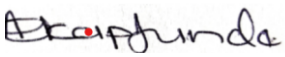
I Lucia Gondongwe do hereby declare that this dissertation is my original work except where sources have been cited and acknowledged. The work has never been submitted, nor will it ever be submitted to another university for the award of a Masters' degree.

Lucia Gondongwe

Student's Full Name

Student's signature

Date: 8/5/24



Dr. A. Kapfunde

Main Supervisor's Full Name

Main Supervisor's Signature

Date:

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Dedication

This study is dedicated to my father, Mr Anderson Gondongwe and to my beloved mother, Mrs. Emmaculate Gondongwe. My parents' prayers, unconditional love, encouragement, patience and faith in me have contributed to my successes. My parents are the drivers of my energy and will. They are indeed a great inspiration in my life.

List of Acronyms and Abbreviations

AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal care
AUREC	Africa University Research Ethics Committee
HCW	Health Care worker
HIV	Human Immunodeficiency Virus
IMMR	Institutional Maternal Mortality Ratio
MoHCC	Ministry of Health and Child Care
PNC	Post natal care
VCPH	Victoria Chitepo Provincial Hospital
WHO	World Health Organization

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CHAPTER 1 INTRODUCTION

1.1 Introduction

Each day, approximately 800 women die from preventable causes related to pregnancy and childbirth and about 95.0% of all maternal deaths occur in low and lower middle-income countries (WHO, 2020). Sub-Saharan Africa accounts for most of the maternal deaths (70.0%). In Zimbabwe, maternal mortality ratio (MMR) declined from 525 in 2012 to 363 maternal deaths per 100,000 live births in 2022 (Zimbabwe National Statistics Agency [ZIMSTAT], 2022). About 63.0% of all maternal deaths in Zimbabwe occur in Central and Provincial Hospitals (Ministry of Health and Child Care [MoHCC], 2021). Victoria Chitepo Provincial Hospital had the highest institutional maternal mortality ratio consistently over the 6-year period (2017-2022), among all the hospitals (MoHCC, 2022). This study investigated the factors underlying high institutional maternal mortality at Victoria Chitepo Provincial Hospital.

Maternal mortality is higher in women living in rural areas and among poorer communities. Young adolescents face a higher risk of complications and death as a result of pregnancy than other women. Haemorrhage, sepsis, unsafe abortion, obstructed labor, and pregnancy-related hypertensive disease account for more than 75.0% of maternal mortality. About 25.0% of deaths are caused by illnesses, such as malaria, anaemia, and increasingly AIDS, which when present during pregnancy have a deadly outcome. Pathogenic factors, health service factors, reproductive factors, and socioeconomic variables are the four primary tiers of contributing factors that have been identified via reviews of individual cases of pregnancy-related mortality (Envuladu, Agbo, Lassa, Kigbu, & Zoakah, 2013). Skilled care before, during and after childbirth can save the lives of women and newborn babies.

The "Safe Motherhood Initiative" is a concept that has been adopted by most developing nations, including Zimbabwe, with the intention of reducing maternal mortality by enabling women to experience pregnancy and childbirth without risk to the mother and the child. The four pillars of Safe Motherhood are: Antenatal Care, Clean and Safe Delivery, Postnatal Care, and Family Planning (Mahler, 1987).

In the 1970s and the beginning of the 1980s, the issue of maternal mortality was frequently overlooked and even neglected. However, it is now recognized as a serious issue in developing nations. The Safe Motherhood Initiative was introduced in 1987 in Nairobi, Kenya, at an international conference. Since then, policymakers, healthcare workers, and the general public in developing nations (Africa, Asia, and Latin America) have become more aware of the issue. A precise estimate of maternal mortality is the first step toward reducing maternal mortality, according to WHO (2020).

1.2 Background to the study

Globally, MMR is unacceptably high, with a maternal death occurring almost every two minutes and close to 800 reported everyday (WHO 2020). Sub-Saharan Africa and Southern Asia have the highest burden, accounting for 87.0% of the estimated global maternal deaths in 2020. Sub-Saharan Africa alone accounts for around 70.0% of maternal deaths, while Southern Asia accounts for around 16.0%. Within Sub-Saharan Africa, the West African region has the highest MMR (Onambele L, et al, 2022).

Efforts to curb global maternal mortality have been bearing fruits. Between 2000 and 2020, MMR dropped by 34.0% worldwide and Sub-Saharan Africa achieved a

substantial reduction of 33.0% (WHO 2020). Eastern Africa, Central Asia, Eastern Asia, and Northern Africa nearly halved their MMR.

Maternal mortality has been on a downward trend in Zimbabwe since 2012. Findings from ZIMSTAT (2022) show a decrease by 31.0% from 525 in 2012 to 363 in 2022. Institutional Maternal Mortality Ratio (IMMR) decreased from 137 maternal deaths per 100,000 births in 2015 to 92 maternal deaths per 100,000 births in 2019. However, it increased to 113 in 2021 against a target of 98 and dropped down to 107 in 2022 (MoHCC, 2022), Figure 1. Pre and post COVID-19 challenges with human resources for health (low morale, staff attrition and industrial action) are likely to have contributed to an increase in IMMR in 2020- 2021.

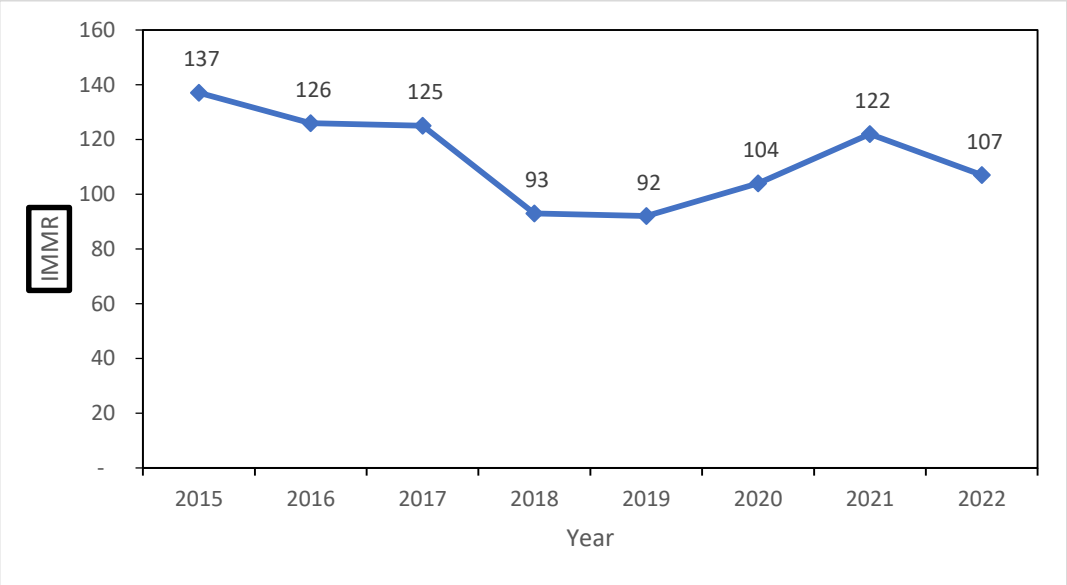

Figure 1: Trends in Institutional Maternal Mortality Ratio: 2015-2022

About 63.0% of maternal deaths in Zimbabwe occur in Central and Provincial Hospitals (MoHCC, 2021). Consistently, Victoria Chitepo Provincial Hospital has

had the highest IMMR from 2017 to 2022 (6-year period), among all the hospitals. Among central hospitals, Chitungwiza had the highest (Table 1).

Table 1: Institutional Maternal Mortality Ratio by hospital and by year: 2017 to 2022

	Institutional Maternal Mortality Ratio						
Hospital	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**Average**
Chinhoyi Provincial	123	287	329	302	579	364	331
Masvingo Provincial	525	486	153	505	644	153	411
Gwanda Provincial	0	93	282	289	155	79	150
St Luke's Mission	35	33	0	0	37	36	24
Gweru Provincial	315	365	351	280	196	90	266
Marondera Provincial	218	70	178	145	186	260	176
Bindura Provincial	109		93	95	72	150	87
Victoria Chitepo Provincial	1452	1753	1433	1919	1547	1681	1631
Chitungwiza Central	653	244	483	462	570	476	481
Parirenyatwa Central	734	492	302	372	547	388	473
Sally Mugabe Central	453	210	354	636	627	512	465
Mpilo Central	543	309	279	111	174	128	257
United Bulawayo	697	358	378	259	306	419	403

1.3 Statement of the problem

Victoria Chitepo Provincial Hospital has consistently reported the highest IMMR each year since 2017 (above 1400 maternal deaths per 100,000 births) when compared to all other tertiary hospitals in the country (see table 1 above). Paradoxically, the provincial hospital also has the highest Caesarean section rate in the same period, when compared to other hospitals (table 2).

Table 2: Caesarean Section Rate by hospital and by year from 2017 to 2022

Hospital	Caesarean Section Rate (%)						
	2017	2018	2019	2020	2021	2022	Average
Chinhoyi Provincial	25	24	22	16	17	21	21
Masvingo Provincial	26	26	27	25	25	24	26
Gwanda Provincial	19	16	14	21	25	28	21
St Luke's Mission	9	12	10	7	6	8	9
Gweru Provincial	22	19	20	17	16	19	19
Marondera Provincial	18	15	15	19	16	18	17
Bindura Provincial	14	18	18	13	14	14	15
Victoria Chitepo Provincial	50	54	55	64	67	59	58
Chitungwiza Central	21	20	23	21	20	24	22
Parirenyatwa Central	31	35	28	25	35		26
Sally Mugabe Central	25	21	29	23	21	20	23
Mpilo Central	33	32	34	30	35	30	32
United Bulawayo	35	59	44	33	40	37	41

There is need to investigate, deep dive and interrogate data at Victoria Chitepo Provincial Hospital to understand why the hospital has been consistently reporting the highest IMMR over the years and paradoxically the highest Caesarean section rates in the same period. Caesarean section is a lifesaving intervention which (when performed timely) can help save the lives of the mother and her newborn baby.

1.4 Research objectives

Broad objective

- To analyse factors underlying high institutional maternal mortality and caesarean section rate at Victoria Chitepo Provincial Hospital from 2017 to 2022.

Specific objectives

i. To determine the factors which contributed to high maternal mortality at Victoria Chitepo Provincial Hospital from 2017 – 2022.

ii. To determine the factors which contributed to high caesarean section rate at VCPH between 2017-2022.

iii. To determine association between high IMMR and institutional caesarean section rate at the provincial hospital between 2017 – 2022.

1.5 Research questions

- What are the common factors associated with high maternal mortality at Victoria Chitepo Provincial Hospital from 2017 to 2022?
- What are the factors which contributed to high caesarean section rate at Victoria Chitepo Provincial Hospital?
- What is the relationship between high maternal mortality and caesarean section rate?

1.6 Significancy of the study

This assessment was commissioned by the Reproductive Health Technical Working Group in the MoHCC to assess the factors underlying high institutional maternal mortality at Victoria Chitepo Provincial Hospital. The study will provide benchmark information upon which progress would be measured throughout implementation of quality improvement initiatives at the hospital. Findings from the assessment will be the springboard for effective implementation of the quality improvement guidelines at the hospital.

1.7 Delimitation of the study

The assessment was conducted at Victoria Chitepo Provincial Hospital only. Health facilities that refer to the provincial hospital (including district and mission hospitals)

were not part of the assessment due to limitations with time. The focus of analysis was on maternal deaths that occurred at Victoria Chitepo Provincial Hospital only and not those that occurred from any other institution.

1.8 Limitations of the study

Time constraints. The research was done in a short space of time and it was impossible to involve all referral hospitals for Victoria Chitepo Provincial Hospital including the district hospitals

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.1 Introduction

Maternal mortality is a good indicator of the standard of obstetric care that pregnant women in the community get. A maternal death is defined as the death of a woman while pregnant or within 42 days of the termination of the pregnancy no matter the length or location of the pregnancy, from any cause connected to or aggravated by pregnancy or its management, but not from accidental or incidental causes. Direct and indirect obstetric deaths are two types of maternal mortality. Obstetric problems during pregnancy, labour, or the postpartum period cause direct obstetric deaths. Indirect obstetric deaths are those brought on by pre-existing illnesses or illnesses that develop during pregnancy (but have no direct obstetric causes) and are made worse by the physiological effects of pregnancy, such as malaria, anaemia, HIV/AIDS, and cardiovascular system (CVS) illnesses. Maternal deaths can be avoided by increasing the availability of skilled birth attendance and delivery in settings that are adequately resourced for emergency obstetric care. The high rate of maternal mortality is a reflection of the community's low socioeconomic position, delayed referrals, and inadequate maternal assistance (WHO, 2020).

2.2 Theoretical framework

The theoretical framework for this study is WHO's Maternal Morbidity Measurement (MMM) Framework which summarizes factors contributing to maternal morbidity and mortality (Firoz et al., 2018). The framework will be used to inform data collection and analysis on the causes of high maternal mortality at

Victoria Chitepo Provincial Hospital. Figure 2 below shows a theoretical framework for this study.

2.3 Relevance of the Theoretical Frame to the Study

The framework shows that maternal mortality is a result of an interplay of factors at policy, systems and service delivery levels. For instance, poor enforcement of the user fees policy may inhibit access to quality maternal health care services by pregnant women which may increase home deliveries and their associated community maternal deaths. Unavailability of standard policies and guidelines on the provision of Emergency Obstetric Care can compromise the quality of care given to pregnant women who present at health facilities with obstetric complications causing an increase in maternal mortality and morbidity. On the other hand, poor quality of care at service delivery level may also negatively affect advocacy efforts to mobilize more resources for maternal health care (system factors). The framework will be used to explore background, intermediate and immediate factors underlying high institutional maternal mortality at the provincial hospital.

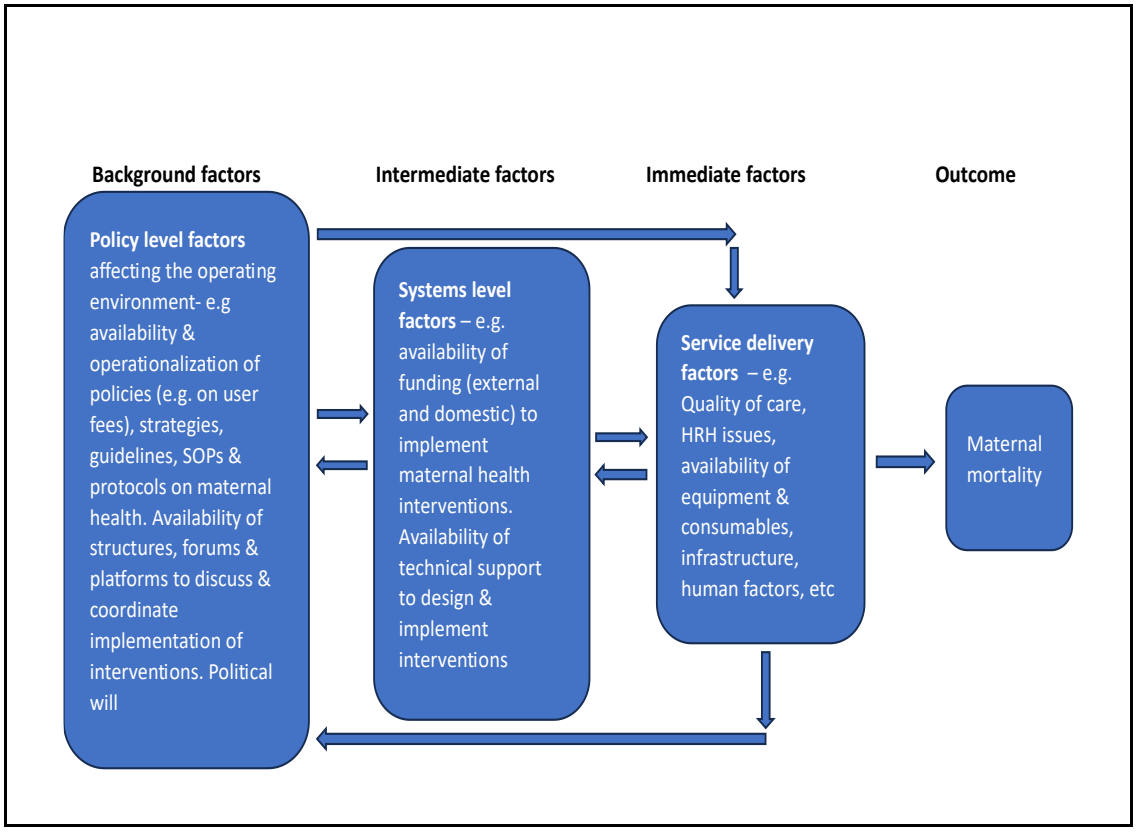

Figure 2: Maternal Morbidity and Mortality Measurement Framework

2.4 Factors influencing maternal mortality and morbidity

2.5 Obstetric factors

Short inter-pregnancy intervals (five months or less) were found to increase the risk of maternal death and pregnancy problems in a retrospective, cross-sectional study conducted in Uruguay (Rush, 2000). According to the research that is now available, short interpregnancy intervals may be linked to higher chances of preeclampsia and labor dystocia and higher risks of later obesity, gestational diabetes, abrupt labor, and placental abruption. A gap of less than six months was linked to a higher risk of uterine rupture, blood transfusions, and other delivery problems in women who had previously had a caesarean section. Whether the association between a short interpregnancy interval and unfavorable health outcomes is causative or muddled by variations in the health traits and lifestyles of women with shorter vs longer intervals—such as socioeconomic status—remains debatable. Preterm birth and

other perinatal consequences have dominated much of this discussion. However, the case for residual confounding is weaker for a number of the maternal health outcomes that our study identified since there is a clear biological pathway through which the interpregnancy gap could exert a causal effect. For instance, according to a long-term research on postpartum weight in US women, the majority of women continue to lose weight for up to a year after giving birth, after which they plateau for the next 12 to 24 months. That women who conceive within a year of giving birth will weigh more at the beginning of their next pregnancy is therefore rather likely. Consequently, there would be a higher chance of obesity and possibly gestational diabetes during the next pregnancy. Similar to this, research on the healing of caesarean wounds indicates that the uterine smooth muscle tissue heals over a few months following surgery. Radiologic results indicate that complete anatomical and scar tissue recovery takes six months. This confirms the result that women who have an interpregnancy gap less than six months after a cesarean delivery are at higher risk of uterine rupture.

Maternal outcomes thus might provide a stronger argument for the causal relationship between changing the length of the interpregnancy interval and health outcomes. Maternal depression, interpregnancy weight increase, maternal anemia, or maternal mortality were not the subjects of any research. A woman is more likely to die in an obstetric emergency if her health is already weakened by malnutrition and illness. (Hoshino et al., 2019).

Numerous studies have connected diet to haemorrhage and obstructed labour, two of the leading causes of maternal fatalities. Even while existing programs of iron

supplementation for pregnant women are unlikely to be successful, hookworm, or HIV, is a significant indirect cause of maternal death in many places (Rush, 2000) One of the most frequent avoidable causes of maternal morbidity and mortality is obstructed labor. Uterine rupture caused 36.0% of maternal deaths in Ethiopia during obstructed labor. A study in a tertiary academic medical center in Southern Ethiopia, aimed to measure the determinants of maternal mortality among women experiencing obstructed labor. This study found that women who received an ANC visit were 80.0% less likely than those who did not to have maternal death as a result of labor blockage. This could be explained by the fact that women who had an ANC visit were more likely to receive guidance on their pregnancy, be assessed for difficulties, have access to institutional delivery, and arrive at the health facility earlier. (Yego et al., 2014),

Approximately 19.7% of maternal deaths are caused by post-partum hemorrhage (PPH), which is the primary cause of maternal death worldwide. There are significant regional differences; for example, in industrialized countries, PPH accounts for around 8.0% of maternal deaths, while in underdeveloped countries, it accounts for 19.7%. In developing nations, maternal outcomes from obstetric hemorrhages, such as PPH, are also more severe. The difference in wealth between developed and emerging regions could be attributed to the latter's scarcity of resources. A few of the shortcomings in the health systems are the scarcity of trained birth attendants to assist with home deliveries as well as hospital births, the inadequate emergency transportation to a facility with greater experience, and the restricted availability of blood banks and blood supplies (WHO;2016)

In order to determine the barriers to or delays in providing effective care for women with pregnancy-related problems, focus group discussions (FGDs) with community members and traditional birth attendants (TBA) were undertaken in Nigeria. Findings from the FGDs show that due to a lack of awareness of warning signs, a belief that supernatural forces were to blame for complications, transportation issues, and a perception that hospitals provided subpar care, women and their birth attendants did not seek help as soon as possible (Ujah, 1999). According to a study conducted in Bangladesh, enhancing the prompt referral of difficult deliveries to hospitals or skilled traditional midwives could lower maternal morbidity and mortality (Fauveau, 2005). One important strategy to lower mother fatalities from childbirth in underdeveloped nations is expanding access to institutional delivery. Safe delivery is ensured by institutional delivery, which also lowers postpartum problems and improves mother and newborn survival. It is estimated that giving birth in a medical facility could reduce maternal deaths by 16–33%. A case-control study compared 338 control women to 102 maternal fatalities to determine the risk factors for maternal mortality in Conakry, Guinea. Poor family income was found to be a risk factor for maternal death. The greatest risk factors for maternal death, according to this study, were the existence of infection symptoms during pregnancy or delivery, anaemia, and hypertension. If the mother underwent a caesarean section, the risk of maternal mortality was 12 times higher (Thonneau et al., 2015).

Pregnancy-related hypertension is a serious public health issue in both developed and developing nations; nevertheless, the probability that a woman in a developing nation will pass away from hypertension-related complications is almost 300 times higher than that of a woman in a developed nation. Preeclampsia and eclampsia are examples of hypertensive diseases during pregnancy that pose a serious threat to

public health in sub-Saharan nations. Pregnancy-related medical complications are frequently the cause of both mother and infant death (WHO, 2016). In the local context, the precise origin of hypertensive problems during pregnancy remains poorly understood, particularly in Sub-Saharan region where mothers visit the hospital after complications arise.

Research conducted in Ethiopia revealed that approximately five percent of pregnant women experience hypertension, with severe preeclampsia accounting for the majority of cases. According to the study, 0.7% of pregnancies were complicated by eclampsia (Hoshino et al., 2019).

2.6 Socio-economic factors

The significance of maternal mortality in poor nations has been confirmed by research on mortality among women of reproductive age. In Bangladesh, a review of literature on maternal mortality from a gender perspective was conducted and the following factors were found to significantly affect women's health condition and access to healthcare:

a) Women's socioeconomic position,

b) Son preference,

c) Usage of medical facilities, and

d) Obstacles to visiting a medical facility and receiving treatment (Fauveau, 2005).

Community-based or socio-cultural factors, such as attitudes and practices, as well as medical and hospital factors also affect mortality. It is becoming more well acknowledged that violence against pregnant women is a major cause of maternal mortality. One in four pregnant women worldwide experience physical or sexual

abuse (WHO, 2001). A study on maternal injuries fatalities at Mozambique's Maputo Central Hospital between 1991 and 1995 established that violence is a significant contributor to maternal mortality (Granja, 2002).

Maternal mortality is influenced by women's inferior status in society to that of males. Maternal mortality is strongly predicted by women's status, according to a cross-sectional study conducted in 79 poor nations (Amowitz, 2018). In Uttar Pradesh, India, a study on women's autonomy and the use of maternal health care services discovered that women with more freedom of movement used safe delivery facilities more frequently and received more antenatal care (Bloom, 1999**)**.

In a 12-month case-control study, 152 documented cases of maternal fatalities were matched with two controls in Dakar, Senegal's three main hospitals. The study found that puerperal sepsis and other infections, hemorrhage, eclampsia, ruptured uteruses and anemia were the main causes of death. The main risk factors for health system failures identified by the study's findings were late referrals, lack of prenatal visits, and shortage of staff at the time of admission. Socio-demographic characteristics, in particular: first pregnancy, multiple pregnancies, the rainy season, being single, and low level of education, were also correlated with maternal mortality (Garenne et.al, 2019).

The following actions can be taken by governments to advance a human rights perspective on safe motherhood: working to end discrimination against women, including violence against women and harmful practices affecting women's health; ensuring that all women receive appropriate antenatal, delivery, and postpartum care;

repealing laws that forbid safe abortion procedures and other medical procedures that only women need; and ending discriminatory practices in public health care facilities, such as requiring risk-factor screening will not significantly lower maternal mortality, according to a prospective study conducted in Guinea-Bissau.

2.7 Factors associated with availability of health services

By promoting an evidence-based approach to decision-making in the care of pregnant women, efforts are being made to reduce the gap between research and practice. On June 26, 2018, a speech was given at a symposium in Korea that reviewed the main maternal issues in Tanzania. Closely spaced and high-order births, malaria, anaemia, maternal depletion, HIV/AIDS, and female genital mutilation are a few health concerns that have been linked to maternal fatalities (Miller, 2018).

By lowering the total number of pregnancies, the percentage of high-risk deliveries, and the percentage of pregnancies that result in unsafe abortions, family planning can lower maternal mortality and morbidity. Family planning could reduce thousands of maternal fatalities by enabling women to schedule, plan, and avoid pregnancies. Data also demonstrate that three to five-year intervals between births improve both child survival and maternal survival (Global Health Council, 2016).

At community, health centre, and hospital levels, the value of providing adequate and accessible obstetric care has been apparent. Although having a skilled attendant present at birth is linked to lower maternal mortality, it is unknown if this connection is causal or whether it is only a result of chance. However, research has indicated that expert attendance is necessary to lessen the risk of maternal death or impairment. Assistance during delivery is related with a lower rate of maternal

mortality. Access to emergency obstetric care resources, a supportive environment, and a partnership of trained attendants are all necessary for skilled attendance (Stekelenburg & Roosman, 2020).

If problems connected to abortion are detected quickly and treated effectively, deaths from them can be avoided. However, many women who experience problems after an abortion put off getting help, which increases the number of maternal fatalities. It has been recommended that post-abortion care (PAC) be implemented as an intervention to lower maternal mortality brought on by unsafe abortions. Experiences in Ghana and Kenya demonstrated that teaching non-physician providers (like midwives) how to provide PAC is a workable and acceptable strategy for decentralizing PAC services to the community level, and that it has increased access to post-abortion family planning and other reproductive health services (Yumkella & Githiori, 2020).

In 1989–1990, a community-based survey of maternal deaths was conducted in Harare and Masvingo, two rural and urban regions of Zimbabwe, to determine the extent to which they may have been avoided. The analysis found that both inside and outside the health industry, preventable issues are very common. Delays in choosing to seek treatment for symptoms was the patient-related factor with the highest prevalence (32.0% of deaths in Masvingo and 28.0% in Harare). Transportation issues from the patient's house to the medical institution were related to 28.0% of deaths in Masvingo and 3.0% in Harare. In Harare and Masvingo, respectively, there were 70.0% and 67.0% of deaths that may have been prevented by changes in the health system (Fawcus, Mbizvo, Lindmark, & Nyström, 1996).

2.8 Pathogenic and medical considerations

Malaria frequently results in maternal deaths that are not directly related to childbirth or pregnancy. HIV infection has a significant impact on both direct and indirect causes of maternal fatalities, while the complete impact of HIV/AIDS on maternal deaths is difficult to assess. Safe parenting initiatives must incorporate appropriate antiretroviral medication throughout pregnancy and enhanced HIV prevention as critical strategies (McIntyre, 2003). According to recent studies, nutritional supplements may lower maternal morbidity and mortality, particularly in women who have early or spaced-out pregnancies. Beta-carotene or vitamin A supplements for women in reproductive age reduced maternal mortality by 40.0%, according to a larger-scale study conducted in Nepal (King, 2013). There is no single, widely accepted method for supplementing pregnant women with iron that clearly benefits mothers and their offspring, even if doing so can prevent the reduction in iron stores that comes with pregnancy. Formative research in eight nations found a number of common barriers to iron supplementation programs as well as a number of supportive characteristics. The results were applied to enhance compliance (Galloway, 2019).

2.9 Information gap

While information on the underlying and immediate causes on maternal mortality and morbidity is available at a national scale in Zimbabwe, information that is specific to Victoria Chitepo Provincial Hospital is not available. There is no specific literature that highlights factors explaining high maternal deaths at the provincial hospital and findings from this study will fill in this information gap.

2.10 Summary

The chapter have summarized available literature on the underlying and direct causes of maternal mortality in Zimbabwe, in the sub-Saharan region and globally. The chapter has also presented a conceptual framework that will be used in the study.

CHAPTER 3 METHODOLOGY

3.1 Introduction

The study will be done at Victoria Chitepo Provincial Hospital in Manicaland Province. Victoria Chitepo is the biggest referral facility in Manicaland and it caters for a population of 2,037,703 people (Zimbabwe Population and Household Census 2022) from 7 districts namely Mutare (urban and rural), Nyanga, Chipinge, Mutasa, Buhera, Makoni and Chimanimani. It is a 300-bedded hospital with an estimated 1000 admissions and between 2000-3000 referral ins per month. The hospitals has a total of 6000 OPD patients and 120 deliveries per month. It provides specialist services through a complement of Physicians, General Surgeons, Orthopedics, Obstetrics and Gynecology, Paediatrics and Anaesthesia.

3.2 Research design

The study was a retrospective correlational study design. The design was appropriate as it investigated the relationship between high IMMR and the increased institutional caesarean section rate at VCPH without manipulating or controlling the two variables. A statistical relationship between the two does not necessarily imply causation although it enhances the possibility of predicting a causal relationship in a more cost effective way. The main methods of data collection in this type of research design were observation; archival document review and survey. In this study the archival document review were employed to extract the factors which contributed to high IMMR and high caesarean section rate at VCPH. The minutes of maternal deaths audits, deceased patient records and maternity registers were reviewed to identify factors contributing to the death.

3.3 Population and sampling

The study was done at Victoria Chitepo Provincial Hospital in Manicaland Province The study population was all maternal deaths that occurred at the provincial hospital from the 1st of January 2017 to the 31st of December 2022. These were captured and recorded in maternal death notification forms kept at the hospital. A total of 143 maternal death notification forms were completed in the period under review and all these forms were analysed. Patient notes of the deceased women were also reviewed and analysed. Complete sampling was used because every maternal death is an outbreak and it is important to look at all the maternal death notification forms and review the notes from 2017 to 2022.

3.4Data collection instruments

A checklist was designed to extract demographics, physical, medical and environmental factors from the notification forms as well as the patient records. The factors contributing to the caesarian section was also captured using the checklist. Data collection was done for a week, in February 2024, by a team made up of officers from MoHCC HQ and the researcher. The team comprised of an M&E Officer responsible for managing the quantitative data and two clinicians (obstetrician-researcher and a midwife) responsible for review of patient notes.

3.5 Data collection procedure

All maternal deaths that occurred from 1 January 2017 to 31 December 2022 at VCPH.All deaths of women that do not fit into the definition of a maternal death. A maternal death is defined by WHO 2010, as ‘the death of a woman while pregnant or within 42 days of the end of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes’. Table 3 below presents some of the variables that were used as units of analysis in the study. The study

assessed the socio-demographic profile of the deceased women, their health seeking and reproductive health behaviors before they deceased and their overall health status which may have predisposed them to bad maternal health outcomes.

Table 3: Study variables

Concept	Variable	Indicator(s)
Socioeconomic, demographic factors	Age, education level, marital status, occupation	Mean for age, level of education attained,
Health and reproductive behavior	Parity, gravidity, booking status, gestational age at booking, ANC visits, place of delivery	Mean for, parity and gravidity. Proportion of ANC booking
Access to health services	Referral system, availability of essential supplies, trained personnel,	
Health status	Medical and Obstetric factors e.g. hypertension, heart disease, eclampsia, previous caesarian section	Proportion of women with high risk factors
Maternity care	Admission time, duration in hospital, drugs and iv fluids administered, mode of delivery, duration of labour, care	Maternal outcome

interventions

3.6Analysis and organization of data

Data from the maternal death notification forms and patient notes was captured, cleaned and analysed using the Statistical Package for Social Sciences (SPSS version 16.0). Descriptive statistics using frequencies means, and cross tabulations was used to draw summary measures. Missing data was excluded from the analysis. Standard guidance (appendix 1 and 4) was used to assist analysis of the data.

The Pearson correlation coefficient was utilized to examine the extent of the relationship between the reported causes of maternal mortality and the rate of high caesarean sections at VCPH from 2017 to 2022. The Pearson correlation coefficient assumes that the data exhibits a linear relationship, the variables being studied are independent of each other, and the variability of the relationship remains constant across all levels of the variables. When interpreting the results of the Pearson correlation coefficient, a high positive correlation is indicated by a value closer to 1, suggesting a strong linear relationship between the independent variables. On the other hand, a high negative correlation indicates a negative relationship between the variables.

The formula for calculating the Pearson correlation coefficient is as follows:

$$\rho = \frac{\sum x \sum y - \sum xy}{\sqrt{(n\sum x^2 - (\sum x)^2)(n\sum y^2 - (\sum y)^2)}}$$

Where;

n is the sample size of the variables (causes).

x and y are independent variables / causes of either maternal mortality or caesarean section.

A chi-square test was done and the purpose of the test is to examine the relationship between the IMMR and the rate of institutional caesarean sections at the provincial hospital from 2017 to 2021. The test involved analysing the observed frequency and expected frequency of these variables. The test was performed at a significance level of 5%, which means that the results was considered statistically significant if the likelihood of obtaining such results by chance is less than 5%.

To determine the association between IMMR and the institutional caesarean section rate, the test utilized a specific statistical formula. Based on the results obtained from this formula, a conclusion was drawn regarding the presence or absence of an association between IMMR and the institutional caesarean section rate. The aim of this analysis is to provide valuable insights into the relationship between these variables and contribute to a better understanding of the factors influencing maternal mortality and the use of caesarean sections in the hospital setting.

$$\chi^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where;

O_i denotes observed frequencies between IMMR and institutional caesarean section rate.

E_i represents expected frequencies of IMMR and institutional caesarean section rate.

3.7 Ethical considerations

The research proposal was submitted to Africa University Research Ethics Committee (AUREC) for ethical clearance and to the medical superintendent for

Victoria Chitepo provincial Hospital for administrative clearance. There was be no physical or psychological risks in this study since it was purely archival data review. Confidentiality was ensured by assigning codes on the cases and not capturing actual names of the deceased patients or actu

3.8 Summary

This chapter provided information of the methods that will be used in the study. The study design, sampling issues, data collection methods and tools and ethical considerations for the study were given.

CHAPTER 4 DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter aims to present and analyze the main findings of the study. SPSS version 15 and Python were used for data analysis. Association tests between IMMR and ICSR were conducted using Pearson correlation and Chi-Square approaches. Descriptive statistics were performed, showcasing demographic frequencies for religion, education level, and marital status, as well as the distribution of maternal death causes, mode of delivery, age, pregnancy-related conditions, and pre-existing medical conditions. The chapter also visualized missing values for all relevant variables, and relevant data cleaning procedures were carried out.

4.2 Demographic characteristics of maternal death cases

The table below presents the distribution of demographic factors among the studied maternal death cases. The findings reveal that 90.9% (n = 130) of the individuals who died during childbirth were married, while 9.1% (n = 13) were single. This indicates that the majority of maternal death cases involved married individuals, with only a small number being single. In terms of education level, the highest percentage, 46.8% (n = 65), had completed secondary education, while the lowest percentage, 3.6% (n = 5), had reached tertiary education. This suggests that most of the patients who experienced maternal death had completed their secondary education. Regarding religious affiliation, Christianity accounted for the highest percentage at 46.4% (n = 77), followed by the Apostolic Sect with 23.5%.

Table 4: Demographic data

Demography Factors		Maternal Death Notification Forms	
		Frequency	**Percentage**
Marital Status	Married	130	90.91%
	Single	13	9.09%
Education Level	Primary	16	11.51%
	Secondary	65	46.76%
	Tertiary	5	3.6%
	Unknown	53	38.13%
Religion	Apostolic Sect	39	23.5%
	Christianity	77	46.38%
	Islamic	3	1.81%
	Unknown	17	10.24%

4.3 Descriptive Statistics

Figure 3 below presents a descriptive summary of Age, ANC Visits, and Parity. The minimum age recorded is 16, while the maximum age is 46. This indicates that the youngest individual among the maternal death cases was 16 years old, while the oldest was 46 years old. The lower and upper quartiles of age, suggest that the majority of ages fall between the age range of 24 and 34. However, there are outliers present in the dataset.

Regarding ANC visits, the average number of visits is 3, indicating that, on average, individuals made three antenatal care visits during their pregnancy. The average Parity stands at 2.26, suggesting that, on average, individuals had given birth to approximately two children.

mean	std	min	25%	50%	75%	max
29.68	7.11	16.0	24.0	30.0	35.0	46.0
2.26	1.71	0.0	1.0	2.0	3.0	9.0
2.99	1.17	1.0	2.0	2.99	3.0	6.0

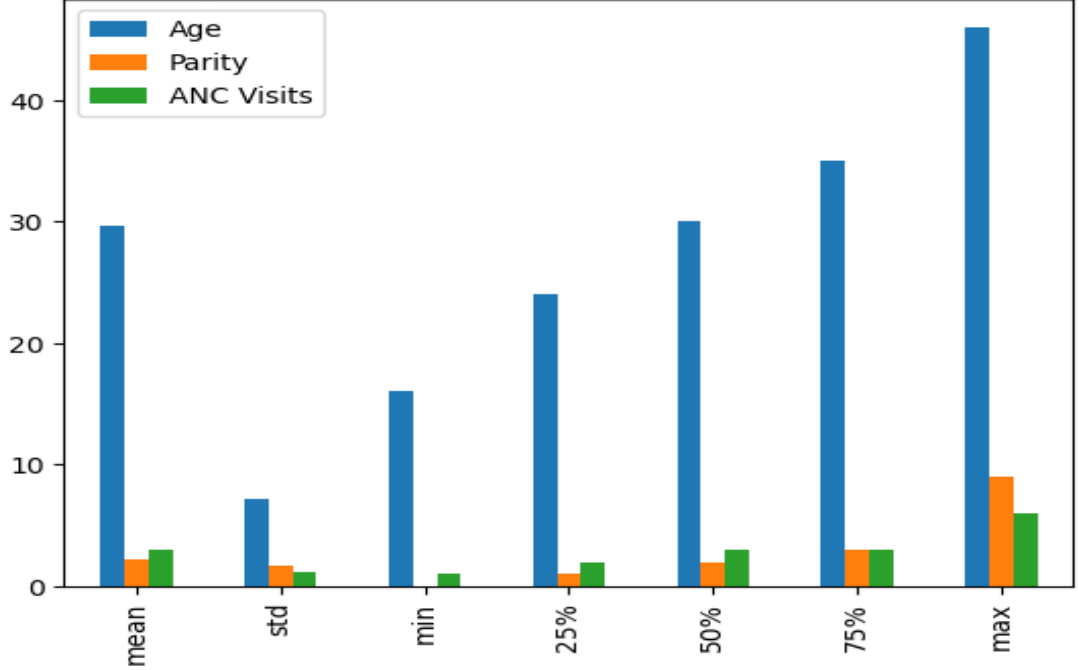

Figure 3 : Descriptive Statistics

4.4 Medical Conditions

As analysis was conducted to check distribution of pre-existing medical conditions and pregnant-related conditions among the patients who experienced maternal death. As indicated by the Pre-Existing Medical Conditions plot below, the majority of patients had no pre-existing conditions, accounting for a significant proportion of 40.8%. Th second highest significant proportion, at 30.4%, was attributed to patients with HIV/AIDS. Maternal patients who had essential hypertension and other relevant pre-existing medical conditions accounted for 16% of the cases. Patients with Diabetes Mellitus constituted 3.2%, while Cardiac patients made up a total of 9.6%. This suggests that the majority of maternal patients who encountered death had HIV/AIDS, while the remaining patients either had other detected conditions.

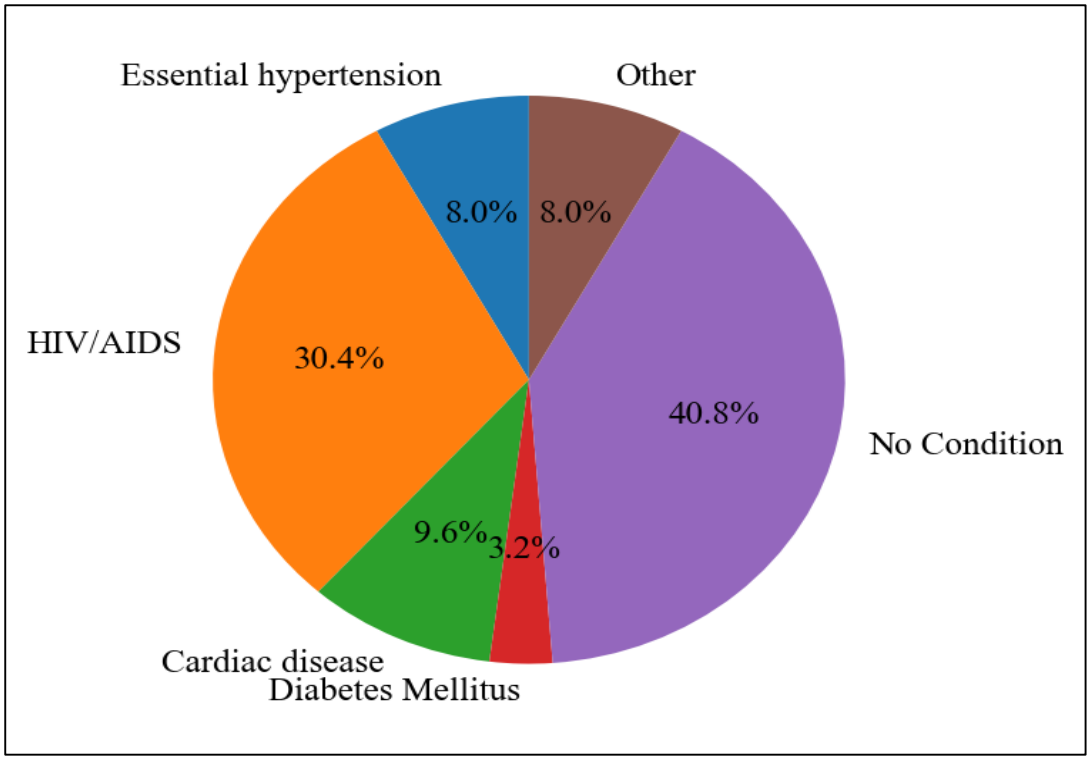

Figure 4: Summary of pre-existing medical conditions

Among those who incurred death, maternal patients without pregnancy-related conditions (Not Known) constituted 59.2%, followed by patients who had Pre-eclampsia/Eclampsia, accounting for 28.3%. Gestational Diabetes and Ectopic pregnancy had the same proportion, representing 2.5% each among the recorded maternal deaths. Additionally, 7.5% of the maternal patients had other relevant pregnancy-related conditions.

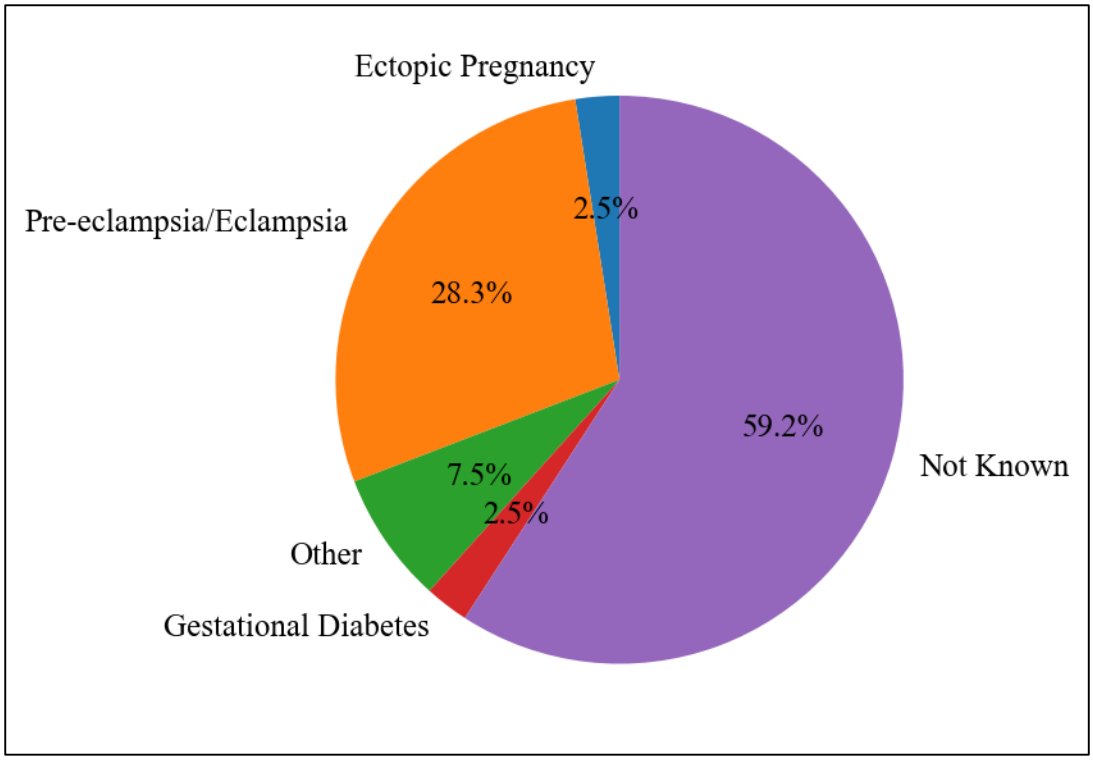

Figure 5: Summary of pregnancy related conditions

4.5 Cause of Death

The study specifically focuses on investigating the causes of maternal death at Victoria Chitepo Provincial Hospital. The records of maternal death notifications and their corresponding notes have documented various causes of death. The plot below provides a comprehensive overview of the primary causes of maternal death.

According to the bar plot, PPH causes of death accounted for a significant proportion of 31.7%. This indicates that a considerable number of maternal deaths were due to PPH. Additionally, the plot demonstrates that maternal deaths attributed to eclampsia, Ruptured Uterus, Malaria, Puerperal Sepsis, Cardiac Diseases, and other causes were also relatively high.

Conversely, maternal deaths resulting from Cryptococcal Meningitis, Diabetes, and Anaesthetic Complications constituted the smallest proportion among the causes of maternal death, depicted in the plot.

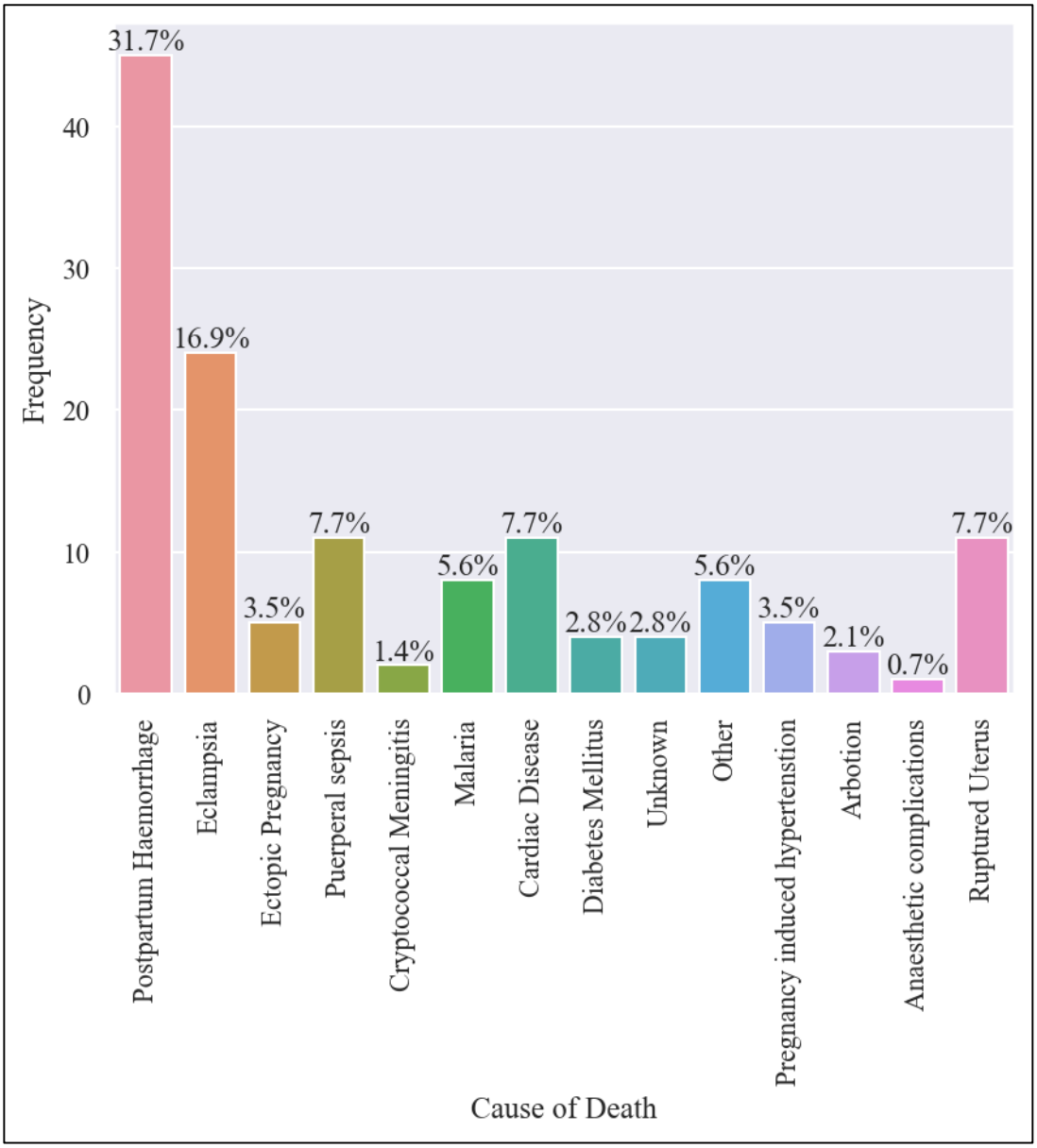

Figure 6: Cause of death

4.6 Maternal death avoidability and the delays

An assessment was conducted to determine the avoidability of maternal deaths. This subsection provides illustrations of potential delays that have contributed to these deaths and assesses their preventability. The figure below summarizes the delays that may have led to maternal deaths at VCPH (Victoria Chitepo Provincial Hospital). The graphs indicate that a majority of the individuals who died had experienced

delays in getting medical attention at the health facility (third delay) resulting in medical practitioners being certain about the avoidability of these deaths.

However, only a few individuals who delayed in seeking medical attention (first delay) had their deaths certified as unsure or not avoidable. A few individuals lacked transport from home but transport between health facilities was almost efficient most women who needed transfer to next hospital facility managed to do so without delay. A few individuals died because there was no equipment ;at one point there was no clinical staff and also lack of experts and these cases were discussed at length in their audit meetings.

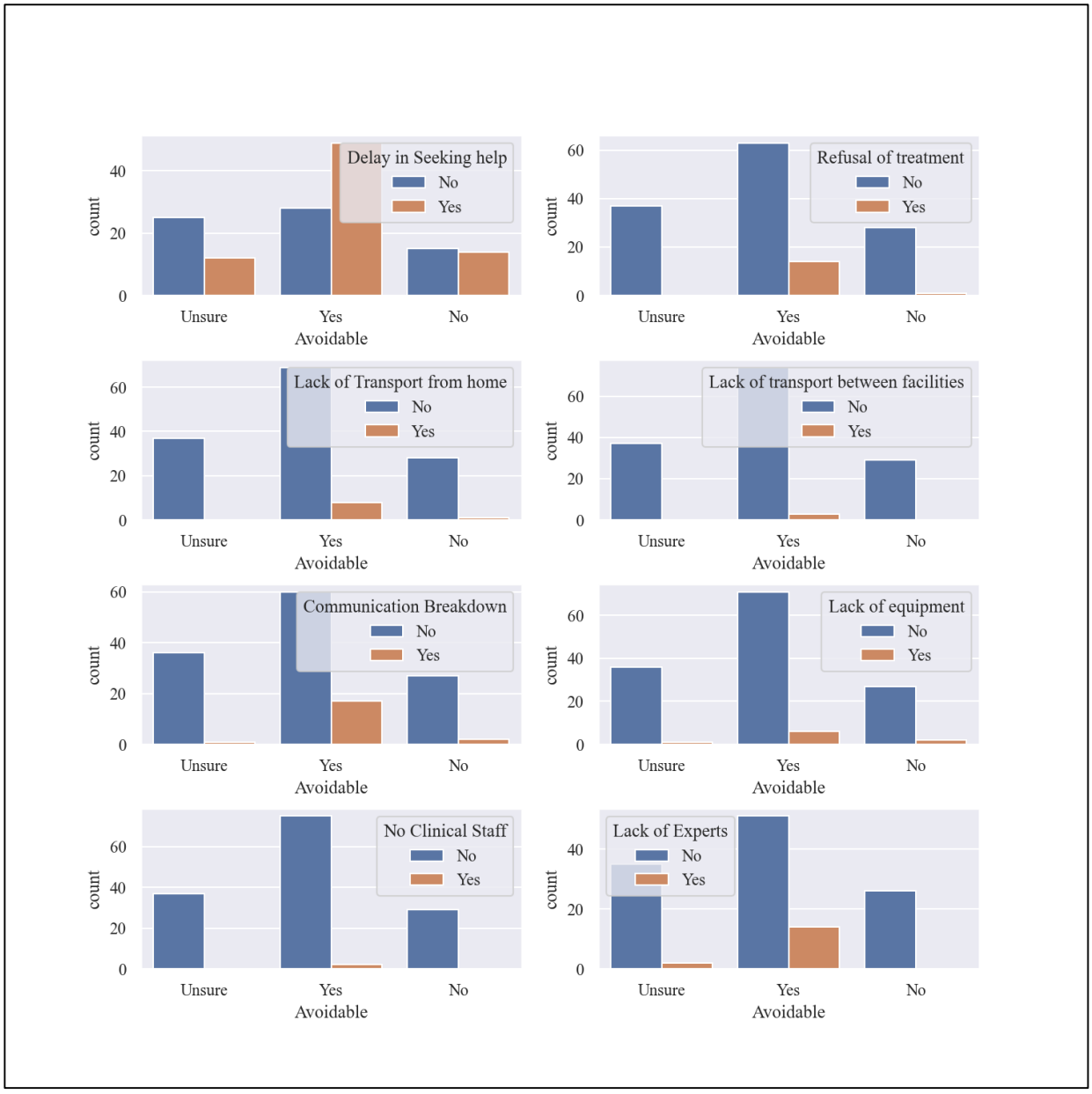

Figure 7: Avoidability and delays

4.7 Mode of Delivery

The mode of delivery has been classified into three categories: Caesarean Section, No Delivery, and Normal vaginal delivery , as shown in the pie chart below. The pie chart indicates that most women who died had a normal vaginal delivery, accounting for 44.3% of the cases at VCPH. Caesarean section delivery was the method used for 35.0% of the maternal death cases, as depicted in the pie chart. The remaining 20.7%

of the data represents patients who did not undergo any delivery procedure and this means that the woman died with the baby in utero.

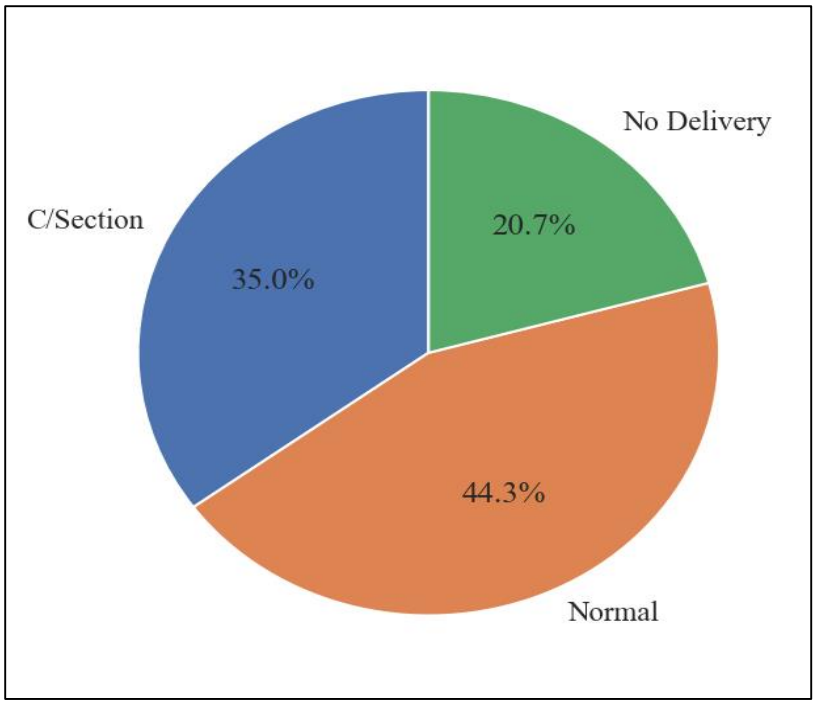

Figure 8: Mode of delivery

4.8 Pearson Correlation Between IMMR and CSR

The correlation test conducted between institutional maternal mortality and Caesarean Section Rate using the Pearson correlation showed a strong positive correlation with an r-value of 0.818. This indicates that as the institutional maternal mortality rate increases, the Caesarean Section Rate also tends to increase. The p-value of 0.046 suggests that this correlation is statistically significant, meaning it is unlikely to have occurred by chance.

The standard error value of 0.213307 indicates the variability or uncertainty associated with the estimated correlation coefficient. It highlights that the sample estimate of the correlation may deviate from the true population correlation by

approximately 0.213307 units. Since the correlation estimate is greater than the standard error, it suggests the Pearson correlation is strong and more reliable.

4.9 Chi-square Test

The study also examined the association between IMMR and CSR using a chi-square test at a significance level of 5.0%. The following contingency table displays the occurrence of IMMR categorized by CSR:

Table 5: Crosstabulation -Institutional Maternal Mortality * Caesarean Section

		Caesarean Section		Total
		Yes	**No**	
Institution Maternal Mortality	Yes	22	68	**90**
	No	33	20	**53**
Total		**55**	**88**	**143**

As shown in the table above, maternal mortality rate occurred 22 times when caesarean section was done, while it occurred 68 times when caesarean section was not done. A chi-square hypothesis test was conducted to verify the association between IMMR and CS. The table below presents the Pearson Chi-square statistic of 20.158, which yielded a corresponding probability value of 0.000. Hypothesis statements are defined as H_0: IMMR and CS are not associated, H_1: IMMR and CS are associated. Based on the probability value obtained and comparing it to the predetermined level of significance, it can be concluded that there is indeed an association between IMMR and CS. This suggests that the Caesarean Section procedure has contributed to the institutional maternal mortality rate between 2017 to 2022.

4.10 Audit Minutes Analysis

This study examined the Audit Minutes of Victoria Chitepo Provincial Hospital from the years 2017 to 2022 to assess the maternal death rate. The study aimed to include all the minutes of the audit meetings conducted; however, only 47 cases were obtained for the years 2019 to 2022. It was observed that the audit minutes for the years 2017 and 2018 were missing, resulting in a lack of data for those years.

It is important to note that demographic information was missing in all the audit minutes, and therefore, this section is excluded from the paper.

4.11 Data Cleaning

Data cleaning was conducted, taking into account various assumptions. The plot below displays variables that had gaps and missing values. Notably, the graph highlights variables such as postpartum diagnosis, ANC visits/contacts, and antenatal diagnosis, which had a significant number of missing values. To address this issue, certain assumptions and measures were employed to mitigate the missing information. The table below outlines these assumptions and measures that were taken to handle the missing data.

Table 6: Assumptions on missing data

Variable Name	Assumptions/ Measures
Age	Age had the fewest missing values and was imputed with the mean of the available ages.
Parity	The average of Parity was used to replace the missing values.
ANC visits/ contacts	The average of the variable was utilized to fill in the missing values.

4.12 Descriptive Statistics

This section presents the descriptive statistics of the study, while the following graphical presentation displays the mean, upper quartile, lower quartile, minimum, and maximum values of the continuous variables analysed in the study, such as age, parity, and ANC visits/contacts. The plot below reveals that the average age of the patients who experienced maternal death at VCPH was 27.9 years, with the youngest recorded age being 16 years according to the audit minutes. In terms of ANC visits, the average number of visits was 4, indicating that, on average, individuals attended

three antenatal care visits during their pregnancy. Additionally, the average Parity was calculated as 2.33, suggesting that, on average, individuals had given birth to approximately two children.

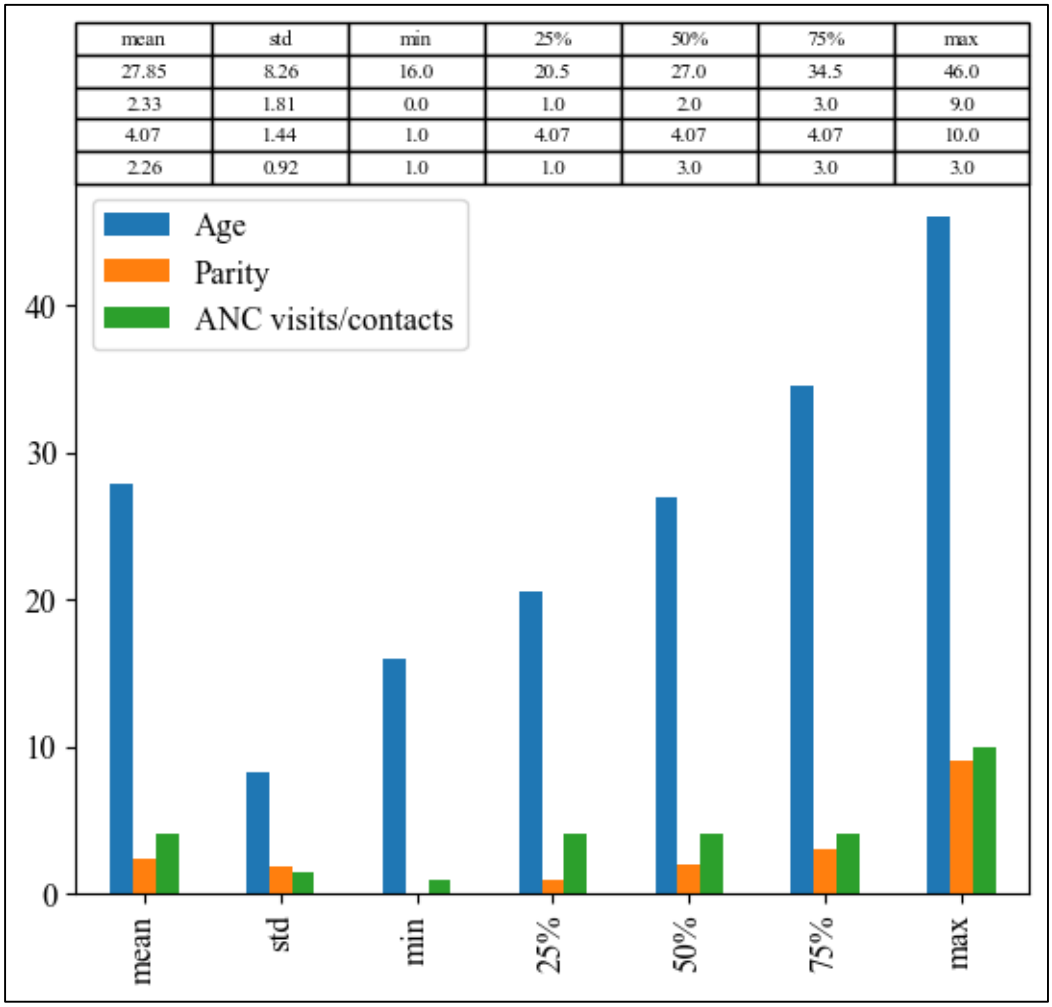

Figure 9: Audit minutes descriptive statistics

4.13 Treatments according to guidelines

Among the variables examined, the treatments administered by Victoria Chitepo Provincial Hospital (VCPH) were evaluated to determine if they adhered to guidelines. The following pie chart sheds light on the quality of services provided by VCPH concerning maternal deaths, as documented in the audit minutes. According to the pie chart, 36.3% of the treatments provided to maternal patients did not align with the established guidelines. This suggests that a significant portion of the

maternal death cases may have been a result of deviating from the recommended protocols. However, 34.0% of the treatments met the standard guidelines. It is important to note that for 29.8% of the total recorded cases, it was not specified whether the treatments followed the appropriate guidelines or not.

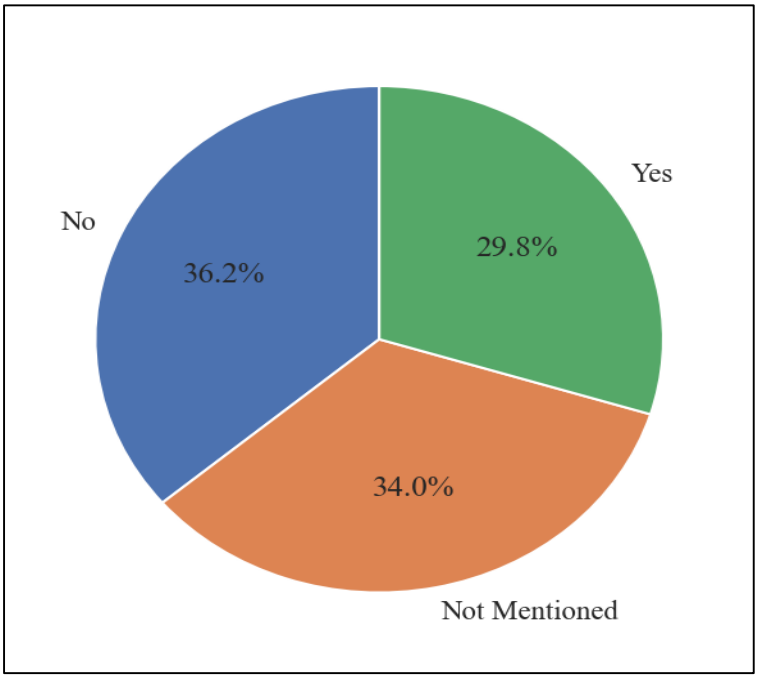

Figure 10: Guidelines usage during management of patients

4.14 Delays

During the analysis of the audit minutes, several delays were identified, and the graph below showcases the distribution of these delays. The delays were categorized into three types: patient delays in seeking medical attention (represented by 1), patient delays in accessing the hospital (represented by 2), and patient delays in receiving assistance at a healthcare facility (represented by 3).

As depicted in the plot, the majority of patients experienced delays in receiving assistance at a healthcare facility. This could potentially be the main cause of the high maternal death rate recorded. The second highest bar on the graph highlights that patient often ignored early warning signs or symptoms of health issues, which

subsequently worsened and led to maternal mortality. Only a small number of patients encountered delays in accessing hospitals.

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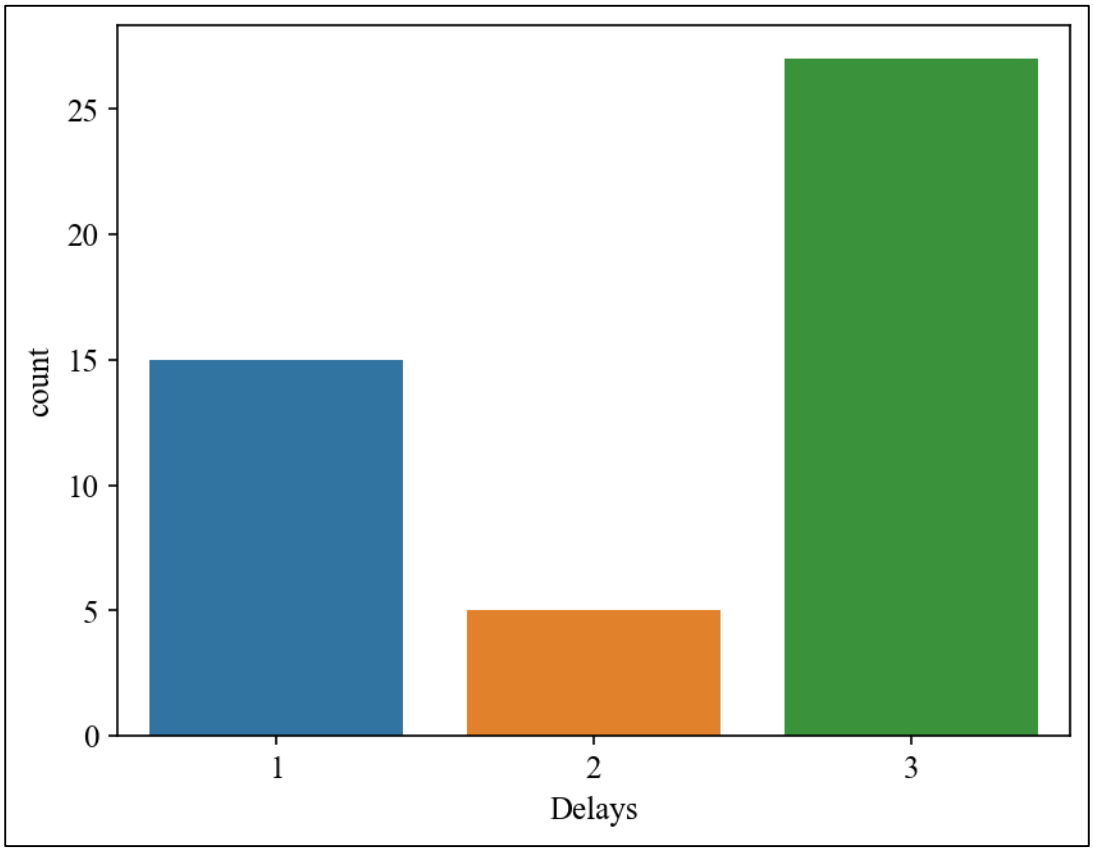

Figure 11: Delays in the management of patients

4.15 Intrapartum diagnosis

The graph below depicts the number of intrapartum diagnoses was made for most of the cases as captured by the audit minutes from 2019 to 2022 and 8 deaths being unavoidable the rest were avoidable. Of the audited cases there was one maternal death case that occurred without an intrapartum diagnosis and this case was deemed unavoidable.

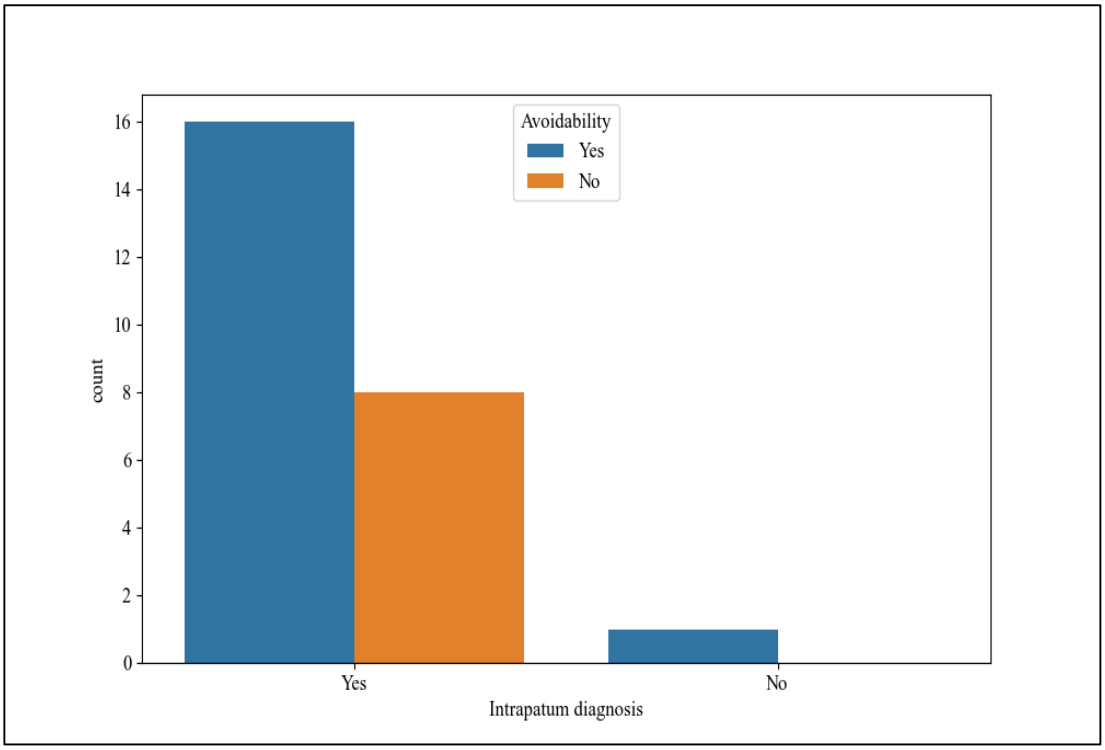

Figure12: Intrapartum diagnosis and avoidability

The table below provides a summary of the core variables captured by the audit minutes, including the cause of death, contributory factors, delays, audit findings, and recommendations.

Table 7: Summary of findings from audit meetings

Cause of Death	**Contributory factors**	**Delays**	**Other audit findings**	**Recommendations**
Fetal distress	Delayed C/Section	Delays in doing USS	Inadequate monitoring of high-risk patient	Coming up with job aides or reminders on fatal distress management
Cardiac Arrest	High spinal anaesthesia	lack of expertise	Anaesthetist trainee attending the patient.	Anaesthetist who is still trainees should be attached to someone qualified
Breast cancer	Nursed inappropriately	Delay in performing emergency caesarean section		There is need to strengthen physical examination during ANC and PNC.
Septicaemia		Delay in seeking help		Proper documentation.
HIV/He	Delayed	Delayed in	Poor history taking	Proper history taking,

patitis B	investigations on all cases for diagnosis	seeking treatment		investigations to be done on all suspected cases to avoid delays
Septic Shock	Under age	Delay in making a delivery plan for the patient	Poor monitoring of at-risk pregnant mothers at waiting mothers' shelter	
Ruptured uterus	Inadequate resuscitation at clinic and district level	Delay in definitive management	No blood grouping done	Blood grouping to be done during ANC on booking as a measure of emergency preparedness
PPH	Kidney failure		Autopsy inadequately done	Medical Superintendent to inform PMD on the impact of unavailability of doctors in some institutions.
Pulmonary Emboli		Clinic delayed in referring patient		To consider use of checklist on admission
Puerperal Sepsis			Staff not forthcoming in attending audit meetings	Making it compulsory for clinical departments to be represented in audit meetings
fetal distress			Patient was not seen by doctor despite presenting to hospital on 3 occasions	To have doctors register in casualty department
ruptured ectopic pregnancy	Inadequate monitoring of patient post-operative in theatre recovery room			To have monitors in recovery room
bleeding intra-operative	No communication was done prior to sending patient		Inadequate monitoring of patient post-operative at referring hospital SDH	To inform Obstetrician before transferring patient for guidance
complicated malaria			MPH Theatre team not available for the emergency when patient arrived.	Night Superintendence to check on theatre team on call
ruptured	Failure to		fetal heart not head,	To liaise with Old Mutare in

uterus	insert iv line		fetal parts felt on palpation and BP un-recordable	order to loan anaesthetic machine to SDH
Congestive Cardiac Failure, Rheumatic heart disease	Anaesthetists failed to attend to the patient	Delays in attending the patient		To avoid trials on patients with delays and complications
Puerperal sepsis	No adequate history from referring hospital, Needed ICU - No bed		USS was ordered but it was not done and reasons were not indicated and Nee for blood cultures to identify causative bug the turnaround time is 10 days.	Hospital team to team up with PMD Manicaland to visit St Peters and have audits with them and Provincial Pharmacist to check with St Peters for the supply of IV antibiotics.
Eclampsia + Aspiration Pneumonia	Dr was not available to assist with resuscitation of the patient	Delayed seeking medical help	Patient was un-booked and referred with no adequate history from the relatives.	Need for sensitization on early booking and Aggressive resuscitation to be done regardless of the state of the patient.
Abdomen distended	Lack of coordinated specialist consultants	Delay in precise communication about perforated bowel and referral was delayed.	There was lack of coordination between the clinical officer, doctors and the Consultants.	A clinical Officer is not qualified to repair a perforated bowel. Renew od the patient post C/Section should be done timeously and Urgent refer of patients must be done to prevent delays
Severe pneumonia, severe sepsis	Evac not done		Rvac was not done on time because removal of PROCS was going to stop the bleeding, Anaesthetic must be done by consultant for eptic cases.	Evacuation of PROCS must be done in Casualty theatre before patient's admission, Haemorrhagic kits must always be available in Casualty Department as well as post abortal care packs.
Abdomen distended, Intestina	Delayed U and E results	At MPH C/S delayed	C/S was done. Difficult extraction of the baby.	JRMOs should be taught about baby extraction during caesarean section, Vacuum extraction should not be attempted if not able to

l Obstruction				perform a Caesarean section at that time.
Cord prolapses	No follow up of results on time (U&E)	Delays in U&E results		Laboratory investigations results to be released on time
Early artificial rapture of membranes	Unavailability of sundries at SDH	Delay in performing the C/S	Early artificial rapture of membranes and proper management of cord prolapse	Holding of refresher course on management of obstetrics emergencies for doctors and midwives
Haemorrhagic shock				A community audit should be held for such cases
Ruptured uterus and hypovolaemic shock		Delay from referral clinic	SDH did not resuscitate patient.	Proper referral system and at district level they should resuscitate patients first
Preterm, Anaemia	Failure to report by the patient	Delay to report earlier		Counselling patients with chronic conditions, Organise with Community Nurses to follow up to such patients documentation should be properly done,
Hormonal imbalance		Resuscitation equipment not in place	Bedside clotting not done at SDH and at VCH, Time of departure from SDH not mentioned	
Pneumonia		PCR results delayed		Emergency caesarean section should be done on all patients with previous caesarean section.
Severe Covid 19 and Pneumonia				High oxygen flow equipment
Severe pneumonia				Maternity theatre should be functional
Septic Shock	Delay in theatre in commencing the LSCS	Delay in decision making by the patient.		Need to do intensive resuscitation of patients on arrival with such cases

Eclampsia	BPs rapidly dropped due to use if strong anti-hypertensive.		Inadequate history taking	To procure IV antihypertensive which reduce BPs about 15-20%
Pregnancy Induced hypertension, kidney failure	Patient had lost blood while at home	Patient delayed to seek health attention	Shortage of material resources (gowns) due to autoclaving machine	To design an ICU admission protocol
Meningitis, Retroviral infection		Unavailability of resources		To train Cadres on testing malaria using RDT kits properly
Puerperal sepsis	Fibrotic uterus completes out		It was noted that the departments were not fully represented as there was need for clarity in some issues.	Pharmacy to highlight drugs out of stock so that prescriptions are given to relatives.
Rheumatic Heart disease	A delay in Casualty	A delay in Casualty	There was no need for an ultrasound scan Oxytocin was given which causes fluid retention that tipped the penitent into heart failure	All patients with threatening miscarriages life threatening conditions must be admitted.
Distended abdomen	The Local clinic did not refer the patient after a difficulty delivery		Intravenous antibiotics were not available at the Pharmacy	Pharmacy to keep medicines for critically ill patients

4.16 Discussion and interpretation

4.17Analysis of factors associated with high maternal mortality at VCPH

In this study information on maternal death was obtained from 143 maternal death notification forms and 105 hospital notes for the deceased patients were analysed from 2017 to 2022. Also audit minutes of the same period were obtained and analysed.

In a study done by Saffron K et al on the relationship between maternal education and mortality among women giving birth in healthcare institutions: Analysis of the cross sectional WHO Global survey on maternal and perinatal health it was shown that in their adjusted models, the risk of maternal mortality was double that of women with more than 12 years of education, and it was 2.7 times higher for women with no education and twice that of women with one to six years of education. In the adjusted model, there was no correlation between maternal mortality and institutional capacity. The mortality risk was nearly twice as high for single people as for married or cohabiting couples. Those over 35 (as opposed to those between 20 and 25 years old), those with more prior pregnancies, and those with lesser state health care spending all had a noticeably increased risk of dying. (Saffron K; 2011) In our study it was shows that 46.8% of the patients were educated up to secondary level and only 3.6 % of the patients were educated up to tertiary level. It means the remainder of the patients did not get much education which is in support of the above study which showed the lower the educational level the higher the chances of maternal mortality. In our study the proportion of patients who deceased who were single was 9.1% compared to 90.9% who were married in contrast to what was found in the above study more married patients died in this study compared to the single ones.

4.18 Causes of high caesarean section rate

Although many maternal deaths can be avoided with quality prenatal and postpartum care, only 64.0% of women worldwide receive antenatal treatment four or more times during their pregnancy. In this study antenatal visits were ranging from one to six. Antenatal care, or ANC, is the term for the medical attention that adolescent girls and pregnant women receive from qualified healthcare experts to guarantee the best possible health outcomes for the unborn child and the mother. Risk assessment: prevention and treatment of diseases connected to or coexisting with pregnancy; and health promotion and education are the constituents of ANC. Antenatal care (ANC) improves obstetric and neonatal outcomes by facilitating institutional delivery and postpartum care, as well as by enabling the appropriate management of prenatal morbidities. The new WHO ANC model emphasizes that a woman's "contact" with her provider should be more than just a "visit," but rather an opportunity for high-quality care that includes timely and pertinent information, medical attention, in helping throughout the pregnancy. The term "contact" is used in the guidelines because it suggests an active relationship between a pregnant woman and a provider, which the word "visit" may not always imply. According to the new model, pregnant women should make their initial contact within the first 12 weeks of pregnancy, and then again at 20, 26, 30, 34, 36, 38, and 40 weeks. The chance of a successful pregnancy rises with more maternal and fetal evaluations to identify problems and with better support and communication between healthcare providers and expectant mothers (WHO;2017). There is need to increase more antenatal care visits for the patients at VCPH in order to reduce complications in pregnancy.

The Sustainable Development Goals (SDGs) of the UN call for a reduction in the global maternal mortality rate to less than 70 per 100,000 live births and the elimination of newborn and child mortality that can be prevented in every nation by 2030. In order to lower maternal and perinatal mortality, enhance care quality, and potentially help achieve the SDGs, audits and reviews of maternal and perinatal deaths are strongly advised. The most economical method of examining and auditing deaths is unclear, though: facility-based audits (significant event analysis; SEA), community-based audits (verbal and social autopsy), or a combination of both (confidential inquiry) may be effective. Maternal and perinatal death reviews, or MPDRs, are advised by the World Health Organization (WHO) to be performed in healthcare facilities Although there isn't much solid data to back up the prevalent belief that death reviews are helpful and will reduce mortality, this assumption is nonetheless made. Policymakers would benefit from knowing which kind of death review has the biggest influence on the rates of maternal, perinatal, and child deaths as well as what characteristics are necessary for a successful death review procedure (WHO 2013; WHO 2016) Confidential inquiry appears to be the most all-encompassing approach to addressing a broad range of preventable factors, and therefore has the potential to have the biggest impact; however, it is not clear how well it would work in low-income countries, how feasible it would be, or whether it could be modified. The literature does not contain a thorough systematic evaluation that looks at the effects of different death investigation techniques. In medical facilities, death audits are typically conducted using SEA or MMCs. In a multidisciplinary team meeting, cases are typically discussed (Hussein 2007). Health professionals identify preventable variables and learning needs after debating the case's specifics. They then suggest courses of action and modifications. Although the

process does not aim to assign blame, the identities of the staff members participating are not kept private. In fact, according to Supratikto (2002), open-mindedness and non-confidential straightforwardness are essential for a plan to be successful. Mortality meetings, root cause analysis meetings, and even serious case reviews (in child protection situations) follow a similar procedure. The majority of mortality discussions are held at secondary healthcare facilities, when the diagnosis and important therapeutic steps are determined by reviewing medical records. In this study the hospital facility audits were done together with review of maternal death patient's notes. Although some of the audit minutes were missing during the study for those audits that were done, very good recommendations came out but was not sure about the implementation of the recommendations.

Particularly in underdeveloped nations, grand multiparity continues to be a risk factor for a variety of obstetric problems. It has been demonstrated that grand multiparity raises the risk of obstetric and medical problems during pregnancies. In this hospital-based prospective investigation, the incidence of poor maternal outcomes for grand multiparous women was compared to that of multiparous women. Overall, there were 39.9% cumulatively unfavorable maternal outcomes (95%CI: 36.6, 43.4%). Separately, it was discovered that 36.3% of multiparous women (95% CI: 32.3–40.6) and 47.1% of grand multiparous women (95% CI: 41.0–53.2) had poor maternal outcomes. Grand multiparous women in this study have a greater frequency of maternal outcomes compared to multiparous women (total hospital days, postpartum hemorrhage, and malpresentation, $P < 0.05$). Multiparous women were more likely to experience preterm membrane rupture, induction/augmentation, cesarean birth, and preeclampsia, although the differences were not statistically significant. The results of this study showed that grand

multiparas had a higher rate of unfavorable maternal outcomes than multiparas. The results are consistent with those of an earlier Ethiopian investigation. Nonetheless, the outcome exceeded that of a study conducted in India. The plausible rationale could stem from India's excellent maternity care services and strong standards across all health facility levels. Adequate prenatal care and regular follow-up are associated with a lower risk of delivery problems when combined with proper health-seeking behavior. In a similar vein, the implementation of a modern healthcare system that offers prenatal and socioeconomic benefits should lower the incidence of unfavorable mother outcomes. Grand multiparity increases the likelihood of unfavorable pregnancy and delivery outcomes for mothers. The study found that postpartum hemorrhage and malpresentation are examples of these unfavorable maternal outcomes. Effective reduction of the risk factor is possible with appropriate prenatal care and delivery by qualified medical professionals. One tactic to stop women from not achieving high parity in low-resource settings is to provide accessible and effective contraception services and promote community health education. Prioritizing education on the detrimental effects of grand multiparity on obstetric performance during pregnancy is another important goal.(Dassa; 2022) In this study the maximum parity was nine which showed that the complications of grandmultiparity contributed to maternal mortality in this study.

In this study the youngest age of the woman who died during this period was 16 years. It also shows the effects of teenage pregnancy. In a document in Uganda on ending child marriage and teenage pregnancy it was stated that the primary cause of death for females between the ages of 15 and 19 worldwide is problems related to pregnancy and childbirth, with lower- and middle-income. Uganda is among the countries that account for 99 percent of maternal fatalities worldwide among women

between the ages of 15 and 49. Compared to women aged 20–24, adolescent moms aged 10–19 are more likely to experience eclampsia, puerperal endometritis, and systemic infections. Furthermore, according to WHO 2020 and UNFPA 2020, there are almost 3.9 million unsafe abortions among girls between the ages of 15 and 19 per year, which raises the risk of maternal death, morbidity, and long-term health issues (The national strategy to end child marriage and teenage pregnancy 2022/2023 – 2026/2027 Uganda).

In a study done in Japan on pregnancy in advanced maternal age the purpose of the study was to elucidate the connection between advanced maternal age and maternal mortality in Japan. For all maternal fatalities in Japan throughout an 11-year period, from 2010 to 2021, maternal mortality rates by age group were examined. The cause of maternal fatalities among individuals who were 40 years of age or older was thoroughly investigated, and the number of deaths by cause was computed. Investigations were also conducted into the origins of the most prevalent causes of death. Compared to other age groups, patients who were 40 years or older had a significantly greater death rate. For patients under 40 years old, hemorrhagic stroke accounted for the majority of deaths (15/65 [23%]); the most common cause of hemorrhagic stroke (8/15 [54%]) was preeclampsia. Hemorrhagic stroke was the most common cause of death in patients aged ≥ 40 years (15/65 [23%]), and preeclampsia (8/15 [54.0%]) was the most common cause of hemorrhagic stroke. Maternal mortality is significantly higher in older than in younger pregnant women in Japan, with hemorrhagic stroke being the most common cause of maternal death among women > 40 years of age. More than half of hemorrhagic strokes are associated with hypertension disorder of pregnancy. These facts should be considered by women who become pregnant at an advanced age and by healthcare

providers involved in their perinatal care.(Hiroaki T;2023) In our study on maternal mortality at VCPH the maximum age of the patient who deceased was 46 years it shows that our setting is not exception to what other countries are going through and the pregnancies in advanced maternal age have to be cautiously managed and women counseled on getting pregnant in that age group when it's really necessary otherwise use of family planning consistently and correctly will be encouraged.

In this study PPH caused 31.7 % of maternal deaths. PPH is a leading cause of maternal mortality in most Sub-Saharan countries. In a study done on maternal death and postpartum hemorrhage in Sub Saharan Africa pilot study in metropolitan Mozambique it was discovered that PPH was detected in 12.0% of births at that hospital and that it was highly correlated with death; a woman's chance of dying rose by around five times if she had PPH. Because at the time there were no clear procedures for the identification, documentation, evaluation, and management of PPH, the prevalence of 12.0% is probably underestimated. In fact, when transfusions were initiated or procedures that are typically linked to hemorrhage (such placental abruption) took place, PPH and/or volumetric estimates of blood loss were frequently not documented. These results imply that health care professionals may not have been well informed about the significance and harmful consequences of PPH. Even in affluent nations, undiagnosed abnormal postpartum blood loss has been observed to occur often (about 11.0%-16.0%). This blood loss can be discovered by changes in indices such as hemoglobin (down of ≥2 gm/d), anemia development, or a drop in hematocrit of ≥5% after delivery.30 In underdeveloped nations without a consistent method for identifying, documenting, and managing PPH, the numbers might even be greater (Lian L BS;2020). In the recommendations from the maternal death audit minutes, it came out several times that the clinicians

are encouraged to follow the guidelines when managing patients. From the analysis of the audit minutes, it was noted that 36.2% of the patients were not treated according to the guidelines and the guidelines were not mentioned in 34.0% of the cases. If reduction of maternal mortality has to be achieved in our setting there is need to have clear guidelines on PPH management and also follow up on whether the clinicians are following the guidelines consistently. In the WOMENS TRIAL that was done in 2020 recruitment for the majority of the 20,060 study participants took place in Asia (6030) and Africa (12,343). In Africa and Asia, respectively, there were 483 maternal fatalities with case fatality rates of 3.0% (375 women) and 1.7% (105 women). 1049 women were enlisted in Europe, and none of them perished. Narratives for 52.0% of the deceased ladies were obtainable (Picette;2020) It shows that its possible to prevent maternal mortality due to PPH.

According to the World Health Organization (WHO), pregnancy-related hypertensive disorders account for 14.0% of all maternal deaths worldwide; in Latin American and Caribbean countries, these disorders accounted for 25.7% of maternal deaths; in Asian and African countries, they accounted for 9% of maternal deaths, and in Sub-Saharan countries, they accounted for 16.0% (WHO, 2010).

A significant number of women died due to eclampsia that was 16.9% of the cases. Compared to causes of maternal death between 2001 and 2010, Bangladesh achieved notable progress in lowering maternal mortality. The MMR was lowered during this time in part because of a notable decrease in hemorrhage-specific fatalities and eclampsia, which may have been brought on by more women accessing antenatal care (ANC) and facility deliveries. In spite of the ongoing advancements in the coverage of ANC and facility-based deliveries, maternal mortality stayed unchanged

in 2016 compared to 2010. This suggests that while low-risk maternal mortality have been successfully avoided by Bangladesh's current maternal healthcare service system, critical and emergency obstetric conditions have not been well managed. Cause-specific interventions to lower preeclampsia/eclampsia-related deaths have not been as successful as anticipated, as seen by the unchanged share of preeclampsia/eclampsia in maternal mortality over the previous ten years. Preeclampsia and eclampsia can be prevented by early detection and management according to the guidelines. In this report from Bangladesh, it has been noted that the "3E" – early identification, early diagnosis, and early treatment are key to averting the severity of any health condition, including preeclampsia/eclampsia. Women who developed eclampsia experience a wide range of symptoms, starting with oedema, headache, blurred vision, and high BP. Despite the life-threatening chances of convulsion, two-thirds of women who had a live birth in the three years preceding the 2016 BMMS were unaware of its danger signs. More than two-fifths of women with preeclampsia symptoms and 15.0% with convulsion symptoms did not seek treatment because most of them thought that the symptoms were not serious. Although four of five women had at least one ANC visit from a medically trained provider, only about 40% of them were informed about the signs of pregnancy complications (Shusmita K; 2023).

According to our research the third delay caused more than 50% of the maternal death cases comparing to the Bangladesh report judgments were occasionally made at the client level with a small delay, which frequently resulted in a delay in receiving timely and suitable treatment. It was noticed that choices were put off during the pregnancy, labor, and postpartum phases of the pregnancy. Most of these

preeclampsia/eclampsia deaths could be avoided with focused, prompt measures (Shusmita K; 2023).

4.19 Association between IMMR and caesarean section rate

In our study it has been noted that there is an association between institutional maternal mortality at VCPH and CS. This could be explained by the fact that CS is typically used to treat urgent medical issues that have saved the lives of most women. In a study done in Ethiopia to find association between maternal mortality and caesarean section in Ethiopia: a national cross sectional study it was found that the regional states of Ethiopia had varying degrees of connection between MMR and CS rate. According to this study in Ethiopia, MMRs and CS rates in other locations were directly correlated. Despite having the lowest MMR and lowest CS rate, the Tigray region showed a statistically significant direct correlation between the two variables. This could suggest that there are more options outside CS for lowering MMR. Evidence that is currently available showed that lower MMR is only associated with greater rates of CS when the CS rate is less than 10%. Consequently, it was not surprising to find larger MMRs in other Ethiopian regions, as earlier research also revealed that CS rates in these areas significantly exceeded 10.0%, in line with the current finding (Ayele G; 2020).

4.20 Summary

This chapter presented the study results in line with the study objectives. SPSS version 15 and Python were used for data analysis. Association tests between IMMR and ICSR were conducted using Pearson correlation and Chi-Square approaches. Descriptive statistics were performed, showcasing demographic frequencies for

religion, education level, and marital status, as well as the distribution of maternal death causes, mode of delivery, age, pregnancy-related conditions, and pre-existing medical conditions. The chapter also visualized missing values for all relevant variables, and relevant data cleaning procedures were carried out.

CHAPTER 5 SUMMARY;CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the study results are discussed considering what other studies had obtained or reported looking at the similarities and differences and the possible way forward. In addition, the chapter highlights the summary of the whole study, conclusion considering the findings and the recommendations.

5.2 Discussion

This study analyzed data on maternal deaths from 2017 to 2022 using information from 143 maternal death notification forms and 105 hospital notes for the deceased women. Additionally, audit minutes from that same time frame were acquired and examined. Only 3.6% of the patients in our study had university education, compared to 46.8% of patients who had only completed secondary school It indicates that the remaining patients received less schooling, which is consistent with other studies finding that the likelihood of maternal death increased with decreasing educational attainment. . In a study done by Saffron K et al health it was shown that in their adjusted models, the risk of maternal mortality was double that of women with more than 12 years of education, and it was 2.7 times higher for women with no education and twice that of women with one to six years of education. In that same study the mortality risk was nearly twice as high for single people as for married or cohabiting couples(Saffron K;2011) In contrast to the findings of the above study, which showed that more married patients died in our study than single patients, the proportion of patients who died in our study who were single was 9.1% compared to 90.9% who were married. In this study antenatal visits were ranging from one to six. PPH was the cause of 31.7% of maternal fatalities in this study. In the majority of Sub-Saharan nations, PPH is the main cause of maternal death. In a study done on

maternal death and postpartum hemorrhage in Sub Saharan Africa pilot study in metropolitan Mozambique it was discovered that PPH was detected in 12.0% of births at that hospital and that it was highly correlated with death; a woman's chance of dying rose by around five times if she had PPH(Lian L BS;2020). The findings in our study was in agreement with what other studies found.The youngest woman who passed away during this time was 16 years old . . In a document in Uganda on ending child marriage and teenage pregnancy it was stated that the primary cause of death for females between the ages of 15 and 19 worldwide is problems related to pregnancy and childbirth, with lower- and middle-income. Uganda is among the countries that account for 99 percent of maternal fatalities worldwide among women between the ages of 15 and 49. Compared to women aged 20–24, adolescent moms aged 10–19 are more likely to experience eclampsia, puerperal endometritis, and systemic infections. Furthermore, according to WHO 2020 and UNFPA 2020, there are almost 3.9 million unsafe abortions among girls between the ages of 15 and 19 per year, which raises the risk of maternal death, morbidity, and long-term health issues (The national strategy to end child marriage and teenage pregnancy 2022/2023 – 2026/2027 Uganda).

The consequences of teenage pregnancy are also depicted. 16.9% of the cases involved women who died as a result of eclampsia. There is a correlation between institutional maternal mortality at VCPH and CS, according to our research. This could be explained by the fact that most women have had their lives saved by CS, which is generally used to address urgent medical conditions. In a study done in Ethiopia to find association between maternal mortality and caesarean section in Ethiopia: a national cross sectional study it was found that the regional states of Ethiopia had varying degrees of connection between MMR and CS rate. According

to this study in Ethiopia, MMRs and CS rates in other locations were directly correlated. Despite having the lowest MMR and lowest CS rate, the Tigray region showed a statistically significant direct correlation between the two variables. This could suggest that there are more options outside CS for lowering MMR. Evidence that is currently available showed that lower MMR is only associated with greater rates of CS when the CS rate is less than 10%. Consequently, it was not surprising to find larger MMRs in other Ethiopian regions, as earlier research also revealed that CS rates in these areas significantly exceeded 10.0%, in line with the current finding (Ayele G; 2020).

The audit minutes revealed that issues at health facilities accounted for the third delay, which is what caused the majority of maternal deaths. Consequently, an evaluation of our institution's quality of care is necessary, and appropriate action should be taken.

5.3 Conclusion

In this study it has been noted that the age group of patients who died at VCPH from 2017 to 2022 were ranging from 16 to 46 encompassing all the complications that can occur in teenage pregnancies as well as in advanced maternal age. It shows that interventions should cover all age groups in order to reduce maternal mortality. A significant percentage of the patients that is 90.9% were educated up to secondary level this indicates a high literacy level in the region being taken care of by VCPH. It means patient education will significantly reduce maternal mortality because the patients will have an understanding of what needs to be done after health education.

A significant percentage of patients 31.7% died of PPH and 16.9% died of eclampsia and this shows us that our efforts to reduce maternal mortality at VCPH should address these main causes which in most cases are avoidable. And this also shows that there is need to invest more in prevention of these complications starting from patient education; training of the medical personnel as well as clearly outlined guidelines on the management of these cases. From the audit minutes it came out that most maternal deaths were caused by the third delay (complications occurring at health facilities) therefore our quality of care in the institution should be assessed and appropriate measures taken. An association between institutional maternal mortality and CS was noted although a caesarean section should be a lifesaving procedure therefore more information should be obtained on how the caesarean sections are being done. Also there is need to look into the indications for caesarean section; the level of the person who did the caesarean section whether it was done by a junior person or a specialist. Also, there is need to look at the anaesthetic side and give appropriate advice on way forward.

5.4 Implications

VCPH is the biggest referral facility in Manicaland and it caters for a population of 2,037,703 people. The high maternal mortality at the hospital from 2017 to 2022 needed a thorough investigation to see what was causing it and the implications. From this study it has been noted that the commonest cause of maternal mortality was PPH contributing to 31.7% of the cases. Eclampsia contributed 16.9% of maternal deaths and most of these deaths are avoidable and are due to third delay.

This shows that the quality of care at the hospital should be looked at further to see what can be improved. Also, the recommendations that have been coming out of the

audit meetings should be followed up to see if they were carried out. There is need to interrogate further beyond the documents to exhaust all the possible causes of high maternal mortality as well as high caesarean section rate. The key informants from the referring hospitals should be interrogated to find exhaust all the contributors to maternal mortality at the hospital. From the results it has been noted that referred patients made 63% of those women who demised during the study period and this points out that there are some contributors to high mortality from the referring hospitals and this needs further interrogation.

5.5 Recommendations

1. Some information was missing including the audit notes from 2107 to 2018. There is need for proper documentation of maternal deaths.
2. Most of the patients were not treated according to guidelines. There is need for clear guidelines stuck on the wall for everyone to see for very common cases and development of an additional guideline covering other less common but important cases for improved patient management.
3. There is need to boost the moral of health workers to improve quality of care of the patients because delay three caused a significant number of maternal deaths during the study period implying that most patients died because of lack of proper care at the health institutions.
4. Most common cause of maternal mortality during the studied period was PPH. Blood and its products should always be available and due diligence be done to prevent PPH.
5. There is need to designate a focal point/desk for following up recommendations that are given during audit meetings so that women will not die from the same causes.

6. There is need to continuously educate health professionals on all the cases that they are managing. Inclusion of nonmedical staff in these education sessions is also critical so that they appreciate the gravity of the issues that come to hospital and support accordingly.
7. There is need to strengthen health education for pregnant women on avoiding delays in receiving care and birth preparedness.
8. In this study maternal mortality was also impacted by delays in accessing healthcare facilities due to inadequate and poor communication, transportation, and road infrastructure. The Ministry of Health and Child Care need to collaborate with other line ministries and private institutions to address this problem.

5.6 Suggestions for further studies

There was no adequate time to exhaust all the contributors to maternal mortality during 2017 to 2018. There will be need to interview the key informants at the hospital that is the medical superintendent; maternity ward matron and sister in charge as well as the medical doctors and midwives. This study can be extended further to get more information from those informants and also key people from referral hospitals.

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APPENDICES

APPENDIX 1: Checklist for analysing data from Maternal Death Notification Forms and reviewing Patient Notes

Case No.	Name of deceased woman	Age	Marital status	Religion/ Denomination	Parity	ANC visits/ contacts	Pre-existing medical conditions	Pregnancy related condition (diagnosis)	Treatment /mode of delivery	Treated according to guideline (yes/no)	Cause of death	Avoidability	Type of delay

APPENDIX 2

Guidance on reviewing minutes of audit of maternal death meetings

Detailed findings from the audit of selected maternal deaths by the MPDSR Steering Committee for Q??? at Victoria Chitepo Provincial Hospital

Case No//	Age of mother	Parity	ANC visits/ contacts	Antenatal diagnosis	Intrapartum diagnosis	GA (wks) at delivery/ Death	Postpartum diagnosis	Facility audit *(cause of death, avoidability and delays)*	Committee audit *(cause of death, avoidability and delays*	Recommendations from the MPDSR Steering Committee *(should be SMART)*
								Cause of death Contributory factors Avoidability Delays Other audit findings	Cause of death Contributory factors Avoidability Delays	

APPENDIX 3
Findings from Audit of Maternal Deaths

Case No	Year	Name of deceased	Age	Marital Status	Education Level	Religion	Parity	ANC Visits	Pre-Existing medical conditions	Pregnancy Related Conditions	Mode of Delivery	Referred from another hospital	Cause of death	Avoidable	Delay in Seeking help	Refusal of treatment	Lack of Transport from home	Lack of transport between facilities	Communication Breakdown	Lack of equipment	No Clinical Staff	Lack of Experts
449	2017		29	Married	Secondary	Christianity	2	2	HIV/AIDS	Not Known	Normal	yes	Postpartum Haemorrhage	Unsure	No	No	No	No	No	No	No	No
448	2017		37	Married	Secondary	Christianity	2	1	Cardiac disease	Pre-eclampsia/Eclampsia	C/Section	yes	Eclampsia	Yes	Yes	No	No	No	No	No	No	No
455	2017		37	Divorced/ seperated	Secondary	Christianity	2		HIV/AIDS	Not Known	Normal	yes	Postpartum Haemorrhage	Yes	Yes	No	Yes	No	No	No	No	No
450	2017		37	Married	unkwon	Apostolic Sect	6	2	No Condition	Not Known	C/Section	yes	Postpartum Haemorrhage	Unsure	Yes	No	No	No	No	No	No	No
439	2017		33	Married	Secondary	Unknown	3		No Condition	Not Known	C/Section	no	Postpartum Haemorrhage	Unsure	No	No	No	No	No	No	No	Yes

442	2017	34	Married	Secondary	Christianity	2	6	Essential hypertension	Pre-eclampsia/Eclampsia	C/Section	yes	eclampsia	Unsure	No	No	No	No	No	No	No	No
437	2017	33	Married	Secondary	Christianity	2		Cardiac disease	Not Known	No Delivery	yes	Cardiac Disease	No	Yes	No	No	No	No	No	No	No
477	2017	19	Married	Primary	Christianity	1	2	HIV/AIDS	Pre-eclampsia/Eclampsia	No Delivery	no	Eclampsia	Unsure	Yes	No	No	No	No	No	No	No
452	2017	31	Single	Primary	Christianity	1	3		Pre-eclampsia/Eclampsia	C/Section	no	Eclampsia	Unsure	No	No	No	No	No	No	No	No
466	2017	22	Married	unkwon	Apostolic Sect		2	HIV/AIDS	Pre-eclampsia/Eclampsia	C/Section	yes	Eclampsia	Unsure	Yes	No	No	No	No	No	No	No
457	2017	27	Married	unkwon	Christianity	2		HIV/AIDS	pregnancy induced hypertension	Normal	yes	postpartum haemorrhage	Yes	Yes	No	No	No	No	No	No	No
453	2017	30	Married	Primary	Christianity	3	4	HIV/AIDS	Pre-eclampsia/Eclampsia	Normal	yes	Eclampsia	Yes	No	No	No	No	No	No	No	No
454	2017	25	Married	Secondary	Christianity	0	1	HIV/AIDS	Ectopic Pregnancy	No Delivery	no	Ectopic pregnancy	Yes	Yes	No	No	No	No	No	No	Yes
438	2017	18	Married	Secondary	Apostolic Sect	0		HIV/AIDS	Not Known	No Delivery	no	Ruptured uterus	Yes	Yes	No	No	No	No	Yes	No	No
440	2017	39	Married	Secondary	Christianity	3	1	HIV/AIDS	Not Known	C/Section	no	Puerperal sepsis	No	No	No	No	No	No	No	No	No

441	2017	33	Married	unkwon	Apostolic Sect	2		HIV/AIDS	Other	Normal	no	Cryptococal Meningitis	No	Yes	No	No	No	No	No	No	No
444	2017	23	Married	Primary	Christianity	1		HIV/AIDS	Other	No Delivery	yes	Malaria	No	Yes	No	No	No	No	Yes	No	No
445	2017	23	Married	unkwon	Apostolic Sect	2		HIV/AIDS	Not Known	Normal	yes	Malaria postpartum haemorrhage	No	Yes	No	No	No	No	No	No	No
443	2017	33	Married	Secondary	Christianity	3	5	HIV/AIDS	Other	Normal	yes		No	No	No	No	No	No	No	No	No
456	2017	30	Married	unkwon	Apostolic Sect	1	3	HIV/AIDS	Not Known	Normal	yes	Other	Unsure	No	No	No	No	No	No	No	No
451	2017	25	Married	Primary	Christianity	3	2	HIV/AIDS	Not Known	C/Section	no	Other	No	No	No	No	No	No	No	No	No
	2018	36	Married	Secondary	Christianity	4		HIV/AIDS	Pre-eclampsia/Eclampsia	No Delivery	yes	postpartum haemorrhage	No	No	No	No	No	No	No	No	No
	2018	36	Single	Secondary	Unknown	2		HIV/AIDS	Not Known	Normal	yes	Other	No	Yes	No	No	No	No	No	No	No
	2018	37	Married	Primary	Christianity	4		Essential hypertension	Not Known	Normal	yes	Postpartum Haemorrhage		Yes	No	Yes	No	No	No	No	No
	2018	24	Married	unkwon	Unknown	2		No Condition	Pre-eclampsia/Eclampsia	Normal	no	postpartum haemorrhag	Yes	No	No	No	No	No	No	No	No

										e									
2018	40	Married	unknown	Unknown	4	HIV/AIDS	Not Known	C/Section	no	Postpartum Haemorrhage		No	No	No	No	No	Yes	Yes	No
2018	34	Married	Secondary	Christianity	3	HIV/AIDS	Not Known	C/Section	yes	Postpartum Haemorrhage	Yes	No	No	No	No	No	No	No	No
2018	39	Married	Secondary	Christianity	2	No Condition	Not Known	Normal	yes	Unknown	Yes	No	No	No	No	No	No	No	No
2018	33	Married	unknown	Apostolic Sect	4	Essential hypertension	Not Known	Normal	yes	Unknown	Yes	Yes	No	No	No	No	No	No	No
2018	35	Married	Tertiary	Christianity	3		Not Known	Normal	no	postpartum haemorrahge		Yes	No	No	No	No	No	No	No
2018	24	Married	Secondary	Christianity	3	HIV/AIDS	Pre-eclampsia/Eclampsia	C/Section	no	postpartum haemorrhage	Unsure	No	No	No	No	No	No	No	No
2018	36	Married	unknown	Christianity	3	Other	Not Known	Normal	yes	Other		Yes	No	No	No	No	No	No	No
2018	16	Single	unknown	Christianity	0	HIV/AIDS	Not Known	C/Section	yes	Puerperal Sepsis		No	No	No	No	No	No	No	No

	2018	43	Married	unknown	Unknown	4		No Condition	Pre-eclampsia/Eclampsia	Normal	no	Eclampsia	No	No	No	No	No	No	No	No	No	No
	2018	38	Married	unknown	Apostolic Sect	5		Diabetes Mellitus	Not Known	Normal	yes	Other		No	No	No	No	No	No	No	No	No
	2018	22	Single	unknown	Apostolic Sect	1		HIV/AIDS	Not Known	C/Section	no	Cardiac Disease	Unsure	Yes	No	No	No	No	No	No	No	No
	2018	35	Married	unknown	Apostolic Sect	1		HIV/AIDS	Other	Normal	yes	Other		Yes	No	No	No	No	Yes	No	No	
	2018	23	Married	unknown	Apostolic Sect	0		Essential hypertension	Other	C/Section	no	Puerperal sepsis postpartum haemorrhage		No	No	No	No	No	No	No	No	
205	2018	36	Married	Secondary	Apostolic Sect	3	3	HIV/AIDS Essential hypertension	Pre-eclampsia/Eclampsia	Normal	yes	Postpartum Haemorrhage										
207	2018	26	Married	Secondary	Apostolic Sect	3	3		Not Known	Normal	yes											
209	2018	33	Married	unknown	Unknown	4			Pre-eclampsia/Eclampsia	No Delivery	yes	Eclampsia										
212	2018	35	Married	Secondary	Apostolic Sect	3	2			C/Section	yes	Postpartum Haemorrhage										
213	2018	20	Married	unknown	Christianity	0	1	Essential hyper	Not Known	No Delivery	yes	Other										

	8							tension														
216	2018	30	Married	Secondary	Christianity	3		HIV/AIDS	Not Known	Normal	yes	Pregnancy induced hypertenstion										
211	2018	32	Married	Secondary	Apostolic Sect	1		Cardiac disease	Not Known	C/Section	yes	cardiac disease										
225	2018	24	Married	unkwon	Christianity	0		HIV/AIDS	Not Known	No Delivery	no	Peri-abortal haemorrhage	No	Yes	No	No	No	No	No	No	No	
232	2018	27	Single	Primary	Christianity	1		HIV/AIDS	Not Known	No Delivery	no	Diabetes Mellitus	Yes	Yes	No	No	No	No	No	No	No	
235	2018	28	Married	Secondary	Apostolic Sect	2	4	HIV/AIDS	Not Known	Normal	yes	Postpartum Haemorrhage	Unsure	No	No	No	No	No	No	No	No	
240	2018	42	Married	Primary	Apostolic Sect	9		Other		Normal	yes	postpartum haemorrhage	No	Yes	No	No	No	No	No	No	No	
719	2019	29	Married	unkwon	Christianity	2	2	Other	Pre-eclampsia/Eclampsia	Normal	yes	Eclampsia	Yes	Yes	Yes	Yes	No	No	No	No	No	
733	2019	30	Married	unkwon	Christianity	2	6	No Condition	Not Known	No Delivery	no	Ruptured uterus	No	Yes		No	No	No	No	No	No	

74	2019	37	Married	Secondary	Apostolic Sect	5	5	Cardiac disease	Pre-eclampsia/Eclampsia	No Delivery	no	Cardiac disease	No	No	No	No	No	No	No	No		
76	2019	20	Married	Secondary	Christianity	2	5	No Condition	Not Known	Normal	no	Unknown										
77	2019	34	Married	unkwon	Christianity	2	6	Cardiac disease	Not Known	Normal	no	Puerperal sepsis	Unsure	No	No	No	No	No	No	No	No	
139	2019	40	Married	Secondary	Apostolic Sect	3	2	Essential hypertension	Not Known	Normal	no	Pregnancy induced hypertenstion	Unsure	Yes	No	No	No	No	Yes	No	Yes	
142	2019	20	Married	unkwon	Apostolic Sect	1	1	No Condition	Not Known	C/Section	yes	Anaesthetic complications	Yes	No	No	No	No	No	Yes	No	No	
144	2019	37	Married	Secondary	Christianity	3	2	diabetes Mellitus	Pre-eclampsia/Eclampsia	Normal	yes	Diabetes Mellitus	Unsure	Yes	No	No	No	No	No	No	No	
181	2019	34	Married	unkwon	Christianity	2	6	Cardiac disease	Not Known	Normal	no	cardiac Disease	Unsure	No	No	No	No	No	No	No	No	
182	2019	29	Single	Secondary	Apostolic Sect	1	3	No Condition	Not Known	Normal	yes	Puerperal sepsis		No	No	No	No	No	No	No	Yes	
183	2019	20	Married	Secondary	Christianity		5			Normal	no	Other	No									

1184	2019	46	Married	unkwon	Christianity	7	3	Essential hypertension	Pre-eclampsia/Eclampsia	Normal	yes	postpartum haemorrhage	Unsure	No	No	No	No	No	No	No	No	No
1185	2019	34	Married	unkwon	Christianity	3	1	Cardiac disease	Not Known	Normal	no	cardiac disease	No	No	No	No	No	No	No	No	No	No
1187	2019	16	Married	unkwon	Apostolic Sect	1		Cardiac disease	Not Known	C/Section	yes	cardiac disease	Yes									Yes
1188	2019	18	Married	unkwon	Unknown	0	4	Diabetes Mellitus	Gestational Diabetes	No Delivery	no	Diabetes Mellitus	Unsure	No	No	No	No	No	No	No	No	No
1189	2019	18	Married	Secondary	Christianity	0	4	HIV/AIDS	Not Known	Normal	yes	Postpartum Haemorrhage	Yes	No	No	No	No	No	No	No	No	Yes
1190	2019	16	Married	unkwon	Christianity	0	4	HIV/AIDS	Not Known	C/Section	no	Pregnancy induced hypertenstion	Unsure	No	No	No	No	No	No	No	No	No
1191	2019	37	Married	Tertiary	Christianity	2	2	No Condition	Pre-eclampsia/Eclampsia	C/Section	no	Eclampsia	Unsure	No	No	No	No	No	No	No	No	No
1192	2019	36	Single	unkwon	Apostolic Sect	5		HIV/AIDS	Not Known	Normal	yes	Cryptococal Meningitis	Unsure	No	No	No	No	No	No	No	No	No
1193	2019	25	Married	Secondary	Christianity	0		Cardiac disease	Not Known	Normal	yes	cardiac disease	Unsure	No	No	No	No	No	No	No	No	No
1205	2020	30	Married	Secondary	Apostolic	2	1	No Cond	Not Known	No Deliv	yes	Malaria	Yes	Yes	No	No	No	No	No	No	No	No

0	2020			y	Sect			ition		ery											
151	2020	20	Single	unkwon	Unknown	0	2	No Condition	preeclampsia	C/Section	yes	postpartum haemorrhage	Unsure	No	No	No	No	No	No	No	No
191	2020	35	Married	Secondary	Christianity	2	4	No Condition	Not Known	No Delivery	yes	Malaria	No	No	No	No	No	No	Yes	No	No
192	2020	27	Married	Secondary	Christianity	1	2	No Condition	preeclampsia	C/Section	yes	Eclampsia		Yes		No	No	No	No	No	No
193	2020	33	Married	Secondary	Islam	3	1		Not Known	C/Section	no	Postpartum Haemorrhage	No	No		No	No	No	No	No	No
194	2020	26	Married	Secondary	Christianity	1	1	No Condition	preeclampsia	No Delivery	no	Eclampsia		Yes	No	No	No	No	No	No	No
195	2020	33	Married	unkwon	Unknown	3			Not Known	C/Section	no	Postpartum Haemorrhage									
196	2020	18	Married	unkwon	Apostolic Sect	0	5	No Condition	Not Known	C/Section	yes	Postpartum Haemorrhage	Unsure	No	No	No	No	No	No	No	No
197	2020	36	Married	Primary	Christianity	5		No Condition	preeclampsia	Normal	yes	Eclampsia	No		No	No	No	No		No	No
203	2020	30	Married	Secondary	Apostolic Sect	1	4	No Condition	preecampsia	Normal	yes	Eclampsia									

204	2020	24	Married	Secondary	Unknown	1				C/Section	yes	Postpartum Haemorrhage	Unsure	Yes	No	No	No	No	No	No	No
206	2020	29	Married	unkwon	Christianity	1	2	No Condition		C/Section	yes	Postpartum Haemorrhage	Unsure	No	No	No	No	No	No	No	No
207	2020	43	Married	unkwon	Apostolic Sect	9		No Condition	Not Known	Normal	no	Postpartum Haemorrhage	Unsure	No	No	No	No	No	No	No	No
29	2020	24	Married	Secondary	Unknown	1			Not Known	C/Section	yes	Postpartum Haemorrhage	Unsure	Yes	No	No	No	No	No	No	No
30	2020		Married		Christianity	2		Other	Not Known	Normal	yes	Unknown	Unsure	Yes	No	No	No	No	No	No	No
31	2020	24	Married	Secondary	Apostolic Sect	1	4	Other		Normal	yes	Malaria	Unsure	Yes	No	No	No	No	No	No	No
46	2020	36	Married	Secondary	Christianity	3		Other	Other	C/Section	no	Postpartum Haemorrhage	Yes	No	No	No	No	No	No	No	No
47	2020	30	Married	Secondary	Apostolic Sect	2	1	Other	Other	No Delivery	no	Malaria	Yes	Yes	No	No	No	No	No	No	No
48	2020	19	Married	Secondary	Apostolic Sect	0			preeclampsia	Normal	no	postpartum haemorrage		Yes	No	No	No	No	No	No	No

50	2020	39	Single	Secondary	Christianity	3		Other	Not Known	C/Section	yes	Postpartum Haemorrhage	Yes	Yes	No	No	No	No	No	No	No
51	2020	17	Single	Secondary	Christianity			No Condition		Normal	yes	Puerperal Sepsis	No	No	No	No	No	No	No	No	No
52	2020		Married	unkwon	Christianity	2		No Condition	Other	Normal	no	Ruptured Uterus	Unsure	Yes	No	No	No	No	No	No	No
53	2020	31	Married	Secondary	Christianity	2		Other	preeclampsia	Normal	yes	postpartum haemorrahge	No	Yes	No	Yes	No	No	No	No	No
74	2020	17	Married	unkwon	Apostolic Sect	0		Other	Other	C/Section	yes	Puerperal sepsis	Unsure	Yes	No	No	No	No	No	No	No
28	2021	26	Married	Primary	Unknown	2				C/Section	yes	Puerperal Sepsis		Yes	No	No	No	No	No	No	No
32	2021	34	Married	Secondary	Apostolic Sect	3	3	No Condition	Not Known	C/Section	yes	Postpartum Haemorrhage	Yes	No	No	No	Yes	No	No	No	No
36	2021	24	Married	unkwon	Unknown	1	1		pregnancy induced hypertension	Normal	yes	Eclampsia	Unsure	No	No	No	No	No	No	No	No
38	2021	34	Married		Christianity	2				Normal	no	Peri-abortal haemorrhage	Unsure	No	No	No	No	Yes	No	No	No

39	2021	34	Married	Primary	Christianity	1	5	No Condition		Normal	no	Cardiac disease	Unsure	No	No	No	No	No	No	No	No
40	2021	36	Married	Primary	Unknown		4	No Condition	Not Known	C/Section	no	Ruptured uterus	No	Yes	No	No	No	No	No	No	No
44	2021	39	Married	Tertiary	Christianity	2	1	HIV/AIDS	Not Known	Normal	no	Malaria	Unsure	No	No	No	No	No	No	No	No
45	2021	23	Married	Secondary	Christianity	3	1	No Condition	pregnancy induced hypetension	Normal	yes	Eclampsia		Yes		Yes					Yes
54	2021	26	Married	unkwon	Apostolic Sect	3	4	No Condition	Not Known	Normal	yes	Postpartum Haemorrhage		Yes	No	Yes	No	No	No	No	No
167	2021	26	Married	unkwon	Unknown			No Condition	Ectopic Pregnancy	No Delivery	yes	Ectopic pregnancy	Yes	Yes	No	No	No	Yes	Yes	Yes	No
168	2021	43	Married	Secondary	Apostolic Sect	6		No Condition	Not Known	Normal	yes	Puerperal Sepsis	Unsure	No	No	No	No	No	No	No	No
169	2021	35	Married	unkwon	Apostolic Sect	3	6	Essential hypertension	Pre-eclampsia/Eclampsia	C/Section	yes	Eclampsia	No	Yes		No			No		
170	2021	25	Married	unkwon	Christianity	2		Diabetes Mellitus	Gestational diabetes	No Delivery	yes	diabetes mellitus	Yes	Yes		No				No	No
	2021	33	Married	Secondary	Christianity	4	4	No Condition		C/Section	no	Ruptured uterus	Yes	No	No	No	No	No	No	No	No

	2021		Married	Tertiary	Christianity	2	1	No Condition	Pre-eclampsia/Eclampsia	C/Section	yes	postpartum haemorrhage	Yes	No	No	No	No	No	No	No	No
	2021	22	Married		Apostolic Sect	1		No Condition	Not Known	No Delivery	yes	Ruptured uterus	Yes	Yes	No	No	No	No	No	No	Yes
	2021	38	Married	Secondary	Apostolic Sect	3	4	No Condition		C/Section	yes	Ruptured uterus	Yes	Yes	No	No	No	No	No	No	Yes
	2021	27	Married	Primary	Apostolic Sect	2	2	No Condition		Normal	yes	Postpartum Haemorrhage	Yes	Yes	No	Yes	Yes	No	No	No	Yes
	2021	29	Married	Secondary	Christianity	0	2	HIV/AIDS	pregnancy induced hypertension	No Delivery	no	Eclampsia	Yes	No	No	No	No	No	No	No	No
172	2021	35	Married	unkwon	Unknown	4		No Condition	preeclampsia	Normal	no	Eclampsia		Yes	No	No	No	No	No	No	No
173	2021	19	Married	Secondary	Apostolic Sect	1		No Condition	Not Known	Normal	no	Postpartum Haemorrhage	Yes	Yes	Yes	No	No	No	No	No	No
175	2021	38	Married	Secondary	Christianity		2	Cardiac disease	Not Known	Normal	yes	Cardiac disease		Yes	Yes	No	No	No	No	No	No
180	2021	35	Married	Secondary	Christianity	6		No Condition		C/Section	yes	Postpartum Haemorrhage	Yes	Yes	No	No	No	No	No	No	No
181	202	26	Single	unkwon	Unknown	1		No Condition	Not Known	Normal	no	Postpartum Haem	Yes	Yes	No	Yes	No	No	No	No	No

	1											orrhage										
182	2021	19	Married	Secondary	Christianity	1			Not Known	no delivery	no	Ectopic Pregnancy	Yes	No	No	No	No	No	No		Yes	
183	2021	39	Married	unkwon	Apostolic Sect	2		No Condition	Pre-eclampsia/Eclampsia	Normal	yes	postpartum haemorrhage	Yes	Yes	No	No	No	No	No	No	No	
184	2021	23	Single	unkwon	Christianity	0		No Condition	Not Known	No Delivery	yes	Post abortal sepsis	Yes	Yes	No	No	No		No		No	
185	2021	25	Married	Secondary	Christianity	4		No Condition	Not Known	C/Section	yes	Postpartum Haemorrhage	Yes	No	No	No	No	No	No	No	Yes	
188	2021	21	Married	unkwon	Christianity	1		No Condition	preeclampsia	No Delivery	yes	Eclampsia	Yes	Yes	No	No	No	No	Yes	No	No	
189	2021	21	Married	unkwon	Apostolic Sect	2		No Condition	Not Known	no delivery	yes	Ectopic Pregnancy	No	No	No	No	No	No	No	No	No	
190	2021	32	Married	Secondary	Christianity	6	3		Not Known	Normal	yes	Postpartum Haemorrhage	Yes	No	No	No	No	No	No	No	No	
192	2021	18	Married	Primary	Christianity	1	6	No Condition	Not Known	C/Section	yes	Puerperal sepsis	Yes	No	No	No	No	No	No	No	No	
184	2022	31	Married	unkwon	Christianity	3			Ectopic Pregnancy	no delivery	yes	ectopic pregnancy	Yes	Yes	No	No	No	No	No	No	No	

85	2022		34	Married	unkwon	Christianity	1		Diabetes Mellitus	Gestational Diabetes	C/Section	no	gestational diabetes	Yes	Yes	No	No	No	No	No	No	No
86	2022		21	Married	unkwon	Christianity	0	2	HIV/AIDS	Pre-eclampsia/Eclampsia	C/Section	no	eclampsia	No	No	No	No	No	No	No	No	No
87	2022		31	Married	Secondary	Christianity	3	2	No Condition	Pre-eclampsia/Eclampsia	C/Section	yes	Eclampsia		No	No	No	No	No	No	No	No
88	2022		39	Married	Secondary	Christianity	6	3			Normal	yes	Ruptured uterus	No	Yes	No	No	No	No	No	No	No
89	2022		26	Married	Secondary	Islam	1	1	HIV/AIDS	Not Known	No Delivery	yes	Pregnancy induced hypertenstion	No	No	No	No	No	No	No	No	No
309	2022		32	Married	Secondary	Christianity	4	4	No Condition		C/Section	no	Ruptured uterus	Yes	No	No	No	No	No	No	No	No
310	2022			Married	Tertiary	Christianity	2	1	No Condition	Pre-eclampsia/Eclampsia	C/Section	no	Postpartum Haemorrhage	Yes	No	No	No	No	No	No	No	No
311	2022		25	Married		Apostolic Sect	1		No Condition	Not Known	No Delivery	yes	Ruptured uterus	Yes	Yes	No	No	No	No	No	No	Yes
312	2022		40	Married	Secondary	Apostolic Sect	3	4	No Condition		C/Section	yes	Ruptured uterus	Yes	Yes	No	No	No	No	No	No	Yes
313	2022		35	Married	Primary	Apostolic Sect	2	2	No Condition		Normal	yes	Postpartum Haem	Yes	Yes	No	Yes	Yes	No	No	No	Yes

	2										orrhage										
314	2022	29	Married	Secondary	Christianity	0	2	HIV/AIDS	pregnancy induced hypertension	No Delivery	no	Eclampsia	Yes	No	No	No	No	No	No	No	No
315	2022	28	Married	unkwon	Apostolic Sect	1		No Condition	Not Known	No Delivery	no	Malaria	Yes	No	No	No	No	No	No	No	Yes
317	2022	20	Married	Primary	Christianity	0	2	No Condition	Not Known	Normal	yes	Pregnancy induced hypertenstion	No	No	No	No	No	No	No	No	No
318	2022	40	Married	Secondary	Islam	3	4	No Condition	Pre-eclampsia/Eclampsia	No Delivery	no	Eclampsia	Yes	No	No						
319	2022	37	Married	Secondary	Apostolic Sect	5	5	Cardiac disease	Pre-eclampsia/Eclampsia	No Delivery	yes	Cardiac Disease	No	No	No	No	No	No	No	No	No
320	2022	20	Married	Secondary	Christianity	2	5	No Condition	Not Known	Normal	yes	postpartum haemorrhage									
321	2022	34	Married	unkwon	Christianity	2	6	Cardiac disease	Not Known	Normal		Puerperal sepsis	Unsure	No	No	No	No	No	No	No	No

Appendix 4 Timelines and budget

Timelines

Activity	November				December				January			
	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4	Wk1	Wk2	Wk3	Wk4
Securing approvals and engagement of the PMD for Manicaland and health managers at Victoria Chitepo Provincial Hospital												
Development of data collection tools and refining of methodology												
Data collection												
Data analysis and report writing												
Sharing and validation of findings - draft report												
Finalization of report												

Budget

Item	Quantity	Unit cost (us$)	Number of nights	Total cost (US$)	Comments
Data collection					
DSA for participants	4	75	6	1800	
Fuel (diesel)	160	1.6		256	
Subtotal				2056	

Data analysis and report writing					
Teas	6	3	5	90	
Subtotal				90	
Sharing and validation of findings					
DSA for participants	4	75	2	600	To be done at Victoria Chitepo
Teas	35	3	1	105	
Fuel (diesel)	100	1.6		160	
Subtotal				865	
Grand total				**3011**	

Appendix 5: AUREC Approval Letter

Investing in Africa's future

AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE (AUREC)

P.O. Box 1320 Mutare, Zimbabwe, Off Nyanga Road, Old Mutare-Tel (+263-20) 60075/60026/61611 Fax: (+263 20) 61785 Website: www.africau.edu

Ref: AU3123/24

23 February, 2024

GONDONGWE LUCIA
C/O Africa University
Box 1320
MUTARE

RE: ANALYSIS OF FACTORS UNDERLYING INSTITUTIONAL MATERNAL MORTALITY AT VICTORIA CHITEPO PROVINCIAL HOSPITAL: 2017-2022

Thank you for the above-titled proposal that you submitted to the Africa University Research Ethics Committee for review. Please be advised that AUREC has reviewed and approved your application to conduct the above research.

The approval is based on the following.

a) Research proposal

- **APPROVAL NUMBER** AUREC3123/24
  This number should be used on all correspondences, consent forms, and appropriate documents.
- **AUREC MEETING DATE** NA
- **APPROVAL DATE** February 23, 2024
- **EXPIRATION DATE** February 23, 2025
- **TYPE OF MEETING**: Expedited
  After the expiration date, this research may only continue upon renewal. A progress report on a standard AUREC form should be submitted a month before the expiration date for renewal purposes.
- **SERIOUS ADVERSE EVENTS** All serious problems concerning subject safety must be reported to AUREC within 3 working days on the standard AUREC form.
- **MODIFICATIONS** Prior AUREC approval is required before implementing any changes in the proposal (including changes in the consent documents)
- **TERMINATION OF STUDY** Upon termination of the study a report has to be submitted to AUREC.

AFRICA UNIVERSITY
RESEARCH ETHICS COMMITTEE (AUREC)
APPROVED
P.O. BOX 1320, MUTARE, ZIMBABWE

Yours Faithfully

MARY CHINZOU
ASSISTANT RESEARCH OFFICER: FOR CHAIRPERSON
AFRICA UNIVERSITY RESEARCH ETHICS COMMITTEE