A STRATEGY FOR REDUCING MATERNAL MORTALITY IN MIGORI, KENYA

by

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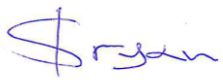
DECLARATION

I declare that **A STRATEGY FOR REDUCING MATERNAL MORTALITY IN MIGORI, KENYA** is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

I further declare that I submitted the dissertation to originality checking software and that it falls within the accepted requirements for originality.

I further declare that I have not previously submitted this work, or part of it, for examination at Unisa for another qualification or at any other education institution.



10 November 2022

..... **.....**

SIGNATURE **DATE**

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A STRATEGY FOR REDUCING MATERNAL MORTALITY IN MIGORI, KENYA

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ABSTRACT

The aim of the study was to investigate the determinants of maternal mortality and develop a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya. The objectives of the study were to describe the causes and the socio-economic determinants of maternal mortality, analyse the existing strategies that aim at reducing MMR, and develop a strategy to reduce MMR in Migori, Kenya.

A sequential explanatory mixed methods study design was used to conduct the study. A checklist and in-depth interview guides were employed to collect the data. The quantitative data was analysed using the Statistical Package for Social Science (SPSS) version 23 and simple descriptive statistics. Thematic analysis was employed to analyse the qualitative data.

The study revealed that the leading causes of maternal mortalities are haemorrhage (34.7%), eclampsia (20.8%) and sepsis (15.8%). Moreover, social and system factors which largely determined the deaths of mothers were found to be timely provision of and lack of drugs and blood, rural residence, and maternal ignorance of danger signs. The above-mentioned factors were exacerbated by the delays in accessing appropriate healthcare that could have saved the lives of mothers. Identified delays were theatre delays, resuscitation delays, competent care delays, referral delays, and the delays in decision-making by the mothers themselves.

The study further established that the existing maternal improvement interventions such as the free maternal service policy, the haemorrhage prevention programmes, and family planning were poorly implemented with low coverage. The findings informed development of an alternative strategy that would reduce MMR in Migori, Kenya.

The proposed strategy targets maternal care delays, which the study found to contribute to the persisting high levels of maternal deaths in Migori, Kenya. Increased focus on the identified determinants of maternal deaths by policy makers is recommended. The study further alerts stakeholders that hospital systems as well as community empowerment programmes are in dire need of quality improvement initiatives. The Kenyan government and non-profit organisations should be involved in the implementation of the proposed strategy.

Key terms

Community empowerment, determinants, health systems, interventions, maternal delays, maternal mortality, obstetric care, obstetric complications, pregnancy, quality care, referral, strategy.

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DEDICATION

I dedicate this thesis to the deceased mothers.

May they rest in peace.

TABLE OF CONTENTS

DECLARATION i
ABSTRACT ii
ACKNOWLEDGEMENTS iv
DEDICATION v
CHAPTER 1 1
OVERVIEW OF THE STUDY 1
1.1 INTRODUCTION 1
1.2 BACKGROUND TO THE RESEARCH PROBLEM 3
1.3 STATEMENT OF THE PROBLEM 5
1.4 PURPOSE OF THE STUDY 7
1.5 RESEARCH OBJECTIVES 7
1.6 RESEARCH QUESTIONS 8
1.7 SIGNIFICANCE OF THE STUDY 9
1.8 THEORETICAL FOUNDATIONS OF THE STUDY 9
1.9 THE RESEARCH PARADIGM 11
1.10 DEFINITION OF KEY CONCEPTS 12
1.11 STRUCTURE OF THE THESIS 13
1.12 CONCLUSION 14
CHAPTER 2 15
LITERATURE REVIEW 15
2.1 INTRODUCTION 15
2.2 MATERNAL MORTALITY TRENDS 15
2.2.1 Global trends 16
2.2.2 Sustainable development goals and maternal health 18
2.2.3 Regional level trends in Sub-Saharan Africa 19
2.2.4 Kenya's maternal mortality level trends 20
2.3 CAUSES OF MATERNAL MORTALITY 22
2.3.1 Haemorrhage 23
2.3.2 Hypertension 26
2.3.3 Sepsis, malaria and HIV infections 28
2.3.4 Abortion 32
2.3.5 Anaemia 34
2.3.6 Obstructed labour 36
2.4 DETERMINANTS OF MATERNAL MORTALITY 36
2.4.1 Antenatal care attendance 37
2.4.2 Place of delivery – TBA/SBA 39

2.4.3 Parity and gravidity 42
2.4.4 Mother's age 43
2.4.5 Mother's knowledge and education level 45
2.4.6 Unwanted pregnancy and family planning 47
2.4.7 Geography and type of residence – rural and urban 48
2.4.8 Occupation 52
2.4.9 Health facility-related factors 54
2.4.9.1 Staffing capacity 55
2.4.9.2 Hospital referral system capacity 56
2.4.9.3 Poor quality of care at the hospital 57
2.4.9.4 Inadequate resources at the hospital 57
2.5 STRATEGIES FOR REDUCING MATERNAL MORTALITY 59
2.5.1 Safe Motherhood Initiative (SMI) 59
2.5.2 Strategies for ending preventable maternal mortality (EPMM) 60
2.5.3 Regional interventions of maternal mortality reduction 62
2.5.3.1 Family planning 62
2.5.3.2 Antenatal care 71
2.5.3.3 Emergency obstetric and intrapartum care 76
2.5.3.4 Postnatal care 84
2.6 STRATEGIES FOR REDUCING MATERNAL MORTALITY IN KENYA 87
2.6.1 Free maternal healthcare services (FMS) policy 87
2.6.1.1 Gaps and challenges of the Linda Mama policy 88
2.6.2 Kenya family planning initiative 89
2.6.2.1 The gap in the Kenyanfamily planning initiative 90
2.6.3 Strengthening the KenyanSafe Motherhood Initiative 90
2.6.3.1 Gaps facing the Kenyan Safe Motherhood Initiative 92
2.6.4 Kenyan mobile-based interventions towards maternal health 93
2.6.4.1 Gaps of mobile-based interventions towards maternal health in Kenya 94
2.6.5 The Kenyan Beyond Zero Campaign initiative 94
2.7 STRATEGIES OR INTERVENTIONS TO REDUCE MATERNAL MORTALITY IN MIGORI, KENYA 95
2.7.1 MAISHA Project 2012-2017 95
2.7.2 Migori County family planning strategy 96
2.7.2.1 Gap in the Migori County family planning strategy 97
2.7.3 Integrated community case management on access and utilisation of maternal health in Migori County 97
2.8 THEORETICAL FRAMEWORK – THE THREE DELAYS OF MATERNAL MORTALITY APPROACH 98

2.9 CONCLUSION 99
CHAPTER 3 101
RESEARCH DESIGN AND METHOD 101
3.1 INTRODUCTION 101
3.2 RESEARCH APPROACH AND DESIGN 101
3.2.1 Phase 1: Quantitative approach 102
3.2.2 Phase 2: Qualitative approach 103
3.3 RESEARCH METHOD 103
3.3.1 PHASE 1: QUANTITATIVE APPROACH 104
3.3.1.1 Study setting 104
3.3.1.2 Study population 105
3.3.1.3 Case-control design 105
3.3.1.4 Sample and sampling procedures 106
3.3.1.4.1 Sample size 106
3.3.1.4.2 Sample size for quantitative research 106
3.3.1.4.2.1 Calculation of sample size for quantitative phase 107
3.3.1.4.3 Inclusion criteria 108
3.3.1.4.4 Exclusion criteria 108
3.3.1.5 Data collection 109
3.3.1.5.1 Data collection tool development 109
3.3.1.5.2 Piloting 110
3.3.1.5.3 Data collection process 111
3.3.1.6 Data analysis procedure 112
3.3.2 PHASE 2: QUALITATIVE APPROACH 113
3.3.2.1 Study population 113
3.3.2.2 Sample and sampling procedures: qualitative phase 113
3.3.2.2.1 Sample size for the qualitative phase 113
3.3.2.2.2 Calculation of sample size for qualitative phase 113
3.3.2.2.3 Inclusion criteria 114
3.3.2.2.4 Exclusion criteria 114
3.3.2.3 Data collection 114
3.3.2.3.1 Development and testing of an instrument 114
3.3.2.3.2 Piloting 115
3.3.2.3.3 Data collection process: qualitative phase 117
3.3.2.4 Data analysis procedure: qualitative phase 118
3.3.3 Data management 118
3.3.4 PHASE 3: INTEGRATION OF THE FINDINGS OF QUANTITATIVE AND QUALITATIVE QUESTIONS 119

3.3.4.1 Development of a strategy 120
3.3.4.2 Validation of review forms 120
3.4 ETHICAL CONSIDERATIONS 121
3.4.1 Permission to conduct research 121
3.4.2 Beneficence 122
3.4.3 Respect for human dignity 122
3.4.4 Justice 122
3.4.5 Informed consent 122
3.4.6 Voluntary participation 123
3.4.7 Benefits and risks 123
3.4.8 Confidentiality and anonymity 124
3.4.9 Study tools handling in relation to Covid-19 124
3.5 ENSURING RIGOUR 124
3.5.1 Phase 1: Reliability and validity for the quantitative phase 125
3.5.1.1 Validity of the instrument 125
3.5.1.2 Reliability of the instrument 126
3.5.2 Phase 2: trustworthiness for the qualitative phase 126
3.5.2.1 Credibility, dependability, confirmability and transferability 126
3.6 CONCLUSION 128
CHAPTER 4 129
ANALYSIS, PRESENTATION AND DISCUSSION OF THE RESEARCH RESULTS 129
4.1 INTRODUCTION 129
4.2 THE AIM AND OBJECTIVES OF THE STUDY 129
4.3 DATA ANALYSIS 130
4.4 RESEARCH RESULTS 131
4.4.1 FINDINGS OF PHASE 1: QUANTITATIVE 131
4.4.1.1 The causes of maternal mortality in Migori, Kenya. 132
4.4.1.1.1 Maternal mortality trends in four Migori hospitals, 2016-2019 132
4.4.1.1.2 Cause of maternal deaths 133
4.4.1.2 The socio-economic determinants contributing to maternal mortality in Migori, Kenya. 135
4.4.1.2.1 Religion 135
4.4.1.2.2 Age 136
4.4.1.2.3 Employment status 136
4.4.1.2.5 Education level 138
4.4.1.2.6 Marital status 139
4.4.1.2.7 Gestational age 140
4.4.1.3 Maternal details and reproductive health status 140

4.4.1.3.1 Attendance of ANC 140
4.4.1.3.2 History of previous caesarean section (C/S) 141
4.4.1.3.4 HIV status 143
4.4.1.4 Intervention data 144
4.4.1.4.1 Referral status 144
4.4.1.4.2 Place of delivery 145
4.4.1.4.4 Person who conducted the delivery 147
4.4.1.4.5 Stage of maternal care at point of death 148
4.4.1.4.6 Duration of hospital stay 149
4.4.1.4.7 Outcome status of baby 149
4.4.1.4.8 Use of partograph 150
4.4.1.4.9 Type of delay recorded 151
4.4.1.5 Multiple regression analysis of determinants contributing to maternal mortality in Migori, Kenya 152
4.4.2 Findings of Phase 2: Qualitative 156
4.4.2.1 Outline of the presentation 156
4.4.2.2 Demographic characteristics of qualitative study participants 157
4.4.2.2.1 Midwives' characteristics 157
4.4.2.2.2 Peripartum mothers' demographics 158
4.4.2.3 Themes developed from interviews with midwives and peripartum mothers 159
4.4.2.3.1 Existing programmes/interventions to improve maternal survival 162
4.4.2.3.2 Reasons for non-utilisation of maternal healthcare interventions 180
4.4.2.3.3 Challenges of access to maternal healthcare interventions 186
4.4.2.3.4 Challenges experienced during hospital referral of mothers with obstetric emergencies 188
4.4.2.3.5 Challenges that hinder maternal care interventions within the hospital 193
4.5 KEY FINDINGS FROM THE INTEGRATED QUANTITATIVE-QUALITATIVE PHASES 211
4.5.1 The causes of maternal mortality in Migori, Kenya 212
4.5.2 The interventions including the strategies that are currently being implemented to reduce maternal mortality in Migori, Kenya 212
4.5.3 Factors that cause delays in maternal care and contributing to increased maternal mortality in Migori, Kenya 213
4.5.3.1 Causes of first delays 214
4.5.3.2 Causes of second delays 214
4.5.3.3 Third delays – hospital system failures 215
4.6 CONCLUSION 216
CHAPTER 5 218

PROPOSING A STRATEGY FOR REDUCING MATERNAL MORTALITY IN MIGORI, KENYA218
5.1 INTRODUCTION 218
5.2 STRATEGY DEVELOPMENT 219
5.2.1 Introduction 219
5.2.2 SWOT analysis 219
5.2.3 Methodology for development of a strategy 222
5.4 PROPOSED STRATEGY FOR REDUCING THE MATERNAL MORTALITY RATIO IN MIGORI, KENYA 224
5.4.1 Strategic/long-term objectives 224
5.4.1.2 Objectives to address second delays 225
5.4.1.3 Objectives to address third delays 225
5.4.2.1 Operational objectives/strategies targeting first delays 226
5.4.2.2 Operational objectives/strategies targeting second delays 228
5.4.2.3 Operational objectives/strategies targeting third delays 230
5.5 VALIDATION OF THE STRATEGY 236
5.5.1 Validation of review forms 236
5.5.2 Reproductive health experts' demographics 236
5.5.3 Scoring criteria and description of validating each strategy 237
5.5.4 Outcome of validation by reviewers 239
5.6 CONCLUSION 239
CHAPTER 6 241
CONCLUSION AND RECOMMENDATIONS OF THE STUDY 241
6.1 INTRODUCTION 241
6.2 RESEARCH DESIGN AND METHODS 241
6.2.1 Phase 1 241
6.2.2 Phase 2 242
6.2.3 Phase 3 242
6.3 SUMMARY OF THE FINDINGS 242
6.3.1 Phase 1 242
6.3.2 Phase 2 243
6.3.3 Phase 3 243
6.4 RECOMMENDATIONS TO REDUCE MATERNAL MORTALITIES IN MIGORI, KENYA 244
6.4.1 Recommendations for hospital management 244
6.4.2 Recommendations for governments and policy makers 245
6.4.3 Recommendations for communities 246
6.4.4 Recommendations for further research 246
6.4.5 Recommendations for dissemination of study findings 247

6.5 STRENGTHS AND CONTRIBUTION OF THE STUDY 247
6.5.1 The strengths of the study in relation to its contribution at the level of quality of care247
6.5.2 The strengths of the study in relation to its contribution at the level of methodology248
6.5.3 The strengths of the study in relation to its contribution at the level of policy 248
6.6 LIMITATIONS 248
6.7 OVERALL CONCLUSION 249
REFERENCES 250
ANNEXURES 298
ANNEXURE AA: ETHICS APPROVAL 299
ANNEXURE A1: COUNTY LEVEL PERMISSION REQUESTED 301
ANNEXURE A2: STUDY SITE PERMISSION GRANTED 303
ANNEXURE A3: STUDY SITE PERMISSION GRANTED 304
ANNEXURE A4: STUDY SITE PERMISSION GRANTED 305
ANNEXURE B1: STUDY TOOL: MEDICAL RECORDS 306
ANNEXURE B2: STUDY TOOL: MIDWIVES 313
ANNEXURE B3: STUDY TOOL: PERIPARTUM MOTHERS 316
ANNEXURE C: REQUEST FOR CONSENT 321
ANNEXURE D: INFORMATION LEAFLET 323
ANNEXURE E: CONFIDENTIALITY BINDING FORM 326
ANNEXURE F: CONSIDERATION OF COVID-19 DURING DATA COLLECTION 327
ANNEXURE G: CRITERIA FOR VALIDATION OF INDIVIDUAL STRATEGIES 330
ANNEXURE H: EDITOR'S DECLARATION 332
ANNEXURE I: TURNITIN DIGITAL RECEIPT 333
ANNEXURE J: TURNITIN ORIGINALITY REPORT 334

LIST OF TABLES

Table 1. 1: Structure of thesis 13
Table 2.1: Regional maternal mortality ratios for 2000, 2010 and 2017 16
Table 3.1: Sampling frame (Phase 1) 107
Table 4. 1: Number of the reviewed cases per hospital (N=101) 132
Table 4. 2: Percentage distribution of cause of death of the reviewed maternal records 134
Table 4. 3: Percentage distribution of religion of the reviewed maternal records 135
Table 4. 4: Percentage distribution of age of the reviewed maternal records 136
Table 4. 5: Percentage distribution of educational level of the reviewed maternal records 138
Table 4. 6: Percentage distribution of marital status of the reviewed maternal records 139
Table 4. 7: Percentage distribution of gestational age of the reviewed maternal records 140
Table 4. 8: Percentage distribution of ANC attendance of the reviewed maternal records 141
Table 4. 9: Percentage distribution of history of previous C/S of the reviewed maternal records 141
Table 4. 10: Percentage distribution of type of delay associated with maternal mortality (N=101) 152
Table 4. 11: Results of multiple regression analysis related to key socio-economic determinants contributing to maternal mortality in Migori, Kenya 154
Table 4. 12: Frequency distribution of professional midwives interviewed (n=37) 157
Table 4. 13: Frequency distribution of midwives' years of experience (n=37) 158
Table 4. 14: Frequency distribution of peripartum mothers' demographics (n=66) 158
Table 4. 15: Themes developed from interviews with midwives and peripartum mothers (three delays model) 160
Table 5. 1: A description summary of SWOT analysis 221
Table 5. 2: A description of Objectives, findings and strategies targeting first delays 226
Table 5. 3: A description of Objectives, findings and strategies targeting second delays 228
Table 5. 4: A description of Objectives, findings and strategies targeting third delays 230
Table 5. 5: A description of objectives, findings and strategies targeting third delays 232
Table 5. 6: A description of Objectives, findings and strategies targeting third delays 233
Table 5. 7: A description of Objectives, findings and strategies targeting third delays 234
Table 5. 8: Health experts' demographics 236
Table 5. 9: Scoring criteria and description of validating each strategy 237
Table 5. 10: Description of reviewers' comments and researcher's responses 238
Table 5. 11: Outcome of validation by reviewers 239

LIST OF FIGURES

Figure 1.1: Three delays model 10
Figure 2.1: Description of maternal mortality ratio from 2000-2017 20
Figure 2.2: Description of proportion of global maternal mortality causes 22
Figure 3.1: A map of Migori County, Kenya 104
Figure 4. 1: Percentage distribution of employment status of the reviewed maternal records . 137
Figure 4. 2: Percentage distribution of residence of the reviewed maternal records 138
Figure 4. 3: Percentage distribution of gravidity of the reviewed maternal records 143
Figure 4. 4: Percentage distribution of HIV status of the reviewed maternal records 144
Figure 4. 5: Percentage distribution of referral status of the reviewed maternal records 145
Figure 4. 6: Percentage distribution of place of delivery of the reviewed maternal records 146
Figure 4. 7: Percentage distribution of mode of delivery of the reviewed maternal records 147
Figure 4. 8: Percentage distribution of person who conducted the delivery of the reviewed maternal records 147
Figure 4. 9: Percentage distribution of stage of maternal care at point of mortality (cases) or discharge (controls) 148
Figure 4. 10: Percentage distribution of duration from hospital admission to mortality occurrence (cases) or discharge (controls) 149
Figure 4. 11: Percentage distribution of baby outcome status of the reviewed maternal records 150
Figure 4. 12: Percentage distribution of utilisation of partograph in care of the reviewed maternal records 151
Figure 5.1: Steps of strategy development 222
Figure 5.2: Diagrammatic presentation of interventions proposed to address maternal delays 223

LIST OF ABBREVIATIONS

AFIDEP	African Institute for Development Policy
ANC	Antenatal Care
CDC	Centers for Disease Control
CEmOC	Comprehensive Emergency Obstetric Care
CHV	Community Health Volunteer
CHW	Community Health Worker
C/S	Caesarean Section
EmOC	Emergency Obstetric Care
EPMM	Ending Preventable Maternal Mortality
FMS	Free Maternal Healthcare Services
FP	Family Planning
HDP	Hypertensive Disorder of Pregnancy
HDU	High Dependency Unit
HIV	Human Immunodeficiency Virus
ICM	International Confederation of Midwives
IERC	Institutional Ethics Review Committee
iMMR	Institutional Maternal Mortality Ratio
KDHS	Kenya Demographic and Health Survey
MMR	Maternal Mortality Ratio
MNM	Maternal Near Miss
MOH	Ministry of Health
MPDR	Maternal and Perinatal Death Review
MWHS	Maternity Waiting Homes
NASG	Non-Pneumatic Antishock Garment
NCPD	National Council for Population and Development
PNC	Postnatal Care
PPH	Postpartum Haemorrhage
PROM	Premature Rupture of Membranes
SBA	Skilled Birth Attendant
SDG	Sustainable Development Goal
SMI	Safe Motherhood Initiative
SPSS	Statistical Package for Social Sciences
SSA	Sub-Saharan Africa
SVD	Spontaneous Vertex Delivery
TBA	Traditional Birth Attendant
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNDP	United Nations Development Programme
UNFPA	United Nations Population Fund
UNFPA	United Nations Fund for Population Activities (formerly)
UNICEF	United Nations Children's Fund
UNISA	University of South Africa
UNPD	United Nations Population Division
USAID	United States Agency for International Development
WHO	World Health Organization

CHAPTER 1

OVERVIEW OF THE STUDY

1.1 INTRODUCTION

Motherhood is something that many women aspire to at some point in their lives (Debeb 2016:15). Yet the normal, life-affirming process of pregnancy and delivery carries with it serious risks of death and disability (Debeb 2016:15). A woman dies every minute in childbirth around the globe and almost half of these deaths occur in Sub-Saharan Africa (SSA) (Olungah & Ochako 2019:5). According to the WHO global trends, the global estimates for 2017 indicate that there were 295 000 maternal deaths (United Nations Population Division[UNPD] 2018:1).The global maternal mortality ratio (MMR) in 2017 was estimated at 211/100 000 live births, representing a 38% reduction since 2000, when it was estimated at 342 (UNPD 2018:10). The global lifetime risk of maternal mortality for a 15-year-old girl in 2017 was estimated at 1 in 190; nearly half of the level of risk in 2000: 1 in 100 (UNPD 2018:10). The overall proportion of deaths to women of reproductive age (15–49 years) that are due to maternal causes was estimated at 9.2% (UI 8.7% to 10.6%) in 2017 – down by 26.3% since 2000 (UNPD 2018:10). This means that compared with other causes of death to women of reproductive age, the fraction attributed to maternal causes is decreasing (UNPD 2018:10). However, when interpreting change in MMR, one should consider that it is easier to reduce MMR when levels are high than when they are low (United Nations Fund for Population Activities [UNFPA] 2015:5).

An emerging challenge is increasing late maternal mortality, a phenomenon referred to as part of the “obstetric transition” (UNFPA 2015:5). As health systems improve and are better able to manage immediate childbirth complications, deaths within the first 48 hours of delivery may be averted, but the proportion of morbidity and mortality caused by late maternal complications can also increase (UNFPA 2015:5). Late maternal

mortality refers to maternal deaths that occur more than 42 days but less than one year after termination of pregnancy (Centers for Disease Control [CDC] 2020:1).

Currently Sub-Saharan Africa (SSA) is the only region with very high MMR for 2017, estimated at 542/100 000 (World Health Organization [WHO] 2019:1). Sub-Saharan Africa and Southern Asia accounted for approximately 86% (254 000) of the estimated global maternal deaths in 2017, with SSA alone accounting for roughly 66% (196 000), while Southern Asia accounted for nearly 20% (58 000) (WHO 2019:1). Three countries are estimated to have had extremely high MMR in 2017 (defined as over 1000 maternal deaths per 100 000 live births): South Sudan (1 150), Chad (1 140) and Sierra Leone (1 120) (WHO 2019:1).

Higher rates of maternal mortality and morbidity have significant negative effects on GDP, through both medical costs as well as non-medical costs such as lost work time (Moran, Wuytack, Turner, Normand, Brown, Begley & Daly 2020:5). Maternal mortality affects the ability to work by the bereaved families and can create significant losses in national economic productivity (Moran et al 2020:5). One estimate found that over a 5-year period, maternal morbidity cost the United States $6.6 billion in lost productivity (White, Lui, Bryant-Huppert, Chaturvedi, Hoyler & Aaronson 2022:927). At individual level, mothers are not only caregivers at home, but contribute substantially to household income (White et al 2022:927). The loss of that income can severely undermine a family's ability to access basic necessities, such as food, shelter and health care. Funeral costs alone can ruin a household's economy (Bazile, Rigodon, Berman, Boulanger, Maistrellis, Kausiwa & Yamin 2015:4). A study explored the consequences of a maternal death to households in rural Western Kenya focusing particularly on the immediate financial and economic impacts (Kes, Ogwang, Pande, Douglas, Karuga, Odhiambo, Laserson & Schaffer 2015:2). It revealed that, households who experienced a maternal death spent about one-third of their annual per capita consumption expenditure on healthcare access and use as opposed to at most 12% among households who had a health pregnancy and delivery (Kes et al 2015:2). Further, maternal mortality lowers the survival chances of newborns (Hough, Shakur, Ian &

Artemis 2021:147). If the infant survives birth but the mother does not, the resulting lack of nutritional support from breastfeeding leaves the baby vulnerable to malnutrition, which can itself be fatal or may increase the risk of disease or death from infection (Hough et al 2021:147). In a study conducted in Butajira Ethiopia, children who experienced a maternal death within 42 days of their birth faced 46 times greater risk of dying within one month when compared to babies whose mothers survived (95% confidence interval 25.84-81.92; or adjusted ratio, 57.24 with confidence interval 25.31-129.49) (Moucheraud, Worku, Molla, Finlay, Leaning & Yamin 2015:3).

1.2 BACKGROUND TO THE RESEARCH PROBLEM

Kenya was among eighteen countries, all in Sub-Saharan Africa, categorised with very high MMR in 2015, with estimates ranging from 999 to 500 deaths per 100 000 live births (UNPD 2018:5; WHO 2019:1). Currently the country's MMR is 362/100 000 (UNFPA 2018:19). The UNDP 2018:1) notes that in 2015, world leaders envisioned reducing maternal mortality through Sustainable Development Goals (SDGs). SDG 3.1 calls for countries to reduce the global maternal mortality ratio (MMR) to less than 70 per 100 000 live births by the year 2030 (UNDP 2018:1). The current global MMR is 210/100 000 (UNDP 2018:1). Achieving the global target of less than 70/100 000 MMR by 2030 requires a global annual rate reduction of at least 7.5% (UNFPA 2015:6). Projections indicate that accomplishing this target will result in over 60% fewer deaths in 2030 than the number that was estimated in 2015 (UNFPA 2015:6). The estimated target will save a cumulative 2.5 million women's lives between 2016 and 2030 (UNFPA 2015:6). For Kenya to meet the MMR target of 140/100 000 by 2030, an annual rate reduction of at least 8.6% is needed (Keats, Macharia, Singh, Akseer, Ravishankar & Ngugi 2018:4).

The 2018 Declaration of Astana repositioned primary healthcare as the most cost-effective and inclusive means of delivering health services to achieve the SDGs (UNPD 2018:41). Primary healthcare is thereby considered the cornerstone for achieving universal health coverage, which only exists when all people receive the quality health

services they need without suffering financial hardship (UNPD 2018:41). Health services that are unavailable/inaccessible or of poor quality, however, do not support the achievement of universal health coverage as envisioned (UNPD 2018:41).

Causes of maternal deaths are divided into direct causes that are related to obstetric complications during pregnancy, labour, or the postpartum period, and indirect causes (United Nations Children's Fund [UNICEF] 2009:1). A previous study on causes of maternal mortality and the changing trends showed that 294 maternal deaths occurred over a period of six years in Rajasthan, India (Soni, Gupta & Gupta 2016:105). The study noted that the triad of haemorrhage, hypertensive disorders and sepsis was responsible for most of the maternal deaths in the study (Soni et al 2016:105). Haemorrhage was the most important cause, accounting for 24.73% of the cases (Soni et al 2016:105). Similarly, a retrospective review of case records on the causes of maternal mortality in hospitals in Indonesia revealed that of the deaths of 90 women in 11 hospitals from January to June 2014, 75 (83%) were due to direct obstetric causes (Baharuddin, Amelia, Suhowatsky, Kusuma, Hud & Benjamin 2019:60). Severe pre-eclampsia and eclampsia combined were the leading direct causes of death (42%) (Baharuddin et al 2019:60).

Indirect obstetric deaths occur from either previously existing conditions or from conditions arising in pregnancy which are not related to direct obstetric causes but may be aggravated by the physiological effects of pregnancy (WHO 2018b:1). These include conditions such as the human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS), malaria, anaemia and cardiovascular diseases (WHO 2018b:1). A report on the prevalence and contributing factors of facility-based maternal and neonatal deaths in Namibia during 2010–2012 showed that of the 22 women who died as a result of one or more indirect causes of maternal death during the study period, HIV/AIDS was the most common contributing cause of indirect maternal death (n=15; 68.2%), followed by severe anaemia (n=7; 31.8%) and tuberculosis (n=6; 27.3%) (Ndishishi 2014:8). A descriptive retrospective data collection conducted by Vahiddastjerdy, Changizi, Habibollahi, Janani, Farahani and Babaee (2016:2) in Iran

noted that among all indirect causes, cardiovascular diseases were responsible for 10% of maternal deaths, followed by thromboembolism and renal diseases (Vahiddastjerdy et al 2016:2).

Many individual and socio-economic factors have been associated with high maternal mortality (Yego, D'Este, Byles, Williams & Nyongesa 2014:2). These include lack of education, parity, previous obstetric history, employment and socio-economic status and types of care seeking behaviours during pregnancy (Yego et al 2014:2). Ibrahim's study reported on socio-economic determinants of maternal mortality in rural communities of Oyo State, Nigeria (Ibrahim 2016:282) and noted that low access to health facilities, level of income, purchasing power and educational status were determining factors.

This study sought to investigate the determinants of maternal mortality and develop a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya.

1.3 STATEMENT OF THE PROBLEM

The Kenyan MMR has remained persistently high, at 400-600 deaths per 100 000 live births over the past decade (National Council for Population and Development [NCPD] 2015:2). This is in spite of Kenya having been one of the countries that had endorsed the United Nations policy instruments such as the Millennium Declaration which ended in 2015 and the Agenda 2030 for Sustainable Development (United Nations Development Programme [UNDP] 2018:1). The latter pronounced 17 sustainable development goals (SDGs) and 169 targets (UNDP 2018:1). SDG 3, target 1 (SDG3.1) calls for countries to reduce their maternal mortality ratio to less than 70 per 100 000 live births by 2030 (UNDP 2018:1).

Population Action International (2019:2) revealed that an estimated 7 900 Kenyan women die during or after pregnancy annually. Previous studies conducted in Kenya have reflected that direct causes of maternal deaths in the country are haemorrhage,

pregnancy complications and postpartum delivery, unplanned pregnancies and the related fatal illegal abortions owing to unmet need, miscarriage, and infection (Desai, Phillips-Howard, Odhiambo, Katana, Ouma, Hamel & Laserson et al 2013:e68733). HIV AIDS contributed 45% to maternal deaths as an underlying factor (Desai et al 2013:e68733).

The indirect factors of maternal mortality such as poor access to health facilities, low utilisation of skilled birth attendance during pregnancy, childbirth, and the postnatal period coupled with poor quality of care are deemed to contribute to poor maternal health outcomes (Dennis, Abuya, Maeve, Campbell, Benova, Baschieri & Bellows 2018:e000726). Increased numbers of maternal deaths can also be explained because of indirect factors such as long distances from a health facility and related delays in receiving skilled, appropriate and quality service for delivery of a newborn (Mmusi-Phetoe 2012:15).

In addition, limited availability of basic emergency obstetric care which can save women's lives in the event of serious medical complications, weak referral systems, as well as limited national commitment of resources for maternal health add to the failure to reduce the MMR (Tiyan 2014:2; Sidze 2017:1; Sharma, Leslie, Kundu & Kruk 2017:e0171236; Dennis et al 2018:e000726). Global reproductive agencies hold that no mother should die from pregnancy or while giving birth (World Bank 2019a:2). However, in 2018 the Kenya Demographic and Health Survey revealed that Migori County was among the 15 Counties out of 47 that accounted for over 60% of maternal deaths in Kenya (Kenya Demographic and Health Survey [KDHS] 2020:5). The estimate of the county's MMR is 673 deaths per 100 000 live births (African Institute for Development Policy [AFIDEP] 2017:2).

Having worked in the maternal and neonatal field for a number of years in the healthcare facilities in Kenya, the researcher has noted with concern that the Kenyan government interventions and policies that were implemented to address the problem of high MMR have not been successful in reducing this phenomenon, as evidenced by the

persisting slow progress. The Free Maternal Healthcare Policy that aimed to increase antenatal care visits, skilled deliveries, postnatal care visits and contraceptive use; the refresher training of emergency obstetrics to health providers programme which aimed at enabling them to accurately diagnose complications; and supply of maternal health equipment to county referral hospitals for provision of specialised obstetrics care at local level were interventions which aimed at tackling maternal mortality (Gitobu, Gichangi & Mwanda 2018:9; Banke-Thomas, Maua, Madaj, Ameh & Van den Broek 2020:12; Mutua & Wamalwa 2020:2; Masaba & Mmusi-Phetoe 2020:3). A time series analysis conducted in Kenya on the effect of the Free Maternal Healthcare Policy on maternal mortality noted no significant impact on the reduction of MMR in this country (Gitobu et al 2018:9).

Considering the above, the researcher aimed to investigate the determinants of maternal mortality and develop a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya.

1.4 PURPOSE OF THE STUDY

The purpose of this study was to investigate the determinants of maternal mortality and develop a strategy for reducing maternal mortality ratio (MMR) in Migori, Kenya.

1.5 RESEARCH OBJECTIVES

Phase 1: Quantitative

- To explore and describe the causes of maternal mortality in Migori, Kenya
- To explore and describe the socio-economic determinants contributing to maternal mortality in Migori, Kenya

Phase 2: Qualitative

- To analyse the current strategies that aim at reducing the MMR in Migori, Kenya
- To explore and describe the socio-economic determinants contributing to pregnancy and childbirth related complications in Migori, Kenya

Phase 3: Integration of the findings of quantitative and qualitative objectives

- To develop a strategy to reduce MMR in Migori, Kenya

1.6 RESEARCH QUESTIONS

Phase 1: Quantitative

- What are the causes of maternal mortality in Migori, Kenya?
- What are the socio-economic determinants that contribute to maternal mortality in Migori, Kenya?

Phase 2: Qualitative

- What are the current strategies that are being implemented to reduce the MMR in Migori, Kenya?
- What are the socio-economic determinants contributing to pregnancy and childbirth related complications in Migori, Kenya

Phase 3: Integration of the findings of quantitative and qualitative questions

- What strategy can reduce MMR in Migori, Kenya?

1.7 SIGNIFICANCE OF THE STUDY

This study helps understand the context-specific determinants of maternal mortality in the region. The findings of the present study guided the development of a strategy for reducing the MMR in Migori, Kenya. The researcher envisages that the developed strategy will be utilised by the following groups:

- County strategic management teams – in modifying and improving the current policies towards maternal health and mortality reduction in Migori, Kenya.
- Ministry of Health – with the adoption of the strategy, its effectiveness in maternal mortality reduction in Migori can be used as a benchmark to other regions.
- Study reviews – the findings would be published in peer reviewed journals enabling other researchers to adopt, evaluate and contextualise the strategy elsewhere.
- Health service providers – to respond to patients' maternal health needs with enhanced awareness of major contributors to maternal mortality that would in turn improve maternal outcomes.
- Researchers – gaining advanced research skills in promoting maternal health through conducting studies.

1.8 THEORETICAL FOUNDATIONS OF THE STUDY

Several studies have successfully developed illustrative models to show the underlying factors associated with morbidity and mortality in human populations (Filippi, Chou, Barreix & Say 2018:5). For instance, the McCarthy and Maine framework described the distal and intermediate determinants of maternal mortality while the Thaddeus and Maine framework demonstrated factors contributing to maternal mortality using the popular "three delays model" (Filippi et al 2018:5). Despite the fact that Thaddeus and Maine's framework was developed long ago, it was found to be still relevant and inclusive of most determinants pertinent to maternal health outcomes (Agena 2018:16). According to the Thaddeus and Maine framework, type 1 delay or first delay occurs at the household and community level and reflects the delay in deciding to seek care for

pregnancy complications (Chavane, Bailey, Loquiha, Dgedge & Aerts 2018:3). Type 2 delay or second delay refers to the delay to reach the facility that provides emergency obstetric care (EmONC) (Chavane et al 2018:3). The type 3 delay or the third delay refers to the delay that occurs in receiving care after arrival at the health facility (Chavane et al 2018:3).

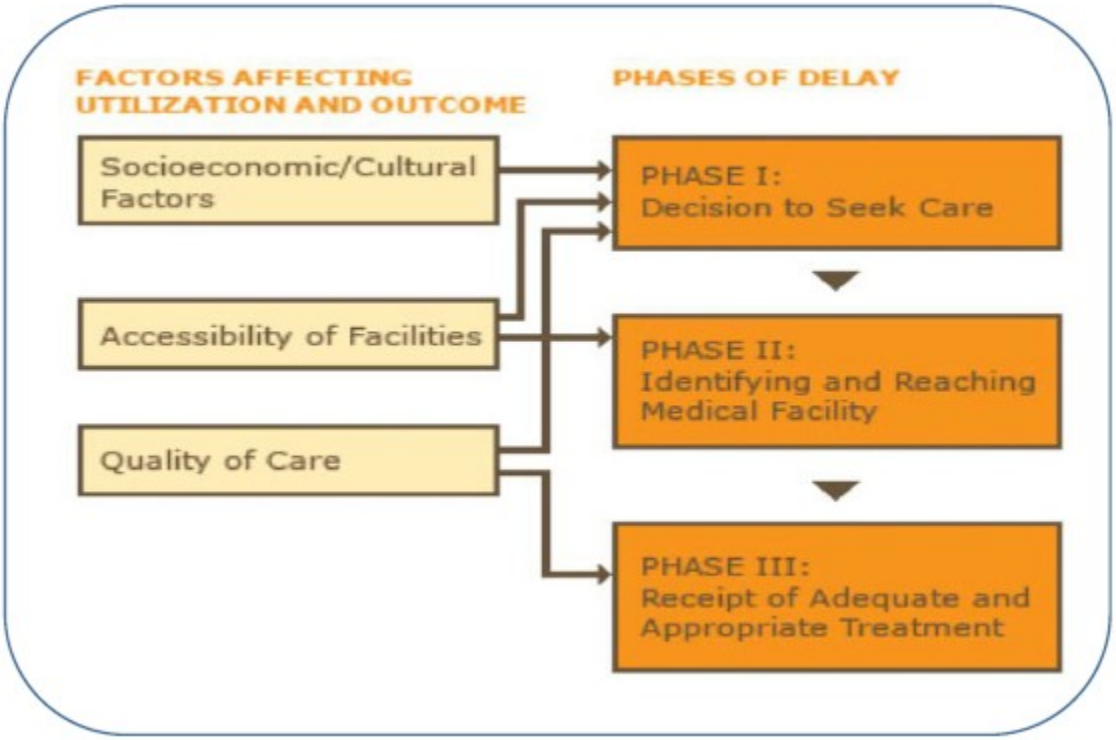

Figure 1.1: Thaddeus and Maine's Three delays model

(UNFPA 2014:1)

The three delays model (Figure 1.1) was adopted to identify and explore the determinants of maternal mortality and accordingly develop a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya. In the present study, the first delay factors included socio-demographic and maternal health variables; maternal age, parity, marital status, educational level, residence, antenatal clinic attendance and gestation. The second delay factors informed analysis of factors such as affordability of care, availability of transport and distance to the hospital. Lastly, the third delay factors of the model were used to help the researcher assess quality of care and availability of staff and equipment, mode of delivery, status of the baby at birth, mother's status on

admission, reasons for admission, timing of death since admission, stage of pregnancy on admission, stage of pregnancy at death, the reported cause of death and the contributing factors.

The study utilised data extracted from maternal medical records of women who gave birth from 1 January 2016 to 31 December 2019 in four hospitals in Migori County. Additionally, data was collected from all midwives working in peripartum units and all peripartum mothers hospitalised due to pregnancy and childbirth complications in the proposed hospitals during that period to analyse the variables.

1.9 THE RESEARCH PARADIGM

The adopted research paradigm for this study was pragmatism. Polit and Beck (2017:738) describe a paradigm as a worldview that is informed by philosophical assumptions that guide the researcher's approach to enquiry. Although assumptions are untested, they influence the researchers' investigation (Brink, Van Der Walt & Van Rensburg 2018:19). The paradigm arose among philosophers who argued that it was not possible to access the 'truth' about the real world solely by virtue of a single scientific method as advocated by the positivist paradigm, nor was it possible to determine social reality as constructed under the interpretivist paradigm (Kivunja & Kuyini 2017:35). For pragmatists, a mono-paradigmatic orientation of research was not good enough (Kivunja & Kuyini 2017:35). The pragmatism allowed the researcher to employ multiple methods such as a mixed methods explanatory sequential study design. Correspondingly, Feilzer (2010:8) holds that pragmatism is a deconstructive paradigm that advocates the use of mixed methods in research and focuses on 'what works' as the truth regarding the research questions under investigation.

1.10 DEFINITION OF KEY CONCEPTS

Determinants: A determinant is any factor, whether event, characteristic, or other definable entity, that brings about a change in a health condition or other defined characteristic. It is a factor which decisively affects the nature or outcome of something (Short & Mollborn 2016:79). These factors include biological, socio-economic, psychosocial, behavioural, or social factors (Short & Mollborn 2016:79). For the purpose of this study, determinants are factors that relate to the maternal mortality outcome to include: 1) socio-demographic and maternal health variables, 2) accessibility to the hospital, and 3) quality of care.

Maternal death: Death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from incidental or accidental causes (WHO 2019:1). For this study, maternal death means: the death of a mother occurring during pregnancy or within 42 days of pregnancy termination.

Maternal mortality ratio: Maternal mortality ratio is defined as the number of maternal deaths during a specific period per 100 000 live births during the same period (WHO 2019:1). The maternal mortality ratio in this study is defined by the WHO (2019:1).

Midwife: A midwife is a person who has successfully completed a midwifery education programme that is based on the International Confederation of Midwives (ICM) Essential Competencies for Basic Midwifery Practice, and the framework of the ICM Global Standards for Midwifery Education and is recognised in the country where it is located; who has acquired the requisite qualifications to be registered and/or legally licensed to practice midwifery and use the title ‘midwife’; and who demonstrates competency in the practice of midwifery (International Confederation of Midwives [ICM] 2020:1). For this study, a midwife is a trained healthcare provider (doctor, nurse or clinician) who is licensed to practice midwifery in Kenya. The midwife was currently working in peripartum units in the selected health facilities in Migori County, Kenya.

Lastly, the midwife needed to have experience of more than a year within the department.

1.11 STRUCTURE OF THE THESIS

This thesis is structured into six chapters as demonstrated in Table 1.1.

Table 1. 1: Structure of thesis

Chapter	Title	Content description
1	Orientation of the study	Introduction of the study, stages of the study, overview of the research problem, research purpose and research question. The study objectives, significance of the study, definition of terms, theoretical foundation, research design and methods and validity and reliability/trustworthiness are briefly introduced.
2	Literature review	A thorough discussion of literature consulted in relation to the study‘s topic is presented.
3	Research design and methodology	The overall design of the research, the research method used to achieve the objectives of the research, ways of ensuring validity and reliability/trustworthiness and ethical considerations are discussed.
4	Analysis, presentation, and description of the research findings	An analysis, presentation, interpretation, and discussion of the research results is offered in this chapter.
5	A strategy to reduce maternal mortalities	A strategy that can be used to reduce/mitigate maternal mortalities is presented.
6	Conclusions and recommendations	The conclusions and recommendations based on key findings of the study are considered.

1.12 CONCLUSION

In this chapter, the researcher presented the following sections and sub-sections of the study: Introduction of the study, stages of the study, overview of the research problem, research purpose and research questions. In addition, the study objectives towards maternal mortality reduction in Migori, Kenya, the significance of the study, a definition of terms, the theoretical foundation, the research design and methods, and validity and reliability/trustworthiness were also briefly introduced.

The next chapter presents the reviewed literature that relates to the focus of the current study.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Chapter 1 introduced the study and outlined the problem, purpose, research design and methodology of the study. This chapter discusses the literature review conducted for the study. Leite, Padilha and Cecatti (2019:7) argue that it is through literature review that the researcher is able to (1) identify the state-of-the-art knowledge in a particular field; (2) clarify information that is already known; (3) elucidate implications of the problem being analysed; (4) link theory and practice; (5) highlight gaps in the current literature; and (6) place the thesis within the research agenda of that field (Leite et al 2019:7). In addition, it is noted that an effective and well-conducted review creates a firm foundation for advancing knowledge and facilitating theory development (Snyder 2019:334). The literature review covered maternal mortality trends – global, regional and national levels – and their causes and socio-economic determinants. The healthcare delivery factors contributing to maternal mortality were also examined. Lastly, the study further reviewed strategies and interventions that aim at reducing maternal mortality ratios internationally, regionally and nationally.

2.2 MATERNAL MORTALITY TRENDS

The global maternal mortality ratio (MMR) in 2017 was estimated at 211 deaths per 100 000 live births, a 38% reduction since 2000, when it was estimated at 342 (WHO 2022a:1). Although a declining trend is noted, most of the mortalities were preventable (WHO 2022a:1). There is therefore a continued urgent need for maternal health and survival to remain high on the global health and development agenda (World Bank 2019:1).

2.2.1 Global trends

Table 2.1: Regional maternal mortality ratios for 2000, 2010 and 2017

Regions	2000	2010	2017
West and Central Africa	962	755	674
Sub-Saharan Africa	870	626	533
Eastern and Southern Africa	780	494	384
South Asia	395	235	163
East Asia and the Pacific	114	86	69
Latin America and the Caribbean	96	84	74
Middle East and North Africa	95	63	57
Eastern Europe and Central Asia	45	26	19
Europe and Central Asia	27	17	13
North America	12	14	18
Western Europe	8	6	5
Least developed countries	763	520	415
World	342	248	211

(United Nations Maternal Mortality Estimation Inter Agency Group [UN-MMEIG] 2022:1)

According to Table 2.1, the MMR in the world's least developed countries is high, estimated at 415 maternal deaths per 100 000 live births, which is more than 40 times higher than that for the MMR in Europe. The high number of maternal deaths in some regions of the world reflects inequalities in access to quality health services and highlights the gap between rich and poor (WHO 2022a:9). The MMR in low income countries in 2017 is 462 per 100 000 live births versus 11 per 100 000 live births in high income countries (Bauserman, Thorsten, Nolen, Patterson, Lokangaka, Tshefu & Jessani 2020:7; WHO 2022a:4).The 10 countries with the highest MMRs in 2017 (in order from highest to lowest) are: South Sudan, Chad, Sierra Leone, Nigeria, Central

African Republic, Somalia, Mauritania, Guinea-Bissau, Liberia and Afghanistan (WHO 2019:4). Poor women in remote areas are the least likely to receive adequate healthcare (WHO 2022a:2). Demonstrating the disparities within countries, in a study in rural Ragh and Kabul city, Afghanistan, the maternal mortality ratio was estimated at 713/100 000 live births (Bartlett, Lefevre, Zimmerman, Saeedzai, Turkmani, Zabih & Rahmanzai 2017:545). Patterns in care-seeking reflect these inequities: of all women who were surveyed, only 3% gave birth at a health facility in Ragh (rural) compared to 82% of women at Kabul city (urban) (Bartlett et al 2017:545). In another Afghanistan study, Najafizada, Bourgeault and Labonté (2017:15) noted that national maternal care provided in the "Basic Package of Health Services" includes antenatal, delivery and postpartum care, family planning and care for the newborn. However, utilisation of these services is variable and inconsistent among Afghan women (Najafizada et al 2017:15).

Two regions, SSA and South Asia, account for 86% of annual maternal deaths worldwide (WHO 2022a:3). Sub-Saharan Africans suffer from the highest maternal mortality ratio – 533 maternal deaths per 100 000 live births a year (WHO 2022a:3). This is over two thirds (68%) of all maternal deaths per year worldwide (WHO 2022a:4). This is especially true for regions with low numbers of skilled health workers, such as SSA (WHO 2022a:1). A case in point is Liberia: as of 2016, it had only 11.7 "core clinical health workers" (midwives, nurses, physicians and physician assistants) per 10 000 people, well below the World Health Organization's minimum threshold of 23 health workers per 10 000 population (Karmbor-Ballah, Fallah, Silverstein, Gilbert, Desai & Mukherjee 2019:e00050). This count is even lower in rural parts of the country (Karmbor-Ballah et al 2019:e00050).

Although most regions recorded a declining trend (Table 2.1), notably, one sub-region with very low MMR (12) in 2000 – Northern America – had an increase in MMR of almost 52% during this period, rising to 18 in 2017 (UNPD 2018:4). This could be attributed to the already low levels of MMR, as well as improvements in data collection, changes in life expectancy, and/or changes in disparities between sub-populations (UNPD 2018:1). On the other hand, it could be due to recent increase in indirect

obstetric causes, including complications related to pre-existing chronic conditions (Rivara & Fihn 2020:2). Moreover, there has been a shift in the timing of US maternal deaths, with much of the increase attributed to deaths occurring in the later postpartum period (42 days to 1 year postpartum), including those related to cardiovascular disease, mental health and substance use disorders (Rivara & Fihn 2020:2).

2.2.2 Sustainable development goals and maternal health

Improving maternal and newborn health is one of the unfinished agendas of the Millennium Development Goals and it remains a high priority area in the era of the Sustainable Development Goals (SDGs) (Nove, Friberg, Bernis, Mcconville, Moran, Najjemba & Tracy2021:e24). Some goals and targets directly linked to maternal health and mortality reduction are as follows:

- SDG target 3.1 – By 2030, reduce the global maternal mortality ratio to less than 70 per 100 000 live births.
- SDG goal 3.7 – By 2030, ensure universal access to sexual and reproductive health-care services, including for family planning, information and education and the integration of reproductive health into national strategies and programmes.
- SDG goal 5 – achieve gender equality and empower all women and girls by 2030 (UNDP 2018:3).

Projections indicate that accomplishing the target of global MMR to less than 70 will result in nearly 70% fewer deaths in 2030 than the estimated number in 2015 and will save approximately 1.4 million women's lives between 2016 and 2030 (WHO 2022b:5). Despite the ambition to end preventable maternal deaths by 2030, the WHO estimates that the world will fall short of this target by more than one million lives at the current pace of progress (WHO 2022b:5).

2.2.3 Regional level trends in Sub-Saharan Africa

SSA alone accounts for roughly two-thirds of maternal deaths annually (WHO 2022a:2). The region has a lifetime risk of maternal deaths of one in 38 with an estimated 530 000 maternal deaths occurring each year (Wekesah, Mbada, Muula, Kabiru & Muthuri 2016:15). A recent study among 54 African countries showed disparity in maternal mortality in Africa. The hotspots were found in the middle and western parts of the continent (Yaya, Anjorin & Adedini 2021:8). Only three countries in SSA had low MMR: Mauritius (61), Cape Verde (58) and Seychelles (53) (UNPD 2018:4). Despite its very high MMR in 2017, SSA as a region has achieved a substantial reduction in MMR of roughly 38% since 2000 (UNPD 2018:5). A systematic review of studies published from 2015 to 2020 reported the major causes of maternal deaths in 57 SSA countries (Musarandega, Nyakura, Machekano, Pattinson & Munjanja 2021:7). Obstetric haemorrhage was the leading group of maternal mortality causes with a proportion of 28.8% of the deaths, followed by hypertensive disorders in pregnancy (22.1%), non-obstetric complications (18.8%), and pregnancy-related infections (11.5%) (Musarandega et al 2021:7).

Compared to developed countries, Africa accumulates many physical, economic, social and psychological handicaps, especially in its rural areas: scattered settlements, poor health infrastructure, shortage of qualified health-care personnel, transportation, health awareness, and low levels of income and education (Garenne 2015:e346;Yaya et al 2021:7). Regional estimates indicate that only 3% of the world's healthcare workforce is found in the region despite the area having 24% of the global disease burden (Yaya, Bishwajit & Gunawardena 2019:5). About 63% of maternal deaths occur intrapartum or postpartum; thus, access to high quality skilled care around the time of childbirth can reduce maternal mortality (Wilunda, Scanagatta, Putoto, Takahashi, Montalbetti, Segafredo & Betra 2016:15). For instance, a study by Wilunda et al (2016:15) reported that access to health services in South Sudan is hampered by a poorly functioning health system that is plagued by chronic problems such as shortage of human

resources, lack of health infrastructure and supplies, and weak health management systems (Wilunda et al 2016:15).

2.2.4 Kenya's maternal mortality level trends

Each year, approximately 6,300 women die from pregnancy complications in Kenya (Nzioka, Sitiene & Kiarie 2020:33). Maternal Mortality Inter-agency working Group (MMEIG) estimate that Kenya's maternal mortality ratio (MMR) ranged from 353 in 2015 to 342 per 100, 000 live births in 2017 (Figure 2.1).

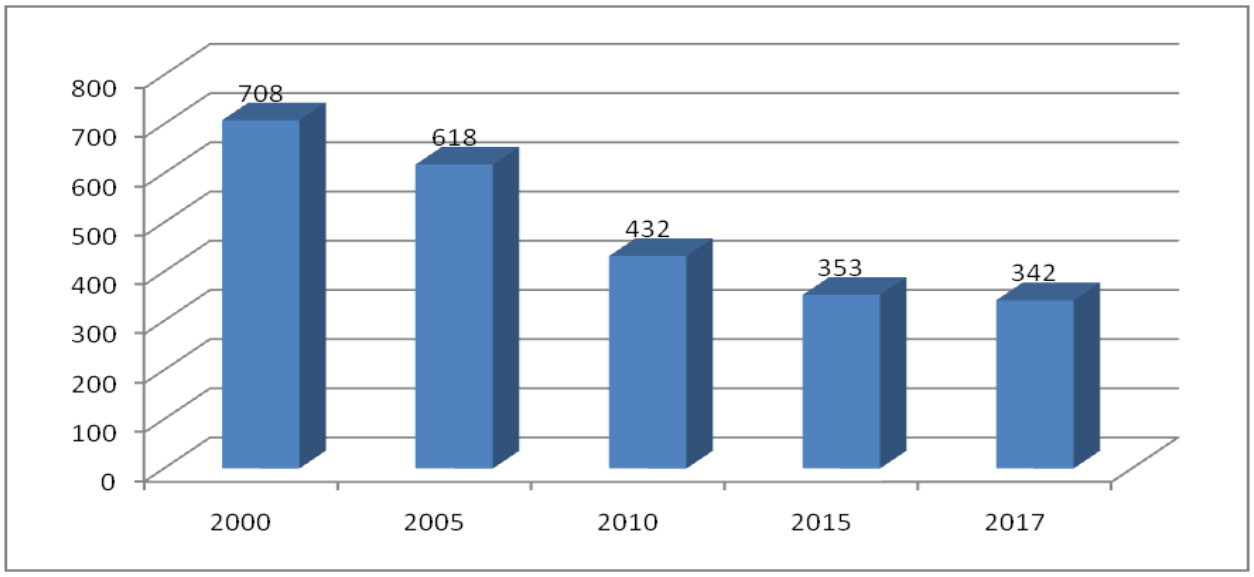

Figure 2.1: Description of maternal mortality ratio from 2000-2017

(UN-MMEIG 2022:1)

The country's MMR is unacceptably high level compared to that of high-income countries (UNDP 2018:22). The MMR of the latter is estimated to be 12/100 000 (UNDP 2018:22). This is despite efforts by the Kenyan government to introduce reproductive health voucher programme within the last 15 years which include measures such as subsidising care in 2006 and provision of free maternity services in public facilities in 2013 (Owolabi, Riley, Juma, Mutua, Pleasure, Amo-Adjei & Bangha 2020:7). On examining the Kenya's progress in achieving Sustainable Development Goals 3, the country is still off-track from achieving less than 140 deaths per 100,000 live births

target by 2030 (Creanga, Odhiambo, Odera, Odhiambo, Desai, Goodwin, Goldberg et al 2016:4).

There are wide regional disparities in maternal mortality indicators across the 47 counties (Kenya-National-Bureau-of-Statistics[KNBS] 2018:27). North Eastern region has the highest MMR of about 2,000 deaths for every 100,000 live births followed by Nyanza (546), Eastern (400), and Rift Valley (377) (MOH 2020:22). Nairobi (212) and Central (289) have the lowest MMR in the country (MOH 2020:22). Migori County in Nyanza region is one of the 15 highly burdened counties which account for 98.7% of all maternal deaths in Kenya (Kenya-National-Bureau-of-Statistics[KNBS] 2018:27). Other counties with worse maternal survival indicators include Mandera, Wajir, Turkana, Marsabit, Isiolo, Siaya, Lamu, Garissa, Nairobi, Nakuru, Kakamega, Homabay, Taita Taveta and Kisumu (Kenya-National-Bureau-of-Statistics[KNBS] 2018:27). Nearly all these counties have faced high levels of poverty, insecurity, infrastructural challenges and inequity/marginalization leading to poor maternal and new-born health statistics (Kenya-National-Bureau-of-Statistics[KNBS] 2018:27).

A hospital based maternal mortality review was conducted in Nyanza region at two referral hospitals from January 2014 to November 2016 (Onyango, Githuku & Gura 2017:8). The researchers noted 164 maternal deaths during the study period (Onyango et al 2017:8). While the MMR increased from 157/100,000 in 2014, to 217/100,000 live births in 2016 (Onyango et al 2017:8). A previous Kenyan study reviewed maternal mortality records from July 2008 to June 2012 in Central region (Muchemi, Gichogo, Mungai & Roka 2016:6). Muchemi and other researchers noted that direct causes (haemorrhage, infection and pre-eclampsia/eclampsia) contributed most (77%) of the deaths (Muchemi et al 2016:6), while hospital based studies at Moi Teaching and Referral Hospital (MTRH) in Kenya had indicated that eclampsia (22%) was the leading direct complication for maternal death, followed by dystocia (14%) and haemorrhage (13%) (Yego, Williams, Byles, Nyongesa, Aruasa & Este 2013:5). In Trans-Nzoia County, evidence in a Kenyan study indicated that fragile health systems, poor access to high quality and specialised care, low health literacy rates, gender-based inequities

and generational poverty contributed to these high maternal mortalities (Maldonado, Bone, Scanlon, Anusu, Chelagat & Jumah 2020:6).

2.3 CAUSES OF MATERNAL MORTALITY

The causes of maternal deaths are divided into direct causes that are related to obstetric complications during pregnancy, labour or the postpartum period, and indirect causes (UNICEF 2009:2).

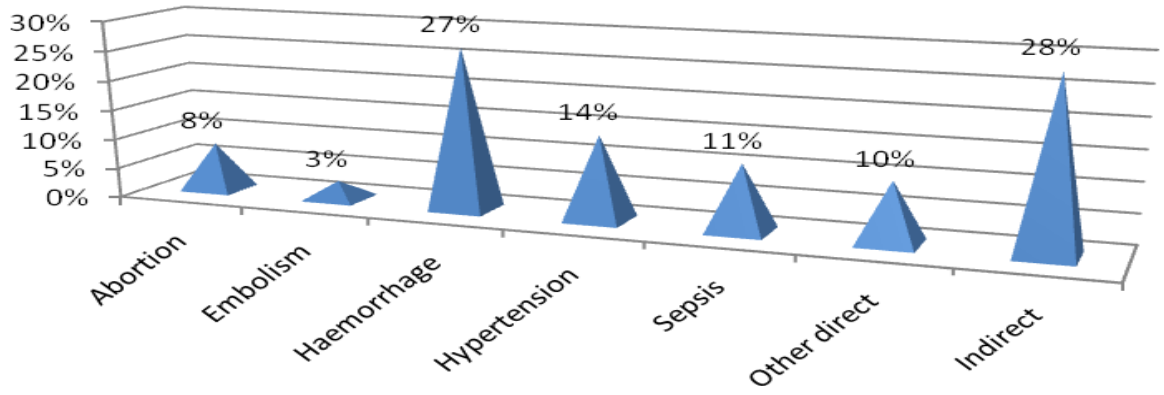

Figure 2.2: Description of proportion of global maternal mortality causes (UN-MMEIG 2022:1).

Approximately 15% of pregnant women develop some form of obstetric complications during pregnancy and childbirth which is likely to result in maternal death if they fail to receive rapid obstetric interventions (Geleto, Chojenta, Musa & Loxton 2018:3). In most developing countries, the major direct causes of maternal morbidity and mortality are hypertensive diseases with eclampsia, postpartum haemorrhage, infections, obstructed labour, ruptured uterus, and unsafe abortion (Bhandari & Dangal 2014:8). Indirect causes of maternal death include both previously existing diseases and diseases that develop during pregnancy (Yego et al 2014:2). These include HIV, malaria, tuberculosis, diabetes and cardiovascular disease, all of which have an enormous impact on maternal and foetal outcomes during pregnancy (Yego et al 2014:2). Figure

2.2 indicates that, globally, haemorrhage (27%) takes the lead as a cause of mortality, recording 27% of the direct causes, followed by hypertension at 14%. Figure 2.2 illustrates sepsis (11%) as the third leading cause of maternal deaths (Nassoro, Chiwanga, Lilungulu & Bintabara 2020:4).

2.3.1 Haemorrhage

Obstetric haemorrhage refers to anomalous or excessive bleeding because of an early pregnancy loss, a placental implantation abnormality (including placenta previa or placental abruption), or because of an abnormality in the process of childbirth (UNICEF 2020:2). Postpartum haemorrhage (PPH) – severe bleeding in childbirth – is the largest direct cause of maternal mortality globally, taking the lives of 130 000 women every year (UNICEF 2020:2). PPH is commonly defined as a blood loss of 500 ml or more within 24 hours after birth, while severe PPH is defined as a blood loss of 1000 ml or more within the same timeframe (WHO 2022a:4). A small blood loss that makes the woman haemodynamically unstable is also termed as PPH (WHO 2022a:5). Uterine rupture is the tearing of the uterine wall and the loss of its integrity through breaching during pregnancy, delivery or immediately after delivery (Astatikie, Limenih & Kebede 2017:7). It is a catastrophic event in obstetrics, often resulting in both maternal and foetal adverse consequences (Astatikie et al 2017:7). Beyond this, it may expose the women to a harmful sequel such as permanent infertility secondary to hysterectomy (Astatikie et al 2017:7). This leads to extrusion of the foetus and/or placenta into the maternal abdomen and massive haemorrhage, especially when the rupture is of unscarred uterus (Ahmed, Mengistu & Endalamaw 2018:2). A ten-year retrospective study conducted between July and December 2016 that involved 34 public hospitals in Tanzania noted 1 987 maternal deaths (Bwana, Rumisha, Mremi, Lyimo & Mboera 2019:e0214807). Bwana et al (2019:e0214807) observed an elevated risk of maternal mortality from ruptured uterus (Bwana et al 2019:e0214807). Generally, in low-income countries like Tanzania, most maternal mortality cases of ruptured uterus are due to ignorance, poverty, unavailability of skilled staff, poor supply of essential medical drugs and consumables (Bwana et al 2019:e0214807). Antepartum haemorrhage is defined

as vaginal bleeding events occurring during the second half of pregnancy (after 20 weeks of estimated gestational age until delivery) (Long, Yang, Chi, Luo, Xiong & Chen 2021:31; Takai, Sayyadi & Galadanci 2017:112). It also remains an important cause of maternal morbidity and mortality worldwide (Long et al 2017:112).

At the time of delivery or miscarriage, the placenta should separate from the wall of the uterus and be expelled (James, Federspiel & Ahmadzia 2022:5). Separation of the placenta exposes the terminal branches of the uterine arteries (the spiral arteries) and results in bleeding across the uterine surface previously occupied by the placenta (James et al 2022:5). The mechanism by which bleeding from these vessels is controlled is external compression from the contraction of the interlacing muscle fibres of the uterus and from internal vasoconstriction (James et al 2022:5). For bleeding to be controlled, the placenta, including any fragments, must be expelled or removed and the walls of the uterus apposed (James et al 2022:5). The Four Ts mnemonic can be used to identify and address the four most common causes of postpartum haemorrhage (uterine atony [Tone]; laceration, hematoma, inversion, rupture [Trauma]; retained tissue or invasive placenta [Tissue]; and coagulopathy [Thrombin] (Evensen, Anderson & Fontaine 2017:442;Tort, Rozenberg, Traoré, Fournier & Dumont 2015:5). In a northwest Ethiopian study, analysis showed that poor uterine tone accounted for the majority of primary postpartum haemorrhage (80%), followed by genital tract trauma (13%), retained uterine products (5%), and coagulation disorders (2%) (Tiruneh, Fooladi, Mclelland & Plummer 2022:7).

A strategy to prevent postpartum haemorrhage is active management of the third stage of labour, which also reduces the risk of a postpartum maternal haemoglobin level lower than 9 g/dL (90 g/L) and the need for manual removal of the placenta (Evensen et al 2017:442). Components of this practice include: (1) administering oxytocin (Pitocin) with or soon after the delivery of the anterior shoulder; (2) controlled cord traction (Brandt-Andrews manoeuvre) to deliver the placenta; and (3) uterine massage after delivery of the placenta (Evensen et al 2017:442). A woman can bleed to death in two hours or less and in rural areas where hospitals may be days away, there is little hope for women

suffering from severe bleeding (WHO 2022a:7). Hence, prompt resuscitation, identification of the cause, and subsequent treatment are essential for improving the outcomes (Trikha & Singh 2018:698). The management consists of fluid resuscitation, administration of blood and blood products, conservative measures such as uterine cavity tamponade and sutures and finally hysterectomy (Trikha & Singh 2018:698).

A systematic review was conducted of the causes of maternal deaths in 57 SSA countries (Musarandega et al 2021:5). Findings revealed haemorrhage as the leading cause of death (Musarandega et al 2021:5). It is associated with unskilled delivery assistance, delivery in ill-equipped facilities, and a shortage of essential obstetric care materials such as transfusion blood (Musarandega et al 2021:5). Similarly, a study among 181 patients with massive obstetric haemorrhage in the United Kingdom Obstetrical Surveillance System database from June 2012 to June 2013 revealed that 15 patients required >20 units of blood, which is a challenge for a small or rural hospital (James et al 2022:5). Evidence from a study conducted in 42 tertiary hospitals in Nigeria observed that less than half of the women with severe maternal outcomes received life-saving treatment critical to survival within 30 minutes of PPH diagnosis, together with a similar finding regarding attention by senior medical personnel (Sotunsa, Adeniyi, Imaralu, Fawole, Adegbola, Aimakhu & Adeyemi 2019:19). This suggests that initiation of definitive life-saving interventions depend on the presence of senior medical personnel (Sotunsa et al 2019:19). Availability of specialist care during obstetric emergencies has been shown to be associated with better maternal outcomes and increased effectiveness of emergency services (Sotunsa et al 2019:19).

Poor outcomes following obstetric haemorrhage have further been attributed to delayed treatment, unavailability of blood and blood products, inaccurate estimation of blood loss, absence of treatment protocols, poor communication among the treating teams, and inadequate organisational support (Trikha & Singh 2018:698). Demonstrating delayed treatment, a study was conducted in Juba Teaching Hospital, South Sudan (Alemu, Fuchs, Vitale & Salih 2019:177). Of the maternal mortalities recorded from March to June 2016, three women with ruptured uteri were operated on after three

hours and one woman died before she could be operated on (Alemu et al 2019:177). A Japanese descriptive study reported 361 maternal deaths between January 2010 and June 2017 (Hasegawa, Katsuragi, Tanaka & Kurasaki 2019:5). Significantly, among all maternal deaths, the frequency of deaths due to obstetric haemorrhage ranged from 29% (2010) to 7% (2017) (Hasegawa et al 2019:5). Hasegawa et al (2019:5) observed that the decline in obstetric haemorrhage-related maternal death rate was due to improvement of management provided by obstetric caregivers throughout Japan.

2.3.2 Hypertension

Hypertensive disorder of pregnancy (HDP) is an umbrella term that includes pre-existing and gestational hypertension, pre-eclampsia and eclampsia. It complicates up to 10% of pregnancies and represents a significant cause of maternal and perinatal morbidity and mortality (Braunthal & Brateanu 2019:10). Pre-eclampsia is responsible for more than 60 000 maternal deaths annually worldwide, placing it as the second cause of maternal mortality after bleeding (Armaly, Jadaon, Jabbour, Abassi & Burton 2018:1). It increases the morbidity and mortality of both the foetus and pregnant woman, especially in developing countries (Armaly et al 2018:1). Centers for Disease Control (CDC) in the USA estimates showed that, during 2017–2019, HDP prevalence among delivery hospitalisations increased from 13.3% to 15.9% (Ford, Cox, Ko, Ouyang, Romero, Colarusso & Barfield 2022:2017). Among maternal deaths occurring during delivery hospitalisation, 31.6% had a diagnosis code for HDP documented (Ford et al 2022:2017). Similar trends were observed from the Global Burden of Disease data covering populations from 204 countries in 2019 (Wang, Xie, Yuan, Wang, Zhao, Zhou & Zhang 2021:7). Wang et al (2021:7) revealed that incidence of hypertensive disorders of pregnancy had increased from 16.30 million to 18.08 million globally, with a total increase of 10.92% from 1990 to 2019 (Wang et al 2021:7).

Pre-eclampsia − the rapid rise of blood pressure during pregnancy − if untreated, can lead to seizures (eclampsia), kidney and liver damage, and death (WHO 2022a:5). The WHO recommends magnesium sulphate as the safest, most effective and lowest-cost

treatment for severe pre-eclampsia and eclampsia, although availability and correct use of this lifesaving drug varies widely (WHO 2022a:3). A case in point is a maternal mortality audit conducted in Norway from 1996 to 2014 (Nyfløt, Ellingsen, Yli, Øian, Vangen & Norwegian 2018:976). The audit revealed that among the maternal deaths recorded, 14 cases did not receive adequate antihypertensive treatment, eight cases received no antihypertensive treatment at all, and in six cases the treatment was insufficient to reduce their blood pressure adequately (Nyfløt et al 2018:976). Perhaps these patients would have had a better prognosis if a standardised clinical protocol was adopted for the management of hypertensive disorders in pregnancy (Keskinkılıç, Engin-üstün, Sanisoğlu, Uygur & Keskin 2017:20).

A prospective cohort study conducted in Jinja and Mulago hospitals in Uganda from March 1, 2013 to February 28, 2014 indicated a high pre-eclampsia case-specific mortality burden (Nakimuli, Nakubulwa, Kakaire, Osinde, Mbalinda, Kakande & Kaye 2016:5). The case mortalities were associated with delayed recognition of the hypertensive disorders, delay in accessing vital services in peripheral units, delay in accessing prompt care, and poor quality of obstetric care in general (Nakimuli et al 2016:5). In a Norwegian study, Nyfløt et al (2018:976) suggested that improvements of substandard care could have made a difference to the outcome in 87% of the women who died due to hypertensive disorders (Nyfløt et al 2018:976).

A systematic review and meta-analysis in SSA demonstrated that pregnant or postpartum women with hypertensive disorders of pregnancy had increased risk of maternal mortality (Gemechu, Assefa & Mengistie 2020:5). Possible reasons were poor health-seeking behaviour, women typically presented late and with advanced disease states in SSA that contributed to high maternal and perinatal morbidity and mortality (Gemechu et al 2020:3). Furthermore, there may have been delayed and lack of intervention due to poor infrastructure (Gemechu et al 2020:3). Harris, Henke, Hearst and Campbell (2020:3) noted that addressing hypertensive disorders in pregnancy requires early identification. Ideally, the identification of hypertensive disorders would occur before pregnancy (Harris et al 2020:3). Then, continuous, risk-appropriate clinical

care and follow-up throughout the continuum of pregnancy throughout both the intrapartum and postpartum periods could be implemented (Harris et al 2020:3). This continuum of quality care is critical to improving maternal outcomes (Harris et al 2020:3). Similarly, in Turkey, a nation-based study indicated that 36.5% of hypertensive maternal deaths were classified as preventable and the key preventable factor was delay in seeking care by the patient (Keskinkılıç et al 2017:20). It was noted that women either presented late for antenatal care or late to hospital when they became symptomatic (Keskinkılıç et al 2017:20). Obada, Abba and Msughter (2021:31458) in Nigeria recommended that pregnant women should visit the hospital regularly, especially to check their blood pressure, and should be educated about the signs of pregnancy-induced hypertension (Obada et al 2021:31458). Similar trends were noted in an Indian hospital-based study conducted from January 2016 to January 2019 that reported that 402 (7.4%) cases had HDP (Panda, Das, Sharma, Das, Deb & Singh 2021:3). Fifty-four (13.4%) cases required admission in the intensive care unit and 12 (2.9%) resulted in maternal deaths (Panda et al 2021:3). Maternal mortality was higher in unbooked cases (Panda et al 2021:3).

2.3.3 Sepsis, malaria and HIV infections

Sepsis is a life-threatening condition that arises when the body's response to an infection injures its own tissues and organs (Bonet, Souza, Abalos, Fawole, Knight, Kouanda &Gülmezoglu 2018:12). When it happens during pregnancy, during or after giving birth, or after an abortion, it is called maternal sepsis (Bonet et al 2018:12). It is characterised by a temperature <36°C or >38°C and clinical signs of shock including systolic blood pressure <90 mmHg and tachycardia >120 beats/minute (Chen, Wang, Gao, Zhang, Cheng, Chen & Wang 2021:12). Physiological, immunological and mechanical changes in pregnancy make pregnant women more susceptible to infections compared to non-pregnant women, particularly during the postpartum period (Escobar, Kusanovic & Echavarria 2022:5). The maternal immunological and cardiovascular adaptations designed to facilitate the development of the foetus may impair the maternal capacity to respond to infection (Greer, Shah, Sriskandan &

Johnson 2019:10) Furthermore, maternal efforts during the second stage of labour, interventions during labour, or blood loss, may obscure signs and symptoms of infection and sepsis (Escobar et al 2022:5). This may result in a delay in the recognition and treatment of sepsis (Escobar et al 2022:5).

Two national cross-sectional assessments in Mozambique of health facilities with childbirth services were conducted in 2007 and 2012 (Bailey, Keyes, Moran, Singh, Chavane & Chilundo 2015:8). Based on the 2007 maternal death reviews and responses to ancillary questions, HIV infection, malaria and/or anaemia contributed to 44% of the maternal deaths, if not as primary causes, as co-morbidities (Bailey et al 2015:8). With prevention of these three co-morbidities, the burden of maternal mortality in Mozambique could be significantly reduced (Bailey et al 2015:8). Bailey et al (2015:8) recommended that efforts to end preventable maternal and newborn deaths must maximise the use of antenatal care that includes integrated preventive/treatment options for HIV infection, malaria and anaemia (Bailey et al 2015:8).

Globally, around 11 women per 1000 live births had an infection which resulted in or contributed to what is known as a severe maternal outcome – either they died or nearly died – during their hospitalisation (WHO 2022a:8). A recent WHO systematic analysis of global, regional and sub-regional estimates of the causes of maternal death found that sepsis accounted for 10.7% (5.9–18.6) of all maternal deaths (Firoz & Woodd 2017:174). Estimates varied between high-income countries (4.7%, 2.4–11.1) and low-income countries (10.7%, 5.9–18.6) (Firoz & Woodd 2017:174). In Uganda, a previous retrospective study among 139 maternal deaths conducted at the maternity unit of Mbarara Regional Referral Hospital indicated that puerperal sepsis (30.9 %) was the leading cause (Ngonzi, Tornes, Mukasa, Salongo, Kabakyenga, Sezalio & Geertruyden 2016:4). Unexpectedly, in the United States the incidence of severe maternal sepsis is increasing and patients with complex medical problems are at the greatest risk (Greer et al 2019:15). Current management strategies include early detection, prompt initiation of resuscitation and anti-pathogen treatment (Greer et al 2019:15).

Puerperal sepsis is common in developing countries because of the lack of basics such as clean water, clean delivery rooms, and limited access to antibiotics (Musarandega et al 2021:8). Initiation of effective antimicrobial therapy within the first hour of diagnosis is associated with maternal survival to hospital discharge (Shields & Assis 2021:289). Key maternal delays that may contribute to sepsis are delays in recognition of sepsis, administration of appropriate antibiotics, and escalation of care (Firoz & Woodd 2017:174). In spite of widespread use of antibiotics during pregnancy and delivery, researchers noted that sepsis had a great role in maternal death in a maternal mortality audit in the Islamic Republic of Iran (Vahiddastjerdy et al 2016:6).

Malaria: Malaria is an acute febrile illness caused by infection with five Plasmodium species, protozoan parasites of the phylum Apicomplexa (Thompson, Eick, Dailey, Dale, Mehta, Nair & Welton 2020:329). The most prevalent species, Plasmodium falciparum, is characterised by its tendency to cause severe infections or death (Thompson et al 2020:329). Approximately 99% of all malaria maternal deaths occur in developing nations, with more than half of these occurring in SSA (Thompson et al 2020:329). One hundred and twenty-five (125) million women in malaria-endemic areas become pregnant each year and require protection from infection to avoid disease and death for themselves and their offspring (Fried & Duffy 2017:20). Women who have survived repeated malaria infections throughout their lifetimes may become partially immune to severe or fatal malaria (CDC 2022:4). However, because of the changes in women's immune systems during pregnancy and the presence of a new organ (the placenta) with new places for parasites to bind, pregnant women lose some of their immunity to malaria infection (CDC 2022:4). Pregnant women who become infected with malaria face a higher risk of developing severe disease, including severe anaemia (circulating haemoglobin<5g/dl), hypoglycaemia, kidney failure, pulmonary oedema, respiratory failure, secondary bacterial infections or death (Thompson et al 2020:329; Fried & Duffy 2017:20).

According to a retrospective study among 139 maternal deaths carried out at the maternity unit of Mbarara Regional Referral Hospital (Ngonzi et al 2016), the

commonest cause of indirect maternal deaths was malaria, contributing 40% of all indirect maternal deaths (Ngonzi et al 2016:5). Investigation in maternal death in rural Ghana revealed that some healthcare workers (HCWs) still resorted to treatment of malaria when test results were negative (Awoonor-Williams & Apanga 2018:2). This could be due to the poorly resourced nature of health facilities in rural communities in northern Ghana which tends to make it difficult for them to carry out basic and ordinary medical and laboratory tests as they lack the requisite equipment and logistics (Awoonor-Williams & Apanga 2018:2).

HIV: Every week, around 5 000 young women aged 15–24 years around the world contract HIV (Joint United Nations Programme on HIV/AIDS [UNAIDS] 2022:1). In SSA, women and girls accounted for 63% of all new HIV infections in 2020 (UNAIDS 2022:1). The prevalence in the antenatal population in most high income countries varies between 0.1–2/1000, whereas in some low income countries, it could be as high as 29% (Chilaka & Konje 2021:484). An annual estimation of 6-20% of maternal deaths worldwide and likely a much higher proportion in SSA are believed to be HIV-related (United States Agency for International Development [USAID] 2022b:4). HIV-infected women are much more likely to die during or soon after pregnancy than their HIV-uninfected counterparts (Lathrop, Jamieson & Danel 2015:216). Lathrop et al (2015) argue that there is an increased risk of mortality from both puerperal sepsis (*including increased risk of intrauterine infection*), especially after caesarean delivery, and abortion-related sepsis among HIV-infected women (Lathrop et al 2015:216). Provision of good quality, evidence-based peripartum care and adherence to best surgical and infection prevention practices, including routine preoperative antibiotic prophylaxis, can reduce the direct obstetric complications caused by sepsis in HIV-infected and uninfected women (Lathrop et al 2015:216).

Further, HIV/AIDS influences the risk of maternal death through a variety of mechanisms (Maternal Health Task Force [MHTF] 2022:1). Pregnancy and HIV/AIDS both increase women's susceptibility to acquiring malaria, with potentially serious drug interactions that hamper effective treatment for both infections (MHTF 2022:3). Women

who are pregnant and infected with HIV should be offered antiretroviral therapy (ART) when required for their own health (USAID 2022b:4). It stands to reason that antiretroviral therapy substantially reduces HIV-related maternal mortality as it has so significantly reduced HIV/AIDS mortality generally (USAID 2022b:4).

In an Eastern and Southern African study, researchers indicated that there was strong evidence that HIV increased the rate of direct maternal mortality across all the study sites in the period antiretroviral therapy was widely available, with the rate ratios varying from 4.5 in Karonga, Malawi [95% confidence interval (CI) 1.6–12.6] to 5.2 in Kisesa, Tanzania (95% CI 1.7–16.1) and 5.9 in uMkhanyakude, South Africa (Calvert, Marston, Slaymaker, Crampin, Price, Klein & Reniers 2020:1397). Women living with HIV may need more closer monitoring for complications such as sepsis (Calvert et al 2020:1397). Calvert et al (2020:1397) recommended that barriers that such women face in accessing quality antenatal, delivery and postnatal care should be addressed.

However, with the global action on HIV/AIDS, these maternal mortality trends seem to be decreasing (Chilaka & Konje 2021:486). A study conducted on maternal mortality in Zimbabwe (2007-08 to 2018-19) revealed that pregnancy-related deaths from indirect causes decreased by more than four fifths (84%) (Musarandega, Ngwenya, Murewanhema, Machekano, Magwali, Nystrom & Munjanja 2022:7). HIV/AIDS was the leading cause in 2007-08 but by 2018-19 the situation had changed significantly (Musarandega et al 2022:7). HIV/AIDS dropped to the fourth cause of death (Musarandega et al 2022:7). Interventions implemented at various levels of the health system contributing to this drop were policy development (roadmap), training (EmONC), providing access (maternity waiting homes, removal of user fees), monitoring and evaluation initiatives (Musarandega et al 2022:7).

2.3.4 Abortion

Abortive outcomes include abortion, miscarriage, ectopic pregnancy and other abortive conditions (WHO 2013:6). These outcomes take place before 28 weeks during

pregnancy, but this time definition varies among countries, with lower cut-offs of 24 weeks also used (Black, Laxminarayan, Temmerman & Walker 2016:33). Around 73 million induced abortions take place worldwide each year (WHO 2022a:8). Abortion is safe when carried out using a method recommended by the WHO, appropriate to the pregnancy duration and by someone with the necessary skills (WHO 2022a:4). Developing countries bear the burden of 97% of all unsafe abortions (WHO 2022a:4). More than half of all unsafe abortions occur in Asia, most of them in south and central Asia (WHO 2022a:4). In Latin America and Africa, the majority (approximately 3 out of 4) of all abortions are unsafe (WHO 2022a:6). Specifically in Africa, nearly half of all abortions occur under the least safe circumstances (WHO 2022a:7). Unsafe abortion is a leading – but preventable – cause of maternal deaths and morbidities (WHO 2022:2a). The latest national level evidence by Miller (2021:5) in Malawi suggests that 6–7% of maternal deaths – approximately 69–147 per annum depending on estimate of total maternal deaths – are due to abortion and miscarriage combined (Miller 2021:5). A secondary analysis of data from 1 876 462 pregnant women aged 15–58 years from nine states in the Indian Annual Health Survey (2010–2013) recorded that there were 253 abortion-related maternal deaths (Yokoe, Rowe, Choudhury & Rani 2019:7). In the same Indian survey, teenage women (aged 15–19 years) were found to have the highest risk of abortion-related death in addition to rural residence and lower socio-economic status (Yokoe et al 2019:7).

Abortion is strongly associated with maternal complications such as haemorrhage, sepsis and trauma (Yokoe et al 2019:7). A major issue with estimating deaths from unsafe abortion is that in mortality statistics ‘abortion’ almost invariably refers to both induced abortion and spontaneous abortion – and sometimes also to ectopic pregnancy (Miller 2021:5). Especially with the advent of medical abortion, induced and spontaneous abortion complications present similarly and it is sometimes impossible to tell whether an abortion is induced or spontaneous (Miller 2021:5). Both induced and spontaneous abortion can result in unsafe abortion and present with complications (Yokoe et al 2019:7). According to a retrospective study among 139 maternal deaths carried out at the maternity unit of Mbarara Regional Referral Hospital the abortion

complications included post-abortion septic shock and haemorrhage and these constituted 10.8% while hypertensive disorders contributed 14.4% of the mortalities (Ngonzi et al 2016:4).

Legal, social and cultural ramifications that are associated with abortion mean that women are reticent to disclose abortion attempts and relatives or healthcare professionals tend not to report deaths as such (Kim, Tunçalp, Ganatra & Gülmezoglu 2016:3). Based on recent legal abortion law changes in the USA, Stevenson (2021:2022) projects that, in the first year in which all wanted induced abortions in the United States are denied, the estimated annual number of pregnancy-related deaths would increase from 675 to 724 (49 additional deaths, representing a 7% increase) and in subsequent years to 815 (140 additional deaths, for a 21% increase) (Stevenson 2021:2022). Stevenson(2021:2022) further believes that the new laws would expose more women to the mortality risks of continuing pregnancy and thereby increase pregnancy-related deaths – owing to the fact that childbirth in the United States carries substantially greater mortality risk than does legal induced abortion.

2.3.5 Anaemia

Anaemia during pregnancy is one of the important factors associated with a number of maternal complications and mortalities (WHO 2022a:4). The WHO global targets call for a 50% reduction in anaemia in women of reproductive age by 2025 relative to 2010 prevalence (Young 2018:e479). Anaemia is categorised into severe, moderate and mild for pregnant women as haemoglobin concentrations of less than 70g/L, 70 to 99 and 100 to 109 g/L (*to convert g/L to g/dL, divide by 10.0*), respectively (Shi, Chen, Wang, Sun, Guo, Ma & Lu2022:3). It decreases the woman's reserve to tolerate bleeding either during or after childbirth and makes her prone to infections (WHO 2022a:4). The physiological adaptation to pregnancy in many healthy women likely leads to a significantly expanded blood volume, which manifests as mild anaemia and results in optimal perinatal outcomes (Smith, Teng, Joseph, Branch & Chu 2019:1234). On the other hand, moderate and severe maternal anaemia place a physiological burden on

the mother, placenta and foetus and this results in less optimal maternal and neonatal outcomes (Smith et al 2019:1234). Severe anaemia can lead to circulatory decompensation, increased cardiac output, an increased risk of haemorrhage and decreased ability to tolerate blood loss, leading to circulatory shock and death (Young 2018:e479). Anaemia has many different causes, including blood loss; infection-related blood cell destruction; and deficient red blood cell production because of sickle cell disease, parasitic diseases such as hookworm or malaria, or nutritional deficiency, including iron deficiency (Black et al 2016:33).

According to an analysis of a dataset of 312 281 pregnancies in 29 countries from the WHO Multi-Country Survey (Daru, Zamora, Fernández-félix, Vogel, Oladapo, Morisaki & Torloni 2018:550), the survey indicated that the odds of maternal death were twice as high in those mothers with severe anaemia compared with those without severe anaemia (Daru et al 2018:550). The association seemed to be moderately strong, temporal and consistent and was reproducible in both multilevel and propensity score regression analyses (Daru et al 2018:550). Similarly, data from China's Hospital Quality Monitoring System from January 1, 2016, to December 31, 2019 revealed a reverse J-shaped association between the severity of anaemia during pregnancy and maternal mortality and other adverse outcomes, such as shock and admission to the ICU, with the lowest risk among pregnant females with mild anaemia (Shi et al 2022:5). In a Gambian tertiary health centre study, of the 663 maternal deaths recorded, analysis indicated that anaemia was the most common cause of indirect maternal death (Idoko, Anyanwu & Bass 2017:3). Furthermore, anaemia-related deaths were higher during the malaria season (Idoko et al 2017:3).

A ten-year retrospective study was conducted between July and December 2016 and involved 34 public hospitals in Tanzania and noted 1 987 maternal deaths (Bwana et al 2019:e0214807). The study explained that there was a network relationship between main causes of maternal deaths (Bwana et al 2019:e0214807). The association of anaemia and maternal mortality observed in the Tanzanian study was most likely to be a co-factor in death from haemorrhage or nutritional deficiencies, usually lack of iron or

folic acid (Bwana et al 2019:e0214807). Nutritional deficiencies could be due to the substantial shift in dietary patterns as observed in China in the past few decades, characterised by a shifting nutritional environment that promotes greater consumption of high-calorie, nutrient-poor foods (Shi et al 2022:5). Smith et al (2019:1235) in Canada found that treating iron deficiency before conception or early in the antenatal period may help reduce maternal morbidity and perinatal morbidity and mortality (Smith et al 2019:1235).

2.3.6 Obstructed labour

Obstructed labour is labour in which progress has come to a complete halt in the presence of good and adequate uterine contractions (Bako, Barka & Kullima 2018:119). Progress here refers to cervical dilatation and descent of the presenting part (Bako et al 2018:119). Obstructed labour affects 3% to 6% of labouring women globally and in low-resourced settings is closely associated with severe maternal morbidity such as postpartum haemorrhage, uterine rupture puerperal sepsis, genital fistula, and maternal death (Mgaya, Kidanto, Nystrom & Esse 2016:3). Obstructed labour is a common underlying condition leading to maternal death in Angola (Cummings, Cummings & Jacobsen 2019:4). Among the 18 maternal fatalities at Kalukembe Mission Hospital in 2017, obstructed labour contributed to three of five anaemia cases, one of five sepsis cases and one of four hypertensive cases, in addition to two cases classified as having uterine rupture as the primary cause of death (Cummings et al 2019:4).

2.4 DETERMINANTS OF MATERNAL MORTALITY

Strategic approaches to reducing maternal mortality in the past 15 years have mainly been focused on clinical interventions and health system strengthening (Abalos, Abasiattai, Bartlett & Rodrigues 2017:1). The greatest attention has been on postpartum haemorrhage and hypertensive disorders, the two leading direct causes of maternal mortality (Abalos et al 2017:1). It is increasingly being recognised that health outcomes are a result not only of biological and individual risk factors but also of other factors such

as wealth, ethnic background, gender, and education (WHO 2020a:1). Inequalities in people's access to information, decision-making and life opportunities contribute to their ill health and levels of well-being (WHO 2020a:2). Political choices and social organisation that distribute power and resources unequally across populations reproduce unequal health outcomes (WHO 2020a:2). A study was conducted using international data bases of health metrics from 2008 to 2016 using aggregates of health indicator data from the WHO, World Bank, United Nations Development Programme (UNDP) and UNICEF data bases for 82 developing countries (Girum & Wasie 2017:2). A significant relationship between the maternal mortality ratio and socio-economic, healthcare and morbidity indicator variables was observed (Girum & Wasie 2017:2). There was an inverse and significant correlation of the maternal mortality ratio with antenatal care coverage, skilled birth attendance, access to an improved water source and sanitation, adult literacy rate, the gross national income per capita and positive relation with disease incidence, and unmet family planning needs (Girum & Wasie 2017:2).

2.4.1 Antenatal care attendance

The antenatal care (ANC) period presents an important chance for detecting threats to the mother and unborn baby's health, as well as for counselling on nutrition, danger signs of ill health – such as underweight, anaemia, hypertension or infection – and family planning options after the birth (Geltore & Anore 2022:10;Das 2017:2). Likewise, if a mother lacks ANC, minor obstetric conditions are not detected and managed early, and serious complications and maternal near-miss events will likely develop (Habte & Wondimu 2021:14). Maternal near-miss (MNM) is a condition where women experience and survive a severe health condition during pregnancy, childbirth or within 42 days of termination of the pregnancy (WHO 2022a:3). In a study that aimed at identifying determinants of MNMs among women admitted to tertiary hospitals in southern Ethiopia (Habte & Wondimu 2021:14), women who were not well prepared for birth and its complications were more likely to encounter MNM events (Habte & Wondimu 2021:14). This may be because women with a poor birth preparedness and complication

readiness plan were likely to be exposed to one of the three maternal care delays (such as delays in seeking, reaching and receiving care) and thus susceptible to MNM events (Habte & Wondimu 2021:14).

A verbal autopsy analysed the possible social reasons for 136 maternal deaths in Chandigarh, India (Kaur, Gupta, Purayil, Rana & Chakrapani 2018:e0203209). Remarkably, most of the women's relatives who were interviewed did not report any birth preparedness and 10% had not registered for antenatal care in public or private hospitals (Kaur et al 2018:e0203209). Discussions with relatives indicated that this decision might have been influenced by past successful delivery experiences at home, as most of those women who did not register for ANC or did not complete the required ANC visits had a history of previous delivery at home (Kaur et al 2018:e0203209). Similarly, in an Ethiopian prospective cross-sectional study, antenatal care follow-up was also found to be significantly associated with severe maternal outcomes (Yemane & Tiruneh 2020:1125). The odds of occurrence of severe maternal outcomes among women who did not receive antenatal care follow-up during their pregnancy were 1.7 times higher than those who had received antenatal care follow-up (Yemane & Tiruneh 2020:1125). Lack of antenatal follow-ups can result in loss of information about anticipating labour and its signs, better sites for delivery, and when to seek professional help rather than managing at home (Yemane & Tiruneh 2020:1125).

Low ANC visits have been associated with home deliveries (Zone, Delibo, Damena, Gobena & Balcha 2020:4). In a Southern Ethiopian community-based cross-sectional study, the researchers noted 73.6% home deliveries among those women with low ANC visits (1-3) who had given birth within the last 12 months (Zone et al 2020:4). The factors associated with home deliveries were lack of a written birth plan for preparedness and readiness and an incomplete number of ANC visits (Zone et al 2020:4). Therefore, those mothers with incomplete visits are probably prone to practise home delivery and mortalities (Zone et al 2020:4).

Conversely, a retrospective analysis in a Gambian tertiary health centre among 663

maternal deaths indicated that, of the mortalities, 51.1% were cases who had ANC (Idoko et al 2017:4). Hence, although most pregnant Gambian women have some form of ANC, the findings of Idoko et al (2017:4) reflect the gap in quality of the maternity services and referral system in the Gambia (Idoko et al 2017:4). A previous study in Kenya noted that ANC quality is suboptimal in terms of providing recommended ANC services as well as ensuring women have a good experience (Afulani, Buback, Essandoh, Kinyua, Kirumbi & Cohen 2019:10). While many women receive basic ANC services such as blood pressure monitoring and urine test at least once during pregnancy, many are not receiving these consistently at every visit as recommended by the Kenyan National guidelines (Afulani et al 2019:10). The situation is even more dire for more advanced services such as ultrasounds, which less than one out of every five women in the sample received, with women who had complications (the group for whom it is recommended) less likely to receive it (Afulani et al 2019:10). A review of medical records and verbal autopsy examined the contribution of the three delays in relation to maternal deaths in a tertiary hospital in Minya Governorate, Egypt (Mohammed, Gelany, Eladwy, Ali, Gadelrab, Ibrahim & Abdallah 2020:4). Unexpectedly, the great majority of cases had attended some form of ANC, while only 7.2% had not attended even once (Mohammed et al 2020:4). This may be explained from the point of view that women with high risk pregnancies receive ANC while women with low risk pregnancies do not book for ANC (Mohammed et al 2020:4).

2.4.2 Place of delivery – TBA/SBA

Traditional birth attendants (TBAs) provide the majority of primary maternity care in many developing countries and may function within specific communities in developed countries (Inyang & Uloma 2015:22). The researchers in Nigeria noted that TBAs did not receive formal education and training in healthcare provision and there were no specific professional requisites such as certification or licensing (Inyang & Uloma 2015:22). The way they attend to delivery is risky for women and their babies, leading to poor health outcomes and even death (Inyang & Uloma 2015:22). Unfortunately, most women make extensive use of and rely on traditional maternal care and remedies, even

when they are suffering serious emergency obstetric complications (Monchari, Nangulu & Broerse 2018:10).

A skilled health birth attendant is a midwife, physician, obstetrician, nurse or other healthcare professional who provides essential and emergency healthcare services to women and their newborns during pregnancy, childbirth and the postpartum period (WHO 2018a:16). TBAs, whether trained or not, are excluded from the category of 'skilled attendant at delivery' (WHO 2018a:16). Skilled attendance at birth, with emergency backup, is considered the most critical intervention for ensuring safe motherhood (UNFPA 2022:5). Globally, between 2013 and 2018, 81% of births took place with the assistance of a skilled birth attendant (SBA) (WHO 2019:4). However, there are wide disparities across regions (WHO 2019:3). Coverage of deliveries by an SBA ranges from 59% in the WHO African region to over 90% in the region of the Americas and in the European and Western Pacific regions (WHO 2019:4). Thus, critical services are least available, or least used, where MMRs are highest (WHO 2019:1). A population-based longitudinal study in Northern Ethiopia, indicated that women giving birth at health institutions can prevent maternal and neonatal deaths through getting skilled birth attendance, drugs to address labour complications, and referrals to more advanced health institutions (Abebe, Adhana, Gebremichael, Gezae & Gebreslassie 2021:e0254146). In contrast, those delivering under unskilled birth attendants might face potential complications such as bleeding, retained placenta, ruptured uterus and infection, which could lead to death (Abebe et al 2021:e0254146).

A verbal autopsy analysed the possible social reasons for 136 maternal deaths in Chandigarh, India (Kaur et al2018:e0203209). Of note was a case that had delivery by a TBA or *dai* (Kaur et al 2018:e0203209). However, the *dai* apparently did not assess the condition of the mother properly and conducted the delivery in aseptic conditions (Kaur et al 2018:e0203209). Thus in this case, the *dai's* intervention and possible injury might have led to the adverse outcome (Kaur et al 2018:e0203209). Khan and Pradhan (2015:14) conducted a verbal autopsy to identify factors associated with maternal deaths in Jharkhand, India. In the Indian study, TBAs' treatment was sought in case of

any post-delivery complication (Khan & Pradhan 2015:14). A case in point was the deceased who was suffering from fever before delivery and delivered a pre-term baby. She did not seek any post-delivery check-up from an SBA (Khan & Pradhan 2015:14). To exacerbate the situation, her haemorrhage was treated by a TBA with traditional herbs that finally led to her death (Khan & Pradhan 2015:14).

In Bosaso District of Somalia a verbal autopsy approach was utilised to analyse contributing factors of maternal mortality (Aden, Ahmed & Östergren 2019:6). Data showed that TBAs played a major role in the study as health service providers (Aden et al 2019:6). Delay in referral from a TBA to a health facility with EmONC and SBAs can result in a high risk of maternal death (Aden et al 2019:6). For example, the six cases in the study by Aden et al (2019), where sepsis was either a direct or underlying cause of death, were all delivered at home assisted by a TBA with no referral intervention initiated (Aden et al 2019:6). An analysis was conducted in rural Bangladesh to explore social factors associated with maternal deaths (Biswas, Halim, Dalal & Rahman 2016:5). Of 28 deaths noted, 80% of the cases died at home and were delivered by untrained birth attendants (Biswas et al 2016:5). It was observed that most of those cases who suffered from pre-eclampsia or haemorrhage died at home (Biswas et al 2016:5). In Ghana a study noted that women's lack of autonomy to seek care without prior permission, perceived quality care of TBAs, stigmatisation of unplanned pregnancies, and cultural beliefs associated with late disclosure of childbirth labour all delayed mothers' timely use of skilled care in the study communities (Sumankuuro, Mahama, Crockett, Wang & Young, 2019:11). These barriers compounded problems arising from communities that were geographically isolated from hospital care (Sumankuuro et al 2019:11).

A case series study was conducted to identify associated factors for maternal deaths in Nepal (Karkee, Tumbahangphe, Maharjan, Budhathoki & Manandhar 2021:5). Noted by the caretaker of the deceased was a case where a woman had thought that she would deliver at home and everything would be fine because she had delivered four babies at home before (Karkee et al 2021:5). But this time, during delivery, the placenta did not

come out. The mother-in-law sought help (Karkee et al 2021:5). Karkee et al (2021:5) observed that home deliveries were preferred because TBAs were locally available and there was no need to go out to health facilities which the women perceived as unfriendly.

2.4.3 Parity and gravidity

Higher risks of complications and death are associated with first pregnancies and more than three to five pregnancies (Black et al 2016:6). Women in their first pregnancies have longer duration of labour while women with multiple pregnancies are more likely to suffer postpartum haemorrhage (Black et al 2016:6). Demonstrating this in an Indian study that analysed 204 maternal deaths, Garg (2016:347) found that most of the deaths occurred in primi (29%) and 71% in multi gravidae (Garg 2016:347).

In a study conducted at a major referral hospital in Northern Uganda, results showed that grand multiparous women were at an increased risk of dying (Alobo, Reverzani, Sarno, Giordani & Greco 2022:4). Moreover, on multivariate analysis, high parity was associated with low ANC attendance (Alobo et al 2022:4), which was further associated with poor knowledge of danger signs in pregnancy and a lack of screening for risk factors, all of which increase the risk of maternal death (Alobo et al 2022:4). Home deliveries that pose high mortality risk have been associated with multiparous mothers (Atahigwa, Kadengye, Iddi, Abrams & Van Rie 2020:4). In a Kenyan study, analysis revealed that multiparous mothers were less likely to deliver at the health facility when compared to primiparous mothers (Atahigwa et al 2020:4). In fact, as the number of parity increases, the likelihood to deliver from a health facility decreases, with mothers whose parity was five or more having over a 50% chance of not delivering at the health facility when compared to first-time mothers (Atahigwa et al 2020:4).

Yemane and Tiruneh (2020:1125) in an Ethiopian prospective cross-sectional study indicated that the parity of the mothers was found to be significantly associated with the occurrence of maternal near misses (Yemane & Tiruneh 2020:1126). The odds of

maternal near misses among primiparous and multiparous women were twice as high when compared with nulliparous women (Yemane & Tiruneh 2020:1126). This might be partly explained by the fact that obstetric complications increase with a higher number of pregnancies (Yemane & Tiruneh 2020:1126). In addition, the number of pregnancies (gravidity) is an important variable significantly associated with anaemia (Khaskheli, Baloch, Sheeba, Baloch & Khaskheli 2016:630). This could be due to the loss of iron and other nutrients during increased and repeated pregnancies and also the possibility of sharing of resources with the foetus (Khaskheli et al 2016:632). A cross-sectional study was conducted at the Department of Obstetrics and Gynaecology Unit IV, Liaquat University of Medical and Health Sciences, Jamshoro in Pakistan (Khaskheli et al 2016:632). Of the 305 registered pregnant women with iron deficiency anaemia, 104 (34.09%) were multiparous (Khaskheli et al 2016:632). This group were prone to serious complications such as antepartum haemorrhage (49, 16.06%), renal failure (48,15.73%), disseminated intravascular coagulation (54,17.70%) and 16 (5.24%) women died (Khaskheli et al 2016:632).

2.4.4 Mother's age

Adolescent girls (aged 10–19 years) face higher risks of eclampsia, systemic infections and complications during childbirth than women aged 20–24 years (WHO 2019:1). There is an inverse association between adolescent birth rates and the proportion of women receiving quality care from a skilled health professional (WHO 2019:4). Thus, not only do adolescents giving birth have less access to methods to prevent high-risk birth, the high-risk birth is less likely to be delivered by an SBA (WHO 2019:2). In most countries, adolescent births are concentrated among poorer, less educated women, which further compounds their disadvantaged situation (Nik-Hazlina, Norhayati, Shaiful-Bahari & Mohamed-Kamil 2022:5).

On the other hand, older maternal age has been associated with a greater likelihood of having pre-existing medical conditions, a higher risk of obstetric complications, maternal morbidity and an increased risk of progression from severe maternal morbidity to death

(Nik-Hazlina et al 2022:5). Epidemiological trends of hypertensive disorders of pregnancy from global data indicated that the risk of pre-eclampsia increased in an approximately linear manner with maternal age and that this pattern was similar in nulliparous and multiparous women (Wang et al 2021:5). The increasing risk of HDP in older mothers could be related to the abnormally high lipid profile, high-density lipid cholesterol and higher risk of vascular damage in this age group compared to younger women (Berhe, Kassa, Fekadu & Muche 2018:6).

A ten-year retrospective study was conducted between July and December 2016 involving 34 public hospitals in Tanzania and 1 987 maternal deaths (Bwana et al 2019:e0214807). A low proportion (10.40%) of women aged 15–19 years were giving birth but had a relatively higher proportion of maternal deaths (13.60%) recorded (Bwana et al 2019:e0214807). Trends further showed an increase in mortality among older women (Bwana et al 2019:e0214807). Some factors that have been identified as responsible for the high maternal deaths among young women include biological, economic, and cultural factors; malnutrition; immature reproductive tract; child marriage; and gender inequities (Bwana et al 2019:e0214807). In Angola, a retrospective cross-sectional analysis of case notes of all maternal deaths and deliveries was recorded from 2010 to 2014 in a regional maternity hospital (Umar & Kabamba 2016:61). Data revealed that 131 cases resulted in maternal death, of which more than half were of women between the ages of 15 and 19 and those > 35 years (Umar & Kabamba 2016:61). Similarly, in a study estimating the risk of maternal death that was conducted in a major referral hospital in northern Uganda (Alobo et al 2022:4), findings suggested that women over 30 years of age were at a higher risk of dying (Alobo et al 2022:4). The same group was also associated with poor ANC attendance (Alobo et al 2022:4). Based on data from the Global Burden of Disease database, higher age partly accounted for a higher MMR in that older women had the highest odds of maternal sepsis mortality (Chen et al 2021:10). Late pregnancy was associated with a number of infectious diseases due to changes in immune responses (Chen et al 2021:10).

Women at the extreme ends of the reproductive age range (younger than age 20 years and older than age 35 years) have a higher risk of death for both physiological and sociocultural reasons. The largest number of deaths might be in the middle group, because this is when most births occur (Black et al 2016:6). Demonstrating this were results from a retrospective observational study of all maternal deaths that occurred in a tertiary Nigerian hospital from 1 January 2014 to 31 December, 2018 (Akaba, Nnodu, Ryan, Peprah, Agida, Anumba & Ekele 2021:e0244984). It showed that maternal deaths occurred mainly amongst women aged 25–34 years (30–57.7%) (Akaba et al 2021:e0244984). Likewise, a maternal mortality study was conducted in a university teaching hospital in Cameroon (Pierre-Marie, Gregory, Maxwell, Robinson, Yvette & Nelson 2015:4). Of the 26 maternal deaths, the most represented age group was 25-29 years (34.7%) while teenagers had an insignificant increased risk of death (Pierre-Marie et al 2015:4). The proportion of teenagers among maternal deaths suggested the contribution of this age group was proportional to the overall contribution of teenage deliveries in the study setting (Pierre-Marie et al 2015:4).

2.4.5 Mother's knowledge and education level

Women who are educated know where to obtain effective services and are more likely to request these services (Atahigwa et al 2020:3). It is assumed that attaining education enhances autonomy among mothers, thus creating confidence and capability to make a decision on their own and thereby having an effect on their health-seeking behavior (Atahigwa et al 2020:3). Generally, a higher level of the mother's education leads to more exposure to information about pregnancy and delivery care, danger signs, and birth preparedness for themselves (Win, Vapattanawong & Vong-ek 2015:179). However, elsewhere the husband's educational level is often a more important determinant of maternal mortality than the woman's education (Atahigwa et al 2020:3).

A retrospective record of maternal deaths was reviewed in Lofa County, Liberia, 2015-2017 (Alpha, Dolopei, Argbah, Ballah, Kortimai, Frimgpong & Monday 2021:5). Of the 46 maternal deaths reported, women with no formal education experienced more

maternal deaths compared to those who had formal education (Alpha et al 2021:5). This may be because women with no formal education lacked information about the importance of health facility delivery (Alpha et al 2021:5). In an Indian retrospective and prospective study of 204 maternal deaths in a tertiary care centre (Garg 2016:347), most of the maternal deaths occurred in illiterate women (63%), compared to educated women (37%) (Garg 2016:347). Similarly, a retrospective observational study of all maternal deaths that occurred in a tertiary Nigerian hospital showed that 22 (42.3%) of the cases had no formal education (Akaba et al 2021:e0244984).

In Bosaso District of Somalia a verbal autopsy approach was utilised to analyse contributing factors of maternal mortality (Aden et al 2019:5). Results showed that the cases underestimated the signs, symptoms and severity of the problem (Aden et al 2019:5). Lack of knowledge about danger signs and warnings during pregnancy and failure to seek prompt treatment from a health facility were the causes of delay in deciding to seek healthcare (Aden et al 2019:5). A study that was conducted in Guinea-Bissau found that women with higher educational attainment and from wealthier households were more likely to deliver at healthcare facilities (Yaya et al 2019:4), while their lesser educated and poorer counterparts were more likely to deliver at home, which has been associated with maternal mortalities (Yaya et al 2019:4). In a Ghana cluster-randomised controlled trial, data indicated that women with more education had lower maternal mortality and fewer stillbirths than those with less education (Gabrysch, Nesbitt, Schoeps, Hurt, Soremekun, Edmond, Manu, Lohela, Danso, Tomlin, Kirkwood & Campbell 2019:e1074). Gabrysch and other researchers explained that it was conceivable that educated women with better health knowledge were able to negotiate better care or were treated better because they could more easily relate to the providers (Gabrysch et al 2019:e1074).

A verbal autopsy technique was applied on 40 cases in India to assess the socio-cultural barriers associated with maternal mortality (Kanchan, Paswan, Anand & Mondal 2019:6). Out of 40 verbal autopsies, 35 women had delayed seeking care (Kanchan et al 2019). The delay ranged between two hours to three days (Kanchan et al 2019:6).

This delay was attributed to low knowledge levels and underestimation of the gravity of the complications (Kanchan et al 2019:6). In Thailand a community-based verbal autopsy was conducted to identify the socio-demographic characteristics that contribute to delays related to maternal mortality (Win et al 2015:179). A total of 863 maternal deaths was reported of which more than half of the cases had a history of delay in decision-making for seeking care at a proper health facility (Win et al 2015:179). Though decision-making is a complex behaviour related to a perception of needs, health seeking behaviour is also related to poor recognition of obstetric emergency complications and low knowledge levels (Win et al 2015:179).

An analysis was conducted in rural Bangladesh to explore social factors associated with maternal deaths (Biswas et al 2016:5). Notably, the community mentioned that one of the reasons they delayed the decision to travel to the hospital was that they worried the delivery might be done by caesarean section (C/S) and that the operation would cause loss of productivity of work of the mother – implying a low level of knowledge (Biswas et al 2016:5). An Eritrean cross-sectional survey was conducted in rural communities (Kifle, Kesete, Gaim, Angosom & Araya 2018:10). The data showed that a higher level of the husband's education was associated with greater knowledge and increased risk perception of home delivery (Kifle et al 2018:10). This signified that reproductive health preferences and practices were not solely determined by women's characteristics (Kifle et al 2018:10). This culturally moulded, male-dominated power differential between husbands and wives may explain why even women with a higher educational level may fail to translate their choice of delivery place into actual behaviour, if their husbands are opposed to their choice (Kifle et al 2018:10).

2.4.6 Unwanted pregnancy and family planning

Unwanted pregnancy is a risk factor for unsafe abortion, lack of social support, and domestic violence (Black et al 2016:51-70). Women who continue with their pregnancies are less likely to plan for childbirth and more likely to commit suicide (Black et al 2016:51-70). Unintended pregnancies are an important cause of maternal deaths

(Population-Action-International 2019:1). Pregnancies that occur too early, too late, or too frequently can lead to illness during pregnancy and complications at the time of birth (Population-Action-International 2019:1). There is an inverse association between MMRs and the proportion of women aged 15–49 years with their contraception needs met with modern methods (WHO 2019:4). In many countries with high maternal mortality, fertility rates would be lower if women had the number of children they desired (Population-Action-International 2019:1). The risk of maternal death can be reduced through better access to modern methods of contraception and by ensuring that women have access to high-quality care before, during and after childbirth (WHO 2019:3).

Contraception has wider social and economic benefits, but its immediate purpose is to avoid unintended pregnancies (Black et al 2016:51-70). The majority of these pregnancies stem from the non-use of contraceptive methods among women wishing to avoid or postpone childbearing (Black et al 2016:51-70). Contraception prevented an estimated 250 000 maternal deaths and an additional 30% of maternal deaths could be avoided by fulfilment of the unmet need for contraception (Black et al 2016:51-70). Unsafe abortion is a major cause of maternal morbidity and mortality, especially in low and middle income countries (Black et al 2016:51-70). Health complications typically associated with unsafe abortion include haemorrhage; sepsis; peritonitis; reproductive tract infections; and trauma to the cervix, vagina, uterus and abdominal organs (Black et al 2016:51-70). A case series study was conducted to identify associated factors for maternal deaths in Nepal (Karkee et al 2021:5). In some cases, the pregnancies were not wanted by the women and they did not seek abortion services earlier from hospitals (Karkee et al 2021:4). The case highlighted that the deceased already had three daughters and one son but her husband wanted to have another son and did not allow her to have contraceptives (Karkee et al 2021:4).

2.4.7 Geography and type of residence – rural and urban

The WHO report recently revealed that poor women in remote areas are the least likely to receive adequate healthcare (WHO 2020b:1). This is especially true for regions with

low numbers of skilled health workers, such as Sub-Saharan Africa and South Asia (WHO 2020b:1). Globally, in 2015 births in the richest 20% of households were more than twice as likely to be attended by skilled health personnel as those in the poorest 20% of households (89% versus 43%) (WHO 2020a:2). This means that millions of births are not assisted by a midwife, a doctor or a trained nurse (WHO 2020a:1). The findings of a study conducted on association between maternal mortality and distance to facility-based obstetric care in rural southern Tanzania among 818 583 people living in 225 980 households demonstrated that pregnancy-related mortality was high at 712 deaths per 100 000 live births, with haemorrhage being the leading cause of death (Hanson, Cox, Mbaruku, Manzi, Gabrysch, Schellenberget al 2015:e387). Deaths due to direct causes of maternal mortality were strongly related to distance, with mortality increasing from 111 per 100 000 live births among women who lived within five km to 422 deaths per 100 000 live births among those who lived more than 35 km from a hospital (Hanson et al 2015:e387).

Results from a mixed-methods study on factors contributing to maternal mortality in Ermera and Manatuto Region concluded that approximately 78% of births are delivered at home and less than 30% of all births are delivered by a skilled provider such as a doctor, nurse, assistant nurse, or midwife (USAID 2015b:5). With such a large percentage of births occurring outside facilities and attended by unskilled providers, coupled with a largely rural terrain and limited transportation infrastructure, Manatuto women are at increased risk of dying from delivery complications (USAID 2015b:5). A study by Atuoye, Dixon, Rishworth, Galaa, Boamah and Luginaah (2015:7) in Ghana explained that consistent neglect of road infrastructural development and endemic poverty in the study area complicated provision of alternative transport services for healthcare (Atuoye et al 2015:7). As a result, pregnant women use risky methods such as bicycle/tricycle/motorbikes to access obstetric healthcare services and some turn to traditional medicines and TBAs for maternal healthcare services (Atuoye et al 2015:7).

In Thailand a community-based verbal autopsy was conducted to identify the socio-demographic characteristics that contributed to delays related to maternal mortality (Win

et al2015:179). A total of 863 maternal deaths were noted of which most cases were from rural areas (Win et al 2015:179). Therefore, distance and time taken to reach the nearest hospital showed significant association with the delay to decide and delay to get to the hospital (Win et al 2015:179). Correspondingly, a retrospective and prospective study investigated 204 maternal deaths in a tertiary care centre in India (Garg 2016:347). Data showed that most (90%) deaths occurred among rural patients and only 10% among urban patients (Garg 2016:347). Previously a study was conducted in a hard-to-reach marginalized rural community of Bangladesh that constitutes tea gardens (Biswaset al2020:5). The researchers noted that although the “tea gardens” formed only one third of the total population in the region, it accounted for almost half of all maternal deaths (Biswas et al 2020:5). Maternal mortalities were associated with poor access to health facilities and home deliveries in the tea garden locality (Biswas et al 2020:5). In practice, the long distance to a health facility, poor communication infrastructure, and transportation continue to complicate a timely access to healthcare due to delays (Biswas et al 2020:5). A retrospective cross-sectional study analysed case notes of all maternal deaths and deliveries that were recorded from 2010 to 2014 in a regional maternity hospital in Kuando Kubango province of Angola (Umar & Kabamba 2016:61). Of 131 maternal deaths, women living in rural areas accounted for 96.2% and the difference in the place of domicile (rural versus urban) was significantly associated with maternal deaths (Umar & Kabamba 2016:61).

A maternal autopsy was conducted in rural Ghana (Awoonor-Williams & Apanga 2018:4). A participant in the study (next of kin of the deceased) indicated that the case faced delays in reaching the health facility as a means of transport to carry her was not immediately available, leading to the family spending several hours to secure a motorbike (Awoonor-Williams & Apanga 2018:4). In an Ethiopian prospective cross-sectional study on the proportion of maternal near misses and associated factors (Yemane & Tiruneh 2020:1125), data showed that the odds of occurrence of near miss events among mothers who lived far from the health centre (>11 km) was 2.27 times higher than those for mothers who lived nearby (<10 km) (Yemane & Tiruneh 2020:1125). Delays in receiving adequate medical care can lead to the development of

severe complications during and after childbirth (Yemane & Tiruneh 2020:1125).

Khan and Pradhan (2015:7) conducted a verbal autopsy to identify factors associated with maternal deaths in Jharkhand, India. It was noted that most of the cases had difficulty in getting transport and associated cost (fare) as they resided in a rural setting (Khan & Pradhan 2015:7). For instance, 70% of the cases took 1-2 hours to search for a transport facility while 23% of the cases could arrange the transport in 2-5 hours and 8% took five hours or more (Khan & Pradhan 2015:7). Worse still, some cases used a bullock cart as mode of transport (Khan & Pradhan 2015:7). In a rural coastal Kenyan cross-section study on why mothers still delivered at home; results revealed that staying ≥10 kms from the nearest health facility was associated with nearly four-fold risk of home delivery (Moindi, Ngari, Nyambati & Mbakaya 2016:4). Most pregnant women are not able to access transport services when they develop labour, mostly due to the poor road network and infrastructure, especially in rural and poor urban regions in Africa (Moindi et al 2016:4). Additionally, distance has a direct impact on the choice of delivery place as transportation to health facilities is usually unavailable or/and unaffordable (Kifle et al 2018:7).

A case series study was conducted to identify associated factors for maternal deaths in Nepal (Karkee et al 2021:5). In hills and mountainous regions, health facilities with comprehensive emergency obstetric care (CEmOC) are far off and hard to physically access (Karkee et al 2021:5). Demonstrating this, it was noted that a case had to walk across the river because there was no bridge for the vehicle to use (Karkee et al 2021:5). She died midway to the hospital (Karkee et al 2021:5). The poor road conditions and unavailability of ambulances or public vehicles in time make the accessibility of hospitals difficult (Karkee et al 2021:5).

A study was conducted in Khyber-Pakhtunkhwa Pakistan on women's status and its association with home delivery (Ali, Khalid, Aisha & Florian 2022:1283). Results revealed that women living in mountainous rural areas were more likely to deliver their child at home than at some health facility due to a lack of means of transportation (Ali et

al 2022:1283). Similarly, in a rural Bangladesh study on reasons for preference of home delivery with TBAs (Sarker, Rahman, Rahman & Hossain 2016:e0146161), researchers argued that the dilapidated condition of the roads and limited transportation physically prohibited mothers from accessing delivery services from a health facility (Sarker et al 2016:e0146161). Furthermore, the situation worsens during the rainy season when a boat is often the sole means of transport (Sarker et al 2016:e0146161). In a meta-analysis conducted in Ethiopia on socio-economic inequities among mothers with near misses (Mengist, Desta, Tura, Habtewold & Abajobir 2021:5), findings showed that women who resided in rural areas were more likely to develop maternal near miss than those who resided in urban areas (Mengist et al 2021:5). A possible explanation for this might be the fact that mothers who live in rural areas have a lower knowledge on maternal healthcare services utilisation and are less likely to get information on healthcare services (Mengist et al 2021:5).

2.4.8 Occupation

Money is often required to cater for both direct and indirect costs associated with safe delivery (Black et al 2016:6). In case of a complication requiring an emergency C/S, the procedure is very expensive, which can lead to delays in seeking care and in catastrophic expenditures (Black et al 2016:6). A Kenyan study on determinants of health facility childbirth service utilisation found that mothers with no income generating activity were less likely to deliver at health facilities (Atahigwa et al 2020:6). This may be intuitive, in the sense that despite the absence of any user fee for childbirth at the health facility, mothers may still need some disposable income to cater for costs such as travel to get there (Atahigwa et al 2020:6). Ameyaw and Dickson (2020:5) in West Africa observed that the higher a woman's wealth standing, the higher the likelihood of skilled birth delivery (Ameyaw & Dickson 2020:5). Having what it takes economically to gratify one's needs is a prerequisite to satiate that particular need (Ameyaw & Dickson 2020:5). Indirect costs (transportation costs) can hinder a woman from accessing an SBA (Ameyaw & Dickson 2020:5). However, this cannot deter a wealthier woman from

accessing skilled birth because she has the financial means (Ameyaw & Dickson 2020:5).

In Bosaso District of Somalia a verbal autopsy approach was utilised to analyse contributing factors of maternal mortality (Aden et al 2019:5). Findings showed that a case went home from the hospital after 10 days because of financial constraints and another one made the same decision because of childcare responsibilities (Aden et al 2019:5). A retrospective and prospective study of 204 maternal deaths was conducted in a tertiary care centre in India (Garg 2016:347). Findings showed that 59% of maternal deaths occurred among patients from low socio-economic strata (Garg 2016:347). Only 2% of maternal deaths occurred among patients from the affluent class (Garg 2016:347). Likewise, a verbal autopsy technique was applied on 40 cases in India to assess the socio-cultural barriers associated with maternal mortality (Kanchan et al 2019:6). Most of the family members of the deceased stated that they had to borrow money for transportation and medicine costs (Kanchan et al 2019:6).

A case series study was conducted to identify associated factors for maternal deaths in Nepal (Karkee et al2021:7). Most of deceased women were from poor and marginalised families (Karkee et al 2021:7). It was argued that the fear of cost and lack of money deterred them from seeking treatment from higher-level hospitals or reaching there on time (Karkee et al 2021:7). For instance, a case in the study spent more than 24 hours in pain at home before going to hospital after managing to obtain some money (Karkee et al 2021:7). In an Eritrean cross-sectional survey on factors influencing the choice of delivery place among mothers (Kifle et al2018:7), the results indicated that women from poor compared to those from rich households were less likely to use delivery services (Kifle et al 2018:7). It was explained that facility-based delivery caused financial hardship and challenged families to pay even for nominal fees, transport fees and compensating the gap left at home to care for children (Kifle et al 2018:7).

A Ghana cluster-randomised controlled trial assessed the influence of major determinants of facility birth on several mortality outcomes (Gabrysch et al 2019:e1074).

Data showed that wealthier women, compared to women who were poorer, and those living closer to childbirth facilities compared to those further away, were much more likely to give birth in a facility (Gabrysch et al 2019:e1074). Nevertheless, mortality among these women or their babies was not any lower than among women from poorer households and those living far from facilities (Gabrysch et al 2019:e1074). In other words, certain population groups had substantially more facility births, but did not see corresponding survival gains (Gabrysch et al 2019:e1074). This emphasises that increasing facility birth does not translate into less mortality unless quality of care is assured and the gap between contact and content is addressed (Gabrysch et al 2019:e1074).

2.4.9 Health facility-related factors

A well-functioning health system should provide effective and efficient care through skilled healthcare providers (Mohammed et al2020:5). The system further requires adequate supplies, equipment and infrastructure, as well as an efficient system of communication, referral and transport (Banskota, Rizwan, Hailegebriel & Carvajal 2020:34). This kind of health system has been noted as an “enabling environment” (Mohammed et al 2020:5). Health system factors contribute to the third delay that occurs in receiving care after the mother’s arrival at the health facility (Chavane et al 2018:3). A systematic review on maternal healthcare services was conducted in Nigeria, Burkina Faso, Gambia, Guinea, Senegal and Sierra Leone (Gunawardena, Bishwajit & Yaya 2018:5). Thirty facility-level barriers were identified and grouped into six themes (human resources, supply and equipment, referral-related, infrastructure, cost-related, patient-related) (Gunawardena et al 2018:5). The most obvious barriers included staff shortages, lack of maternal health services, procedures offered to patients and lack of necessary medical equipment and supplies in the health-care facilities (Gunawardena et al 2018:5). Additionally, a case study in the Upper-East Region of Ghana revealed maternal healthcare impediments (Awoonor-Williams & Apanga 2018:5). Lack of logistics, medical and laboratory equipment, inadequate knowledge about the benefits

of antenatal care services as well as non-adherence of healthcare workers to treatment protocols and standard operating procedures were found as major barriers to the provision of effective and quality maternal healthcare services in the region (Awoonor-Williams & Apanga 2018:5).

2.4.9.1 Staffing capacity

A study by Ackers, Ackers-Johnson and Ssekitoleko (2018:4) revealed that on a typical day in Ugandan public health centres, it was not unusual for no doctors to be present for work (Ackers et al 2018:4). This has led to a total breakdown in referral systems and highly congested referral hospitals where women are treated by intern doctors and students, usually with no supervision (Ackers et al 2018:4). The researchers further suggested that doctors not presenting themselves for work were one of the causes of maternal mortality in Uganda (Ackers et al 2018:4). In Bosaso District of Somalia a verbal autopsy approach was utilised to analyse contributing factors of maternal mortality (Aden et al2019:5). Case caretakers noted that there was a lack of doctors on duty, causing the deceased to move from one facility to the next in desperation for getting adequate service (Aden et al 2019:5). A mortality survey was conducted in Georgia that aimed to define the underlying causes of maternal deaths (Berdzuli, Lomia, Staff, Lazdane, Pestvenidze & Jacobsen 2021:205). The study's results showed that facilities managing the miscarriages and related complications such as bleeding and uterus perforation leading to maternal death were basic maternity units with limited staff capacity to handle such complications or to stabilise the patient before referring to another facility (Berdzuli et al 2021:205). A case series study was conducted to identify associated factors for maternal deaths in Nepal (Karkee et al2021:7). Researchers highlighted that a lack of life-saving procedures or competent health workers may have caused multiple referrals (Karkee et al 2021:7). Case caretakers noted that senior doctors and nurses were often absent and lower-level workers were not skilled (Karkee et al 2021:7). Karkee and other researchers suggested that to save maternal deaths by offering timely intrapartum or postpartum care, it was important to screen the high-risk pregnancies, placing them in or referring them to the most appropriate facility (Karkee et

al 2021:7).

2.4.9.2 Hospital referral system capacity

Khan and Pradhan (2015:3) conducted a verbal autopsy to identify factors associated with maternal deaths in Jharkhand, India. Data revealed that 37% of the cases went to a facility where the required care was not available (Khan & Pradhan 2015:3). They (cases) then decided to go or were referred to another facility, with substantial delays resulting in deaths (Khan & Pradhan 2015:3). A study was conducted in a major referral hospital in Northern Uganda to estimate the risk of maternal death at admission (Alobo et al 2022:5). Researchers noted that women who were referred from other health centres and hospitals were at a higher risk of dying than non-referred women (Alobo et al 2022:5). Being referred from a lower facility is linked to late presentation and critical condition at admission (Alobo et al 2022:5). In Bosaso District of Somalia a verbal autopsy approach was utilised to analyse contributing factors of maternal mortality (Aden et al 2019:5). Results pointed towards delays in referral and incompetence of the available staff (Aden et al 2019:5). This was illustrated by next of kin of the deceased that the placenta was retained after delivery in the health centre; however, no manual removal of placenta was performed and no timely referral was made at the health centre (Aden et al 2019:5). In Malawi, facility-based medical records were reviewed on factors associated with maternal mortality (Mgawadere, Unkels, Kazembe & Broek 2017:5). Researchers noted that there were delays in the necessary referrals of deceased mothers from one healthcare facility to another due to the lack of emergency transport (Mgawadere et al 2017:5). For instance, during the study period there was a lack of fuel in ambulances (Mgawadere et al 2017:5). Similarly, a verbal autopsy technique was applied in 40 cases in India to assess the socio-cultural barriers associated with maternal mortality (Kanchan et al2019:6). Deceased's family members noted that they had to go through three types of referral hospitals before receiving adequate comprehensive obstetric medical care (CMoC) at the study hospitals (Kanchan et al 2019:6). Notably, this journey took seven days and eight hours to travel a distance of 90 km, illustrating serious gaps in referral systems (Kanchan et al 2019:6). Furthermore, a

verbal autopsy analysed the possible social reasons for 136 maternal deaths in Chandigarh, India (Kauret al2018:e0203209). Multiple referrals from lower-level health facilities to higher-level health facilities happened in one fifth of the cases and at least one referral was made in another two fifths (Kaur et al 2018:e0203209). Severity was reported as the major reason for referral to higher-level health facility (Kaur et al 2018:e0203209).

2.4.9.3 Poor quality of care at the hospital

In Thailand a community-based verbal autopsy was conducted to identify the socio-demographic characteristics that contribute to delays related to maternal mortality (Win et al2015:179). The next of kin of the deceased perceived that the hospitals that handled the cases were of poor quality (Win et al 2015:179). Poor quality of services in turn influence future decisions to seek care and in such circumstances it makes sense that people decide not to use health facilities (Win et al 2015:179). A ten-year retrospective study was conducted between July and December 2016 in public hospitals in Tanzania (Bwana et al 2019:e0214807). Substandard care was associated with the majority of the 1 987 maternal deaths recorded (Bwana et al 2019:e0214807). Factors highlighted included inadequate quantities or lack of blood for transfusion, delay in receiving treatment, and mismanagement (Bwana et al 2019:e0214807). In Norway, a maternal audit study was conducted to identify suboptimal factors in treatment (Nyfløt et al 2018:976). Remarkably, inadequate monitoring of blood pressure after admission was common (Nyfløt et al 2018:976). In one case, blood pressure measurements were not made between the woman's last antenatal visit one week before the onset of labour and her sudden collapse four hours after delivery of the infant (Nyfløt et al 2018:976).

2.4.9.4 Inadequate resources at the hospital

A lack of comprehensive maternal and child health infrastructure and a need for policy improvements were found as factors that influenced maternal health in Nigeria (Amutah-Onukagha, Rodriguez, Opara, Gardner, Assan & Hammond 2017:130). However,

putting services in place would not in itself achieve results (Paruzzolo, Mehra, Kes & Ashbaugh 2017:18-24). To be effective in reducing maternal mortality, these services need to be both acceptable and accessible to women in need (Paruzzolo et al 2017:18-24). Specifically, Paruzzolo et al (2017:18-24) argue that, in order to adequately reduce maternal mortality, it is essential to address poverty and gender inequality, which together affect the demand for and the utilisation and supply of maternal healthcare services (Paruzzolo et al 2017:18-24). A cross-sectional study was carried out to audit near miss events and their causes in South Sudan (Alemu et al2019:177). Researchers observed that the nonexistence of an ICU unit contributed to the higher proportion of women experiencing organ dysfunction or dying due to lack of intensive care services (Alemu et al 2019:177). Notably, this entails a third delay (Alemu et al 2019:177). A retrospective record review that aimed to identify major causes and contributing factors of maternal death was conducted in Lofa County, Liberia (Alpha et al 2021:5). Most of the 46 maternal deaths reported had an early hospital discharge (Alpha et al 2021:4). Routinely, cases spent at most eight hours after delivery due to inadequate supply of beds (Alpha et al 2021:5). The high proportion of MMR due to early discharge for mostly complicated deliveries increases chances of acquiring sepsis and other infections (Alpha et al 2021:5). A study was conducted to unravel the circumstances that lead to maternal deaths in rural Ghana (Awoonor-Williams & Apanga 2018:4). It highlighted that moderate anaemia was an indirect cause of maternal mortality (Awoonor-Williams & Apanga 2018:4). The absence of oxygen and readily available blood at the district hospital exposed how weak rural healthcare services could be (Awoonor-Williams & Apanga 2018:4). It is most likely that if oxygen and blood were readily available, the deceased's life could have possibly been saved (Awoonor-Williams & Apanga 2018:4). A verbal autopsy analysed the possible social reasons for 136 maternal deaths in Chandigarh, India (Kaur et al2018:e0203209). A case caregiver narrated that when they took the woman for delivery at a lower healthcare facility they were told to come on the next day, as there was no bed available in the labour room (Kaur et al 2018:e0203209). The same incident was repeated on the second day (Kaur et al 2018:e0203209). On the third day, the delivery happened at home with the help of a neighbor (Kaur et al 2018:e0203209).

2.5 STRATEGIES FOR REDUCING MATERNAL MORTALITY

2.5.1 Safe Motherhood Initiative (SMI)

In 1987, the WHO took action to improve the quality of maternal health around the world through the declaration of the Safe Motherhood Initiative (SMI) at an international conference concerning maternal mortality in Nairobi, Kenya (Santora 2020:2). Its visionary goal was to end preventable maternal mortality (Stanton, Kwast, Shaver & Mccallon 2018:408). SMI's basic principles, the six pillars of safe motherhood, include family planning, antenatal care, obstetric care, post-natal care, post-abortal care, and control of STI/HIV/AIDS (Anoldis, Christine, Gladys, Clara & Abigail 2018:48). These are briefly discussed below.

- *Family planning* – Ensures that couples and individuals have information, access and utilisation of family planning services. They should be able to plan the time, number and spacing of pregnancy. Family planning reduces maternal mortality by enabling women to prevent conception, which in turn eliminates the risk of unwanted pregnancy and mortality related to pregnancy or childbirth (Ewerling, Victora, Raj, Coll, Hellwig & Barros 2018:5;Prata, Passano, Sreenivas & Gerdts 2010:311).
- *Antenatal care* – Screening of infectious conditions and other medical conditions and risk factors that may affect the pregnancy are done during the antenatal period. Complications are detected early, and corrective or preservative measures are taken. To prevent maternal death, detection of hypertension, proteinuria, STIs/HIV, anaemia and foetal malpresentation are particularly important, as is educating women and their families to recognise and respond to danger signs during pregnancy (Miltenburg, Van der Eem, Nyanza, Van Pelt, Ndaki, Basinda & Sunby 2017:10).
- *Obstetric care* – Ensures all deliveries are conducted by skilled attendants to prevent avoidable complications, and care for high risk pregnancy and

complications is available (Santora 2020:4). Basic emergency obstetric care (EmOC) consists of interventions that do not include surgery, such as antibiotics, oxytocics, anticonvulsants, manual removal of placenta, assisted vaginal delivery and the removal of retained products. Comprehensive EmOC includes all basic EmOC interventions as well as the ability to perform C/Ss and blood transfusions (Kyei-Onanjiri, Carolan-Olah, Awoonor-Williams & McCann 2018:5).

- *Postnatal care* – Care rendered to the mother after delivery in the postpartum period. The mother is assisted with breast feeding, vulval toilet, and observed for any signs of infection. Family planning services are also offered during this period (Santora 2020:3).
- *Post abortal care* – Prevents and manages complications associated with abortions like haemorrhage and sepsis; family planning services are also provided (Santora 2020:3). Comprehensive abortion care averts the possibility of injury or death owing to unsafe abortion, as well as eliminating the chance that a woman will die from any other direct causes related to pregnancy (Santora 2020:3).
- *STI/HIV/AIDS control* – Mothers are screened for HIV and sexually transmitted infections (Santora 2020). Attention to prevention of mother-to-child transmission of HIV where needed is provided. Strategies include interventions to increase knowledge and reduce risk-taking behaviour, voluntary (or routine) HIV counselling and testing, antiretroviral treatment (including prevention of mother-to-child transmission) and referrals to sexual/reproductive health services, such as STI treatment and prevention (Santora 2020:5).

2.5.2 Strategies for ending preventable maternal mortality (EPMM)

Global understanding of the determinants of maternal mortality and a global vision of ending preventable maternal mortality have resulted in a shift in global efforts from the “Safe Motherhood Initiative” launched in 1987 in Nairobi to “Ending Preventable Maternal Mortality” in 2014 in Bangkok (Stanton et al 2018:408). In January 2013, the Ending Preventable Maternal Mortality (EPMM) Working Group, led by the WHO with support from partner organisations, achieved multi-stakeholder consensus on goals for

maternal health and survival from 2015 to 2030 (Jolivet, Moran, O'Connor, Chou, Bhardwaj,Newby, Requejo, Schaaf,Say & Langer2018:10). The EPMM strategy, developed at global level, moves beyond emphasis on clinical care to address the social, political and economic determinants of maternal survival and health that have contributed to countries' failures and successes (Stanton et al 2018:408). A Consensus Statement by United Nations member states was that they recognised EPMM as within reach and that necessary acceleration of progress could be achieved by positioning maternal survival in the context of every woman's right to healthcare and the highest attainable level of health across their lifespan (WHO 2015:4). The strategies outlined in the report are exemplified by 11 key themes that are grounded in a human rights-based approach to health and focus heavily on the principles of equity and non-discrimination; transparency, participation, and accountability to ensure that reproductive, maternal and newborn healthcare is available, accessible and acceptable to all who need it (Jolivet et al 2018:10). The themes point to the need to assess and address not only the most proximal causes of maternal death, but also the broad range of more distal systemic and social determinants of maternal health and survival (Jolivet et al 2018:10).

Guiding principles for EPMM

- Empower women, girls and communities.
- Protect and support the mother-baby dyad.
- Ensure country ownership, leadership and supportive legal, regulatory and financial frameworks.
- Apply a human rights framework to ensure that high-quality reproductive, maternal and new-born healthcare is available, accessible and acceptable to all who need it.

Cross-cutting actions for EPMM

- Improve metrics, measurement systems and data quality to ensure that all maternal and new-born deaths are counted.
- Allocate adequate resources and effective healthcare financing.

Five strategic objectives for EPMM

- Addressing inequities in access to and quality of sexual, reproductive, maternal and newborn healthcare.
- Ensuring universal health coverage for comprehensive sexual, reproductive, maternal and newborn healthcare.
- Addressing all causes of maternal mortality, reproductive and maternal morbidities and related disabilities.
- Strengthening health systems to respond to the needs and priorities of women and girls.
- Ensuring accountability to improve quality of care and equity.

2.5.3 Regional interventions of maternal mortality reduction

According to UNFPA (2022:6), preventing maternal deaths is possible with existing knowledge and technology. It involves preventing unintended pregnancies, monitoring women during their pregnancies, and managing medical complications that arise during pregnancy and delivery.

2.5.3.1 Family planning

Preventing unintended pregnancies is a first step to preventing maternal deaths (National Council for Population and Development [NCPD] 2015:34). Contraception refers to the prevention of pregnancy as a consequence of sexual intercourse using either traditional or modern methods (Tessema, Gomersall, Mahmood & Laurence 2016:5). For women, contraceptives have been found to reduce the number of abortions and lower the incidence of disability related to complications of pregnancy and child-birth, primarily by reducing the number of times a woman has to go through the potentially deadly process of child-birth (Keen,Begum, Friedman & James 2017:45). Contraception further helps women avoid closely spaced pregnancies that increase the

risk of poor outcomes (Starbird, Norton & Marcus 2016:195). Each year, greater access to family planning has the potential to prevent up to 30% of the 295 000 maternal deaths that occur (USAID 2020:7). Yet, more than 218 million women in low- and middle-income countries who want to avoid pregnancy are not using a modern method of contraception (USAID 2020:7). To meet SDGs 3 and 5, significant investments are required by countries and donors in the following priority areas: sustainable financing, reaching all adolescents, expanding availability of services to the poorest and hard-to-reach populations, improving the quality of services, increasing the range of methods available, strengthening procurement procedures and supply chains, broadening social and behaviour change, communication interventions, and sustaining research and development investments in contraceptive methods and their delivery (Machiyama, Obare, Chandra-Mouli, Chou, Festin & Khosla 2018:3).

Contraceptive methods are often classified as either modern or traditional (United Nations Department of Economic and Social Affairs 2020:21). Examples of some modern methods of contraception include female and male sterilisation, an intra-uterine device, implants, injectables, oral contraceptive pills, male and female condoms, vaginal barrier methods (including the diaphragm, cervical cap and spermicidal foam, jelly, cream and sponge), lactational amenorrhea method (LAM) and emergency contraception. Modern methods tend to be more effective than traditional methods at averting unintended pregnancies (Karra, Maggio, Guo, Ngwira & Canning 2022:5). Some of the traditional methods of contraception include rhythm (e.g., fertility awareness-based methods, periodic abstinence) and withdrawal (United Nations Department of Economic and Social Affairs 2020:26).

Increasing acceptance and use of family planning requires more than increasing access to health services. Truly effective family planning programmes must address possible critical barriers to sexual and reproductive health (Wegs, Creanga, Galavotti & Wamalwa 2016:7). In Sub-Saharan Africa, the major barriers to family planning include pro-natalist values, poor livelihoods, weak health systems and poorly-trained providers, lack of access to quality sexual and reproductive health information, fears of side effects

and weak support by male partners and religious and political authorities (Adjei, Mutua, Athero, Izugbara & Ezeh 2017:2). Given the current socio-economic and demographic indicators in poor countries and the slow progress in the unmet need of family planning (FP), four critical steps should be taken: (i) increase knowledge about the safety of family planning methods; (ii) ensure contraception is genuinely affordable to the poorest families; (iii) ensure supply of contraceptives by making family planning a permanent line item in healthcare systems' budgets; and (iv) take immediate action to remove barriers hindering access to family planning methods (Prata et al 2010:312).

Integration of family planning into other health and non-health services is increasingly being used as an approach for meeting the contraceptive needs of childbearing age women (Duminy, Cleland, Harpham & Montgomery 2021:5). Integration has been defined in many ways (Nkhoma, Sitali & Zulu 2022:395). From a recipient point of view, integration is concerned with healthcare that is easy to navigate (Nkhoma et al 2022:396). It is a service that is well harmonised and reduces the number of stages in an appointment and the number of separate visits required to a health facility (Nkhoma et al 2022:396). On the other hand, from the health systems' perspective, integration takes place when decisions on policies, financing, regulation and delivery are properly sorted (Duminy et al 2021:5). In principle, integration offers an economy of service provision and is therefore valuable in contexts with limited resources (Duminy et al 2021:5). A critical scoping review was conducted in low- and middle-income countries on some reproductive health programmes that specifically targeted the integration of FP with other healthcare services (Duminy et al 2021:5). Evaluation of the programmes suggest that the integration of FP services with those of maternal and child health presents a significant opportunity to reduce unintended pregnancies in urban areas (Duminy et al 2021:5). A study conducted during the Covid-19 pandemic in Ethiopia examined the integration of FP with maternal healthcare services, including ANC, delivery, postnatal care (PNC) and immunisation (Tsegaye,Tehone, Yesuf & Berhane2021:5). The results showed a 6% increase in the uptake of integrated FP services, which is significant in a low-resource setting, given the widespread effect of the global pandemic (Tsegaye et al 2021:5).

In India a family planning intervention by the Village Health Guides was designed to be integrated into the existing Network of Entrepreneurship and Economic Development (NEED) operations with the goal of enhancing its sustainability (USAID 2013:4). Family planning messages by the Village Health Guides was associated with a meaningful increase in family planning use and reduced unmet need (USAID 2013:4). Within the intervention group of 800 women, family planning use for all methods increased significantly from 40% at baseline to 69% at end-line (USAID 2013:4). Similarly, a Kenyan family planning services programme teamed with the Green Belt Movement (GBM) to improve access to contraceptives in a rural setting (Hoke, Mackenzie, Vance, Boyer, Canoutas & Bratt 2015:44). GBM is a Kenyan non-governmental organisation dedicated to environmental conservation and community development (Hoke et al 2015). The GBM volunteers promoted family planning use in a number of ways: they delivered Environmental Health Perspectives messages during regular meetings − typically 2–4 times a month − with their assigned tree nursery groups; they referred community members seeking family planning services to public-sector health centres (Hoke et al 2015:44). Upon the integration, the most common spontaneous response was improved knowledge of and attitudes toward family planning among Green Volunteers and tree nursery group members (69%) (Hoke et al 2015:44).

A survey on community and health systems enablers to family planning use was conducted in Kabwe District, Zambia (Silumbwe, Nkole, Munakampe, Milford & Cordero2018:5). Though found to be an enabler, integration of sexual and reproductive health (SRH) interventions into community health systems remains complex, due to diverse norms, values, as well as the less formal mechanisms which shape coordination, accountability, health practice and health-seeking behavior (Silumbwe et al 2018:5). Key factors to consider at the community level may include the community's capacity to engage and participate in the implementation process, and to commit and sustain health actions and ensure the development of effective partnerships between a complex array of actors involved in the intervention (Silumbwe et al 2018:5).

The central goals of family planning demand-side interventions include changing women's, men's and couples' knowledge and attitudes about family planning methods, increasing their knowledge of sources of contraceptives and increasing their use of family planning to meet their fertility desires (Salem, Bernstein, Sullivan, Martin & Payne 2008:5). As an intervention, mass media through the radio, television or print media is an appealing strategy for the promotion of family planning because of its potential reach and ability to address often culturally taboo issues in an entertaining way (Mwaikambo, Speizer, Schurmann, Morgan & Fikree 2013:920). Social marketing combines mass media and marketing of contraception with private sector distribution channels to increase awareness of and access to contraceptive methods among the population (Naik, Morgan & Wright 2015:110). A review in low- and middle-income countries indicated that local and television and radio FP programming were significantly and positively associated with increased modern contraceptive methods use (Duminy et al 2021:5).

While family planning programmes have traditionally been aimed at women, there is growing awareness that reproductive well-being is the responsibility of both men and women (Wondim, Degu, Teka & Diress 2020:198). Male participation in contraceptive use improves women's uptake and continuity of family planning approaches by increasing spousal coordination and decreasing opposition (Wondim et al 2020:198). Men (and sometimes mothers-in-law) are the family's primary decision makers, so women have limited autonomy over contraceptive use (USAID 2022a:4). Women lack resources to pay for them even though women are seen as responsible for family planning (USAID 2022a:4). A survey was conducted on community and health systems enablers to family planning use in Kabwe District, Zambia (Silumbwe et al 2018:5). It demonstrated that couples counselling services targeting male involvement in contraceptive choices are important enablers to contraceptive services provision and use (Silumbwe et al 2018:5). Such counselling services allow for increased male participation and support for family planning and contraceptive choices (Silumbwe et al 2018:5). The couples counselling services help to educate and encourage male partners to support their spouses in using such services (Silumbwe et al 2018:5). A

review of male interventions implemented in the South Asian countries of Bangladesh, India and Nepal found that the programmes that were most effective in changing men's behaviour and gender-related attitudes had one or more of the following features:

- Group education, including discussion sessions, didactic lessons and participatory methods (e.g., role-plays).
- Community outreach, mobilisation and mass-media campaigns, including radio and television messages, billboards, widespread educational materials and public events.
- Clinic-based interventions, including introduction or scale up of male reproductive health services, individual or couples counselling and provider education about men's and women's reproductive needs (USAID 2022a:6).

Reorganising and expanding the provision of contraceptive methods to other health worker cadres can significantly improve access to contraception for all individuals and couples – through a task shifting and sharing strategy (WHO 2017:8). Task sharing initiatives involve the safe expansion of tasks and procedures that are usually performed by higher-level staff (i.e., physicians) to lay and mid-level healthcare professionals (i.e., midwives, nurses and auxiliaries) (Ouedraogo, Habonimana, Nkurunziza, Chilanga & Hayfa 2021:5). In the same perspective, the WHO recommends that midwives be empowered to provide all family planning services except tubal ligation and vasectomy (Ouedraogo et al 2021:5). Task shifting refers to a process of delegation or rational distribution of tasks among health workforce teams (WHO 2017:8). Specific tasks are moved, where appropriate, from highly qualified health workers to health workers with shorter training and fewer qualifications to make more efficient use of the limited human resources for health (WHO 2017:8). For instance, community health volunteers, better known as Shyastha Shebika*,* were utilised in expanding access to family planning for married adolescent girls in the urban slums of Dhaka (Huda, Mahmood, Ahmmed, Ahmed & Hassan 2019:6). The Shyastha Shebikas were trained to provide comprehensive information on correct and consistent use of short-acting methods and to promote the uptake of long acting reversible contraceptive (LARC)

methods, emphasising any misconceptions on the different available methods, including fear of side effects and complications, and to make referrals for such methods among married adolescent girls who needed to space pregnancies for longer periods (Huda et al 2019:6). Upon the Shyastha Shebikas strategy, an evaluation showed an increased number of married adolescent girls were using family planning methods, as well as conducting discussion on family planning with their husbands (Huda et al 2019:6).

Limited uptake in use of family planning services is often a result of poor quality services (Ganle, Baatiema, Ayamah, Ofori & Ameyaw 2021:188). If clients are concerned about or not satisfied with the care that they receive, they tend not to return (Ganle et al 2021:188). Improvements in the quality of services will result in a larger, more committed clientele of satisfied contraceptive users (Hancock, Stuart, Tang, Chibwesha & Stringer 2016:2). Over the long term, this expanded base of well-served individuals will translate into higher contraceptive prevalence and, ultimately, reductions in fertility (Hancock et al 2016:2). Frontline health workers in communities and primary care facilities play a vital role in the provision of family planning, as they are uniquely poised to shape health outcomes (Kassie, Wale & Yismaw 2021:480). However, inadequately trained staff could be a barrier to the provision of family planning, especially long-acting reversible contraception (Lemani, Kamtuwanje, Phiri, Speizer & Singh 2018:37).

A growing body of evidence indicates the use of digital tools by providers supports a range of functions, including registration, health data collection and reporting to improve continuity of care and improved adherence to treatment approaches (Kassie et al 2021:480). As a complement to in-person trainings, digital applications can improve clinical and non-clinical knowledge through refresher trainings and continuous learning opportunities for various cadres of service providers (Kassie et al 2021:480). Appropriate service provider trainings are one of the cornerstones of a high-quality FP programme (Kassie et al 2021:480).

Family planning training programmes are designed to be competency-based (Duminy et al 2021:5). Competency-based training is focused on developing and mastering the specific skills necessary to correctly conduct a set of tasks, functions and/or core competencies according to predetermined standards for a specific job or set of responsibilities:

- On-the-job training, whereby knowledge and skills are gained at the providers' place of work, is an alternative option to classroom-based training.
- Refresher training should always be considered, whether it is revisiting materials from a prior training or building on previously gained skills. This can take place in person, through an online learning system, or even through a mobile application (Duminy et al 2021:5).

A study was conducted to explore the prevalence of service provider-imposed barriers to family planning in urban settings of Kenya (Tumlinson, Okigbo & Speizer 2016:145). It revealed that provider-imposed eligibility restrictions may contribute to unmet need and are more frequently practised in private facilities and among providers lacking in-service training in family planning provision (Tumlinson et al 2016:145). It suggested that programmes seeking to increase contraceptive use, particularly for the unmarried and young, need to consider training providers so that these young people could have access to injectables, intra-uterine contraceptive devices and implants without any restrictions (Tumlinson et al 2016:145).

The issue of cost of family planning methods is often discussed as both a supply-side and demand-side issue (Mwaikambo et al 2013:920). From the supply-side perspective, the direct cost of a family planning method is seen as a barrier to use (Mwaikambo et al 2013:920). Vouchers directly augment the purchasing power of users, increasing their uptake of goods or services covered by the programme (Eva, Quinn & Ngo 2015:E16). When distributed with a means test or other targeting criteria, vouchers are hypothesised to increase the use of goods or services among sub-populations (Eva et al 2015:E16). By increasing uptake and making reimbursement consistent, vouchers

are further hypothesised to increase revenue for service providers, who can then reinvest directly in services to improve their quality (Eva et al 2015:E16). In Uganda, between 2011 and 2014, a social franchise and family planning voucher programme supporting 400 private facilities was implemented (Bellows, Bulaya, Inambwae, Lissner & Ali 2016:360). The programme aimed to provide family planning counselling and broaden contraceptive choice by adding long-acting reversible contraceptives and permanent methods to the service mix, offered a voucher to enable poor women to access family planning services at franchised facilities (Bellows et al 2016:360). Over the nearly four-year project period, the number of clients participating in the family planning social franchise and voucher programme in Uganda increased substantially, with more than 330 000 services provided in total (Bellows et al 2016:360). In 2018, the Government of Burkina Faso adopted auser fee exemption scheme – known as the gratuité scheme – for FP services (Koulidiati, Straubinger, Metangmo & Boxshall 2020:20). The gratuité scheme was intended for anyone who was sexually active. The package included long- and short-acting contraceptive methods, outpatient curative care for management of adverse side effects, and inpatient curative care in the event of complications (Koulidiati et al 2020:20). However, in a Burkina Faso survey, most health workers under the gratuité scheme noted that in the event of stockouts of medical consumables, it was common practice for the user to have to buy these supplies at their own cost, which might create an additional financial deterrent to seeking FP services (Koulidiati et al 2020:20).

Interventions delivered by mobile phone could help increase uptake and continuation of contraception, particularly among hard-to-reach populations (Hill, McGinn, Cairns, Free & Smith 2020:6). In Cambodia, the Mobile Technology for Improved Family planning (MOTIF) trial evaluated an intervention delivered by mobile phone to provide post-abortion family planning support to women who received safe abortion at Marie Stopes International Cambodia (MSIC) clinics (Hill et al 2020:6). The MOTIF intervention was effective at increasing uptake of long-acting reversible contraceptive methods (subdermal implant and intra-uterine device), which are associated with lower

discontinuation rates compared with those of short-acting hormonal methods (Hill et al 2020:6).

2.5.3.2 Antenatal care

Antenatal care (ANC) is defined as the care provided by skilled health-care professionals to pregnant women and adolescent girls to ensure the best health conditions for both mother and baby during pregnancy (WHO 2022a:5). ANC reduces maternal and perinatal morbidity and mortality both directly, through detection and treatment of pregnancy-related complications, and indirectly, through the identification of women and girls at increased risk of developing complications during labour and delivery, thus ensuring referral to an appropriate level of care (WHO 2022a:6). It is recommended that expectant mothers receive at least eight antenatal visits to check and monitor the health of mother and foetus (Orjingene & Morgan 2020:11). Mothers who attend more ANC visits are also more likely to deliver under a skilled healthcare attendant (Muvengei, Karanja & Wanzala 2021:750). They are expected to acquire more knowledge and develop better attitudes about using other maternal health services (Fekadu, Ambaw & Kidanie 2019:5). Unexpectedly low facility deliveries were noted in an Ethiopian study among mothers who attended four or more antenatal care visits (Fekadu et al 2019:6). The possible reasons for low health facility delivery service use among women who attended four or more ANC visits may be the poor quality of information provided during antenatal care sessions (Fekadu et al 2019:6). If women rated the quality of delivery service low, they would be less likely to give birth at a health facility although they attended ANC (Fekadu et al 2019:6). The WHO has suggested some reasons why antenatal care may fail to improve maternal outcomes (WHO 2022a:5). These reasons include:

- Difficulty in predicting birth complications during pregnancy.
- Lack of communication between antenatal and delivery care personnel.
- Poor quality of antenatal services.

Although ANC alone cannot prevent all obstetric emergencies, the information provided during ANC services can go a long way to ensure the successful management of pregnancies and the subsequent well-being of the child (Haruna, Dandeebo & Galaa 2019:4). The ANC services are tailored to the individual woman's needs, to ensure a positive pregnancy experience (Miltenburg et al 2017:5). ANC generally comprises the following interventions (Mbuagbaw, Medley, Darzi, Richardson & Habiba Garga 2015:CD010994):

- Health promotion: ANC is an opportunity to educate the woman about her health, pregnancy and childbirth, recognising danger signs, the benefits of good nutrition and exclusive breastfeeding, the harms of alcohol, tobacco and drugs and other relevant issues (Miltenburg et al 2017:5).
- Disease prevention: immunisation against tetanus, prophylactic treatment against malaria and protection against iron-deficiency anaemia (Miltenburg et al 2017:6).
- Early detection and treatment for complications and diseases: pregnant women can be screened for syphilis, HIV and other sexually transmitted infections. Complications of pregnancy such as pre-eclampsia and eclampsia, infection and vaginal bleeding can be addressed (Miltenburg et al 2017:6).
- Birth preparedness: the pregnant woman is counselled on her decision about where to deliver, choice of a SBA and a caregiver (for herself or her other children at home). The ANC visit may cover planning for transportation to the hospital, costs of care and supplies for delivery (Kim, Erim, Natiq, Salehi & Zeng 2020:5).
- Complication readiness: women are encouraged to have an emergency plan for complicated deliveries. This plan includes saving money for extra medical or surgical care and potential blood donors (Mbuagbaw et al 2015:CD010994).

Global reports in 2017 showed that only three in five women attended at least four antenatal visits (Okedo-alex, Akamike, Ezeanosike & Uneke 2019:5), while more than 90% of women in developed regions, such as the Americas and Europe, adhered to the WHO's previous (*four ANC visits)* recommendations (Esopo, Derby & Haushofer 2020:4). In regions with the highest rates of maternal mortality, such as Sub-Saharan

Africa, only 52% of women received at least four ANC visits (Okedo-alex et al 2019:5). This SSA data falls short of the United Nations global target of 90% coverage of four or more antenatal care contacts (Jolivet et al 2018:3). Evidently, approximately only one quarter of women had eight or more ANC contacts in a recent Liberian study (Ekholuenetale, Nzoputam & Barrow 2022:9). Whether a woman receives ANC during pregnancy often depends on her geographical location and socio-economic status (Bailey 2019:13). Other barriers to ANC include availability and quality of healthcare services, cultural beliefs, lack of understanding of the benefit of care and obstetric history (Bailey 2019:13). To better maternal outcomes, previous strategies developed to strengthen and overcome ANC challenges are as follows (Lincetto, Mothebesoane-Anoh, Gomez & Munjanja 2012:55):

- Establish or strengthen national policies: A national policy and locally adapted guidelines must be in place to protect the rights of all women, regardless of their socio-economic status or place of residence, to access ANC services.
- Strengthen the quality of ANC services: This includes improvements in the time taken for service delivery, supplies and logistics and offering refresher trainings to staff.
- Improve integration with other programmes: ANC services should take advantage of existing programmes, especially those with outreach activities targeting women of childbearing age.
- Reduce barriers to accessing care and reach out to women without access such as user fees (Lincetto et al 2012:55).
- Task shifting – the distribution of recommended nutritional supplements and intermittent preventive treatment in pregnancy for malaria prevention to a broad range of cadres, including auxiliary nurses, nurses, midwives and doctors is recommended.
- Community-based interventions to improve communication and support: these visits do not replace ANC, but they may be helpful in ensuring that there is continuity of care and promotion of healthy behaviours.

- Providing incentives to attract and retain qualified personnel for the lower-level health facilities (Afulani 2015:3).

Community healthcare workers are an essential cadre of healthcare workers in low-income countries, where human resources for rural healthcare infrastructure are often limited (Maru, Nirola, Thapa, Thapa & Kunwar 2018:56; Nishimwe, Mchunu & Mukamusoni 2021:2515). In Ngara, Tanzania, the Lady Health Worker Programme (LHWP), a community-based intervention aimed at improving access to antenatal care in predominantly rural environments (Bailey 2019:13), trains local women to be community healthcare workers who are capable of providing preventative primary care in their communities (Bailey 2019:13). The intervention improved access to and early initiation of antenatal care, as well as recognition and referrals of pregnancy complications associated with maternal morbidity and mortality (Bailey 2019:13). A community-based intervention comprising community health volunteers, known as Safe Motherhood Action Groups (SMAGs), was implemented in rural Zambia (Jacobs, Michelo & Moshabela 2018:75). The intervention had one main component of recruiting, training and providing support for volunteer SMAGs to provide essential maternal healthcare services in communities beyond a five-kilometre radius from a health facility (Jacobs et al 2018:75). This led to significant increase in ANC attendance at least four times, SBA at delivery and receipt of PNC within 48 hours after delivery (Jacobs et al 2018:75).

Current guidelines recommend that women have a first contact (with a midwife or doctor) followed by an antenatal care booking appointment with a maternity service within the first trimester of pregnancy (and ideally by 10 weeks), in order to fully benefit from the available screening, interventions and support (Sawtell, Sweeney, Wiggins, Salisbury & Eldridge 2018:165). In Thailand, training local health volunteers in communities by knowledge-counselling intervention significantly improved early ANC initiation, but the magnitude of change was still limited (Liabsuetrakul, Oumudee, Armeeroh, Nima & Duerahing 2018:5). Significantly higher rates of early ANC were

found in the intervention group compared to the control group and among women who met a local health volunteer compared to those who did not (Liabsuetrakul et al 2018:5).

Focused antenatal care services delivered under the auspices of community-based health planning and services in rural Ghana have been largely accepted and recognised as a very useful intervention in the improvement of access and utilisation of maternal health services (Haruna et al 2019:5). The community-based health planning and services framework has reduced barriers to access and other impediments in terms of time constraints, improved privacy and given more time for counselling, timely testing, and treatment of pregnancy-related complications (Haruna et al 2019:5).

One of the most basic and limiting bottlenecks revolves around procurement and supply chain deficiencies that result in stockouts of key supplies at point of antenatal care (Betrán, Bergel, Griffin, Melo & Nguyen 2018). It is not enough to provide resources for medical supplies; these supplies have to be in the right place at the right time, consistently and reliably (Betrán et al 2018). In a Mozambique intervention, each health facility was provided with antenatal care kits, containing the necessary medicines, laboratory supplies, materials and equipment and a refresher course on the kit's use (Betrán et al 2018:e57). The kits created the necessary conditions for a woman-centred approach, resulting in improvements in antenatal care across practices (all >80% coverage for the whole intervention period) (Betrán et al 2018:e57).

Appointment adherence can be improved by initiating a systems approach intervention that integrates people, processes and technology (Opon, Tenambergen & Njoroge 2020:5). Such logistical issues may range from bad road network and cost of transportation, limited telecommunication network, to low quality of care factors, especially in rural areas (Opon et al 2020:4). The systematic review of Opon et al (2020:5) indicated a positive effect of a systems approach intervention in increasing appointment adherence, with an average of 42% appointment adherence and 35% reduction in missed appointments in antenatal clinics across all the studies. Starting

operations in time can improve relationships between health workers and patients, prompt extended operation hours and foster good attitudes (Opon et al 2020:4).

Evidence shows that using technology in maternal health (mHealth) improves outcomes (Muvengei et al 2021:750). In a Kenyan experimental study, an SMS and a phone call reminder were administered in the intervention arm while the non-intervention group received routine care (Muvengei et al 2021:750). A targeted mobile-phone intervention improved ANC attendance in a pastoralist community in Narok, Kenya (Muvengei et al 2021:752). A feasibility study of mHealth intervention to improve uptake of antenatal and postnatal care services was conducted in peri-urban areas of Karachi (Feroz, Rizvi, Sayani & Saleem 2017:7). The study indicated that mHealth could evolve into a practice consortium to encourage community women to use ANC services in a timely and more efficient manner to improve existing service delivery structure (Feroz et al2017:4). However, clients' challenges could be illiteracy, cultural restrictions, technological discomfort, issues of trustworthiness, and technology cost (Feroz et al 2017:4), while healthcare providers' challenges could be difficulties in management of complex health problems and misuse of technology (Feroz et al 2017:4). Similarly, a meta-analysis was conducted to evaluate the impact of mobile health (mHealth) intervention on antenatal and postnatal care utilisation in low- and middle-income countries (Yadav, Kant, Kishore, Barnwal & Khapre 2022:e21256). Its analysis depicted a significant increase in four or more antenatal care attendance, tetanus vaccination, compliance with iron supplementation and postnatal care attendance among those pregnant mothers who received mHealth intervention in comparison with those who did not receive the intervention (Yadav et al 2022:e21256).

2.5.3.3 Emergency obstetric and intrapartum care

Access to appropriate healthcare, including skilled birth attendance at labour, delivery and timely referrals to access EmONC services can greatly reduce maternal deaths and disabilities (Daniels & Abuosi 2020:5). However, before a pregnant woman arrives at a health facility, delays in the decision to seek care (first delay), travel to reach

appropriately equipped health facilities (second delay) and delay in receiving care (third delay) can increase the risk of death of the pregnant woman (Banke-Thomas, Avoka, Gwacham-Anisiobi, Omololu & Balogun 2022:5).

The concept of emergency obstetric care (EmOC) assumes that maternal complications are unpredictable and that obstetric complications can occur in around 15% of deliveries (Mkoka, Goicolea, Kiwara, Mwangu & Hurtig 2014:2). To put it another way, any pregnant woman can develop complications at any time during pregnancy, at delivery, or in the postpartum period. EmONC is a set of internationally agreed-upon treatments for the most common problems (haemorrhage, pre-eclampsia, sepsis, incomplete miscarriage or unsafe abortion and obstructed labour), all of which can lead to maternal mortality if left untreated (Das, Dil, Zakia, Kallol & Baayo 2022:801). Most obstetric complications occur at the time of labour and delivery (Banke-Thomas et al 2020:12). It takes an SBA to swiftly recognise life-threatening complications and to intervene in time to save the mother's life (Banke-Thomas et al 2020:12). Evidence shows that EmOC can reduce institutional maternal mortality by 15–50% (Banke-Thomas et al 2020:12). The WHO recommends that for every 500 000 people, there must be at least four facilities offering BEmOC and at least one facility offering CEmOC services (Okonofua, Yaya, Owolabi, Ekholuenetale & Kadio 2016:4). Such facilities must not only be physically available, but they must also have the required number of trained and experienced staff, equipment and consumables to carry out the emergency obstetric treatment needed to save the lives of women (Okonofua et al 2016). The set of life-saving services at a health facility with regard to its capacity to treat obstetric and newborn emergencies include services such as:

- General requirements for health facility: Service availability 24/7, skilled providers in sufficient numbers, referral service to higher-level care, communications tools, reliable electricity and water supply, heating in cold climates, clean toilets, a system for responding to emergencies; and regular drills.

- Routine care (for all mothers and babies): Monitoring and management of labour using partograph, infection prevention measures (handwashing, gloves) and active management of the third stage of labour.
- Basic emergency care (BEmOC): Parenteral magnesium sulphate for pre-eclampsia assisted vaginal delivery, parenteral antibiotics for maternal infection, parenteral oxytocic drugs for haemorrhage, manual removal of placenta for retained placenta, removal of retained products of conception.
- Comprehensive emergency care (CEmOC): Surgery (e.g.,caesarean) including anaesthesia and blood transfusion (Otolorin, Gomez, Currie, Thapa & Dao 2015:S46).

Trends demonstrate that the proportion of women utilising skilled health personnel to deliver their babies has increased across all regions in the past two decades from 64% in 2000 to 83% in 2020 (Nelson, Ess, Dickerson, Gren & Scott 2022:5). Increasing use of facilities has not consistently translated into reduced mortality in low- and middle-income countries (Gage, Carnes, Blossom, Aluvaala & Amatya 2019:1576). In such countries, many deliveries occur at primary care facilities where the quality of care is poor (Gage et al 2019:1576). The quality of care depends on the physical infrastructure, human resources, knowledge, skills and capacity to deal with both normal pregnancies and complications that require prompt, life-saving interventions (Barker, Nynke, Dickson, Hanson & Hill 2016:3). Other reasons for maternal deaths within the health system are remoteness, delay in referral for EmONC, delay or poor implementation of interventions at the facility level and vertical delivery of care in which single elements of care are implemented without connection with the comprehensive care (Elmusharaf, Byrne & Donovan 2015:4). The outcome of the care for women and newborns around the time of birth in health facilities reflects the evidence-based practices used and the overall quality of services provided (Barker et al 2016:3).

Quality EmOC services is technically difficult to define because of its complex nature; however, it involves alertness that will enable a health centre to respond appropriately and timely to women with obstetrics emergencies in a manner that fulfils the needs of

the patient with almost technical competency (Jombo, Enabudoso, Njoku & Afekhobe 2019:6). Lack of good quality routine care may lead to more complications or late detection of ill health (Miltenburg, Kiritta, Meguid & Sundby 2018:2). A substantial body of evidence is emerging that documents low provider skills and limited facility capability to provide good quality routine and emergency care at birth (Gabrysch et al 2019:e1074). This evidence might explain the mismatch between high coverage of facility birth and persistently high mortality burdens in many settings (Gabrysch et al 2019:e1074). In Brong Ahafo, Ghana, a secondary analysis was conducted using data on 119 244 pregnancies from two cluster-randomised controlled trials (Gabrysch et al 2019:e1074). It indicated that increasing facility birth does not translate into less mortality unless quality of care is assured (Gabrysch et al 2019:e1074). Gabrysch et al (2019) argued that to bring women into a building with a health worker labelled as being skilled is not enough; rather, women should give birth in a health facility with good care that can save lives and prevent ill health (Gabrysch et al 2019:e1074). Improving the quality of care in health facilities is thus recognised as an important focus in the quest to end preventable mortality and morbidity among mothers and newborns (WHO 2022a:7). This involves upgrading facility infrastructure, equipping the facilities with essential medical equipment and supplies and ensuring the presence of adequately trained personnel in health facilities to make the facilities BEmOC or CEmOC providers (Hou, Khan, Pulford & Saweri 2022:4).

Saving Mothers, Giving Life (SMGL), a five-year initiative designed to aggressively reduce deaths related to pregnancy and childbirth, was implemented in Ugandan and Zambian health facilities (Serbanescu, Goldberg, Danel, Wuhib & Marum 2017:2). The initiative adopted a comprehensive approach that strengthens maternal health services in high mortality settings in Ugandan and Zambian health facilities (Serbanescu et al 2017). Its strategy had the following components:

- A comprehensive approach uses evidence-based interventions that are designed to address three dangerous delays that pregnant women face in childbirth.

- An adequate number of high-quality delivery facilities, including EmONC, that are accessible within two hours of the onset of labour or obstetric emergencies.
- An integrated communication-transportation system that functions 24 hours a day/seven days a week to encourage and enable pregnant women to use delivery care facilities.
- An adequate number of SBAs who can provide quality care for normal delivery and who are able to identify and refer obstetric emergencies.
- A functional supply chain system to ensure that facilities have the equipment, supplies, commodities and drugs they need to deliver high-quality obstetric care.
- A system that accurately records every birth and maternal and neonatal death.

The approach noted improvements in access to, availability of, and quality of maternity care in the Saving Mothers, Giving Life districts in the first year of the initiative associated with a 30% decline in population-based maternal mortality in Uganda and a 35% decline in MMR in Ugandan and Zambian health facilities (Serbanescu et al 2017:6). Similarly, in Kigoma, Tanzania, a comprehensive approach to improving emergency obstetric and newborn care had the following initiatives:

- Decentralising high-quality comprehensive emergency obstetric and newborn care (EmONC) to lower-level facilities.
- Sustaining high-quality comprehensive EmONC services at health centres, included routine supportive supervision, clinical audits, mentorship and multiple methods of providing continuing medical education.

Dedicated efforts to sustain high-quality EmONC along with supplemental programmatic components contributed to the reduction of maternal and perinatal mortality (Prasad, Mwakatundu, Dominico, Masako & Mongo 2022:5).

Building the capacity of healthcare providers via ‘in-service’ or ‘on the job’ training has become a common approach (Ameh, Mdegela & White 2019:257). Such training is provided in almost all settings (Ameh et al 2019:257). There is evidence that training in

EmOC results in more components of this care package being available, including in low middle-income countries and that maternal and perinatal health outcomes are improved as a result (Ameh et al 2019:257). It is noted that training programmes improve healthcare providers' knowledge, skills and attitudes as well as care outcomes for women and their newborns by all stakeholders (Banke-Thomas et al 2020:12).

In Northern Bangladesh, a study was conducted to explore the current knowledge and skills of healthcare providers already trained by SIMESON (simulation for essential skills for obstetrical and neonatal care) (Das et al 2022:802). There were improvements in the quality of care for maternal and neonatal health services at the intervention–government healthcare facilities (Das et al 2022:802). Additionally, during the six months after training, 477 PPH cases were managed successfully with only one death (Das et al 2022:802). In Ukraine, a non-randomised controlled trial was conducted on effectiveness of EmONC training at the regional level (Mogilevkina, Gurianov & Lindmark 2022:5). Re-training of obstetric staff with focus on EmOC in a setting with universal access to perinatal and obstetric care and restricted resources had positive effects, as evidenced by a decrease in the incidence of PPH related interventions (Mogilevkina et al 2022:3). In a cluster randomised trial in South Africa, effectiveness of 'skills and drills' training of maternity staff in EmOC was evaluated (Van den Broek, Ameh, Madaj, Makin, Whiteet al 2019:2). Maternal case fatality rates did not significantly reduce but a significant increase was noted in the number of women recognised by healthcare providers to need and who received EmONC (Van den Broek et al 2019:2).

Maternity waiting homes (MWHS) is an intervention aimed at eliminating the phase 2 delay by bringing women closer to facilities for delivery (Smith, Henrikson, Thapa, Tamang, Rajbhandari et al 2022:3). MWHS go by many names (e.g., maternity waiting areas, antenatal villages), but in general they are accommodations at or near a health facility where pregnant women can stay in the final weeks of their pregnancy so that they can easily be transferred to the health facility to give birth with a skilled attendant

present and with EmONC available if needed (Ngoma, Asiimwe, Mukasa, Binzen & Serbanescu 2019:68). A recent scoping review and meta-analysis indicated that MWHS interventions are protective against maternal mortality and perinatal mortality in low- and middle-income settings and should be strongly considered as part of a comprehensive plan to improve maternal and child health (Smith et al 2022:3). Maternity waiting homes may have an impact especially for populations who live far from health systems, considering that 40%–45% of maternal deaths occur during labour, delivery and the 24 hours post-partum (Zuanna, Fonzo, Sperotto, Resti & Tsegaye 2021:3). Many women in low and middle-income countries face the challenges of inaccessibility of obstetric care in rural and urban areas (Dadi, Bekele, Kasaye & Nigussie 2018:2). A systematic review and meta-analysis was conducted on the role of maternity waiting homes in the reduction of maternal death and stillbirth in developing countries and its contribution for maternal death reduction in Ethiopia (Dadi et al 2018:2). It revealed that maternity waiting homes contributed more than 80% to the reduction of maternal death among users in developing countries and Ethiopia (Dadi et al2018:2).

Transport systems –ensuring that those who develop obstetric emergencies during childbirth are quickly transported to facilities where they can receive quality EmONC – can be the difference between life and death for the pregnant woman and her foetus (Alaofe, Lott, Kimaru, Okusanya & Chebet 2020:7). In many settings where the emergency transport system is managed or provided by the government health system, efforts to transfer women with obstetric complications to health facilities often fail, especially in rural and remote areas, because no vehicles are available, the terrain is difficult, or families cannot afford the associated fees (Oguntunde, Yusuf, Nyenwa, Dauda & Salihu 2018:774). Bhandari and Dangal (2014:9) advocate for strong and functional linkages between community and health facilities established to address the delays in care seeking and the low utilisation rate of EmONC (Bhandari & Dangal 2014:9). A systematic review was conducted on emergency transportation interventions for reducing adverse pregnancy outcomes in low- and middle-income countries (Alaofe et al 2020:7). The review observed that transportation interventions in low- and middle-income countries may be effective in: i) reducing maternal and child mortality; ii)

increasing health facility delivery significantly; iii) increasing C/S for women in need of such service; and iv) reducing referral delay (Alaofe et al 2020:7). However, as mentioned, referral to needed EmONC may not be possible for a plethora of reasons, including geography, cost, and lack of transportation (Alaofe et al 2020:7). Therefore, when strengthening capacities of community health workers to promptly assist and refer emergency cases, it is crucial to encourage local transport programmes and transportation infrastructure among minimally resourced communities to support access and engagement with health systems (Amosse, Boene, Kinshella, Drebit & Sharma 2021:124). Notably, community mobilisation efforts will notamount to anything if there are no midwives and doctors in health facilities; blood, drugs; functioning operating theatre; in short, if there is no functioning health facility (Kieny, Evans &Scarpetta 2022:7).

Free maternal health: There is a growing movement, globally and particularly in the Africa region, to reduce financial barriers to healthcare generally, considering that cost of management of obstetric complications is unaffordable to most families (Azaare, Akweongo, Aryeetey & Dwomoh 2020:10). For instance, Ghana introduced one of such policies in 2008 dubbed the ‘Free’ Maternal Healthcare Policy, with a primary aim of increasing facility delivery utilisation and to achieve maternal and newborn care in general (Azaare et al 2020:10). Similarly, the government of Ethiopia introduced a free delivery service policy in all public health facilities in 2013 to encourage mothers to deliver in health facilities (Demissie, Worku & Berhane 2020:2). Demissie et al (2020:3) note that free delivery services at public health facilities increased facility delivery use in Ethiopia. A study was conducted to describe service utilisation and delivery outcomes before and after removal of user fees and quality of delivery care and associated costs, at St Joseph’s Hospital (SJH) in Roma, Lesotho (Steele, Sugianto, Baglione, Sedlimaier & Niyibizi 2019:5). It noted that removal of user fees for hospital delivery care resulted in a large increase in facility-based deliveries and lower neonatal and maternal mortality (Steele et al 2019:5).

2.5.3.4 Postnatal care

The postnatal period, just after delivery and through the first six weeks (42 days) of life, is recognised as a critical time for both mothers and newborns (Yang, Yue, Han, Hu & Sun 2021:4). Postnatal care (PNC) services are a constellation of preventive care, practices and assessments designed to identify and manage maternal and newborn complications during the first six weeks after birth (Habte, Gebiremeskel, Shewangizaw, Dessu & Glagn 2021:e0246243). Potentially life-threatening complications which occur in the postpartum period include: postpartum haemorrhage, persistent high blood pressure as a result of pre-eclampsia, postpartum sepsis and puerperal psychosis (McCauley, McCauley & Van den Broek 2022:5). Worldwide, more than three in ten women and babies do not currently receive postnatal care in the first days after birth – the period when most maternal and infant deaths occur (Esopo et al 2020:5). Globally, over 65% of maternal deaths occur during the first 42 days postpartum (Tessema, Yazachew, Tesema & Teshale 2020:4). In 2022 the WHO made over 60 recommendations that help shape a positive postnatal outcome for women, babies and families, of which some include (Noble & Sheppard 2022:5):

- High quality care in health facilities for all women and babies for at least 24 hours after birth, with a minimum of three additional postnatal check-ups in the first six weeks. In the case of a home birth, the first postnatal contact should occur as early as possible and no later than 24 hours after birth.
- Steps to identify and respond to danger signs needing urgent medical attention in either the woman or the baby (Ahinkorah, Seidu, Budu, Armah-Ansah, Agbaglo et al 2021:24).

Most women only do their PNC during their child's vaccination or in case of postpartum complications, contrary to the current WHO recommendations (Balde, Diallo, Soumah, Sall & Diallo 2021:392). Several factors have also been associated with the poor uptake of postnatal care services. The list includes but is not limited to: lack of accessibility, poverty, low education levels, lack of knowledge of pregnancy-related complications,

few antenatal care checks, untrained birth attendants, lack of awareness among women with regard to the importance of postnatal care, long waiting time, forgetting appointments, poor quality of services, negative cultural beliefs and dynamics of decision-making within the family (Olajubu, Fajemilehin, Olajubu & Afolabi 2020:e0238911; Balde et al 2021:393).

With an aim to improve access and quality of postpartum care (PPC) (Djellouli, Mann, Nambiar, Meireles & Miranda 2017:5), a missed opportunities in maternal and infant health project was developed and implemented in four African countries (Burkina Faso, Kenya, Malawi and Mozambique) (Djellouli et al 2017:5). Some context-specific packages of health system strengthening and demand generation were:

- Enhance the delivery of immediate postpartum care (PPC) in health facilities with focus on the detection and management of postpartum haemorrhage and sepsis and postpartum family planning.
- Integrate maternal and infant services in the postpartum period.
- Support mother and infant during the postpartum period through female community health workers conducting home visits, providing individual counselling and group health education on PPC (including FP) and by referring women to the health facility for scheduled PPC consultations and in case of complications (Djellouli et al 2017:5).

In Tanzania, a mixed methods study was conducted to evaluate postpartum care after a participatory facilitation intervention (Pallangyo, Mbekenga, Olsson, Rubertsson & Pallangyo 2017:3). Six facilitators were trained to facilitate their colleagues in improving PPC at three to five health institutions and they were supervised by a principal investigator (Pallangyo et al 2017:4). The outcomes that were noted were: improved PPC attendance and quality of care; increased HCP knowledge and professional confidence; and increased PPC awareness among mothers (Pallangyo et al 2017:4).

Ethiopia recently implemented mHealth technology on a limited scale to help increase the uptake of health services, including intervention postnatal care (PNC) health service utilisation (Kassa & Matlakala 2022:34). A study was conducted to analyse the effectiveness of the mHealth intervention by measuring the level of maternal health service utilisation in four health centres in Ethiopia (Kassa & Matlakala 2022:34). The Ethiopian findings indicated that women enrolled in mHealth were more likely to undergo the recommended PNC compared to women not enrolled in the mHealth (Kassa & Matlakala 2022:34). In a Nigerian post intervention study, mHealth initiatives in the form of appointment reminders and educational text messages had a significantly positive impact on the spectrum of outcome measures of PNC utilisation among the respondents (Olajubu et al 2020:e0238911). The proportion of women who utilised the recommended four visits in the intervention group were significantly higher than those who did in the control group (Olajubu et al 2020:e0238911).

Postnatal care is also an important platform to promote family planning (Mccauley, Lowe, Furtado, Mangiaterra & Broek 2022:5). By spacing the birth-to-pregnancy interval by at least two years and the inter-birth interval by at least three years, the use of effective postpartum contraceptive methods in less developed countries could prevent poor maternal outcomes and maternal mortality (Tran, Gaffield, Seuc, Landoulsi & Yamaego 2018:3). Postpartum family planning plays an important role in strategies to prevent these pregnancies in the first year after childbirth (Maternal and Child Survival Program 2018:23). Suggested integration of antenatal and postnatal care interventions to improve postpartum family planning uptake include the following (Maternal and Child Survival Program 2018:23):

- Incorporate client-centred postpartum family planning discussions during ANC, providing FP counselling and information on healthy timing and spacing of pregnancies and return to fecundity.
- Establish a plan with the client, during ANC and before 36 weeks' gestation, for how she and her partner wish to address their postpartum family planning needs.

2.6 STRATEGIES FOR REDUCING MATERNAL MORTALITY IN KENYA

The demographic and health survey (2014) reported Kenya's MMR to be 362 per 100 000 live births (KDHS 2020:7). According to modelled estimates by the Maternal Mortality Inter-agency working Group, Kenya's MMR was 353 in 2015 and reduced to 342 per 100 000 live births in 2017 (World Bank 2022:5). With the annual rate of decline of 3.3%, the MMR would be 215 by 2030; still below the SDG 3.1 target of less than 140 per 100 000 live births (Ministry of Health [MOH] 2019:2). In response to the persistent high maternal mortalities, the Kenyan government has adopted several approaches to enable the nation to meet the global targets (MOH 2019:2). The national programmes include free maternal healthcare services (FMS) policy, the Beyond Zero Campaign and Strengthening of Safe Motherhood Initiatives (MOH 2019:3).

2.6.1 Free maternal healthcare services (FMS) policy

In June 2013, President Uhuru Kenyatta declared maternity services free in all Kenyan public health facilities (Masaba & Mmusi-Phetoe 2020:2). In April 2017, the programme under a new name 'Linda Mama' was improved in scope to include private facilities and offer an expanded package of benefits comprising antenatal care (including laboratory and radiology investigations), child delivery, postnatal care, and child healthcare services to the newborn for a period of one year since enrolment (Asito & Adoka 2019:3). Just a year after this declaration, there was a reported 26.8% increase in the number of deliveries in hospitals (Wausi 2018:12). In addition, antenatal care attendance increased by 16.2% in 2014 among the county referral hospitals (MOH 2019:3), while the proportion of pregnant women who had skilled attendance at birth increased from 69.1% in 2015 to 80.6% in 2019 (MOH 2019:3). To further encourage the Linda Mama utilisation, the government has employed some approaches to include:

- Use of local vernacular FM radio stations to mobilise for Linda Mama enrolment and demand creation (World Bank 2019b:12).

- Use of community health workers for identification and referral of pregnant women to health facilities (World Bank 2019b:12).

2.6.1.1 Gaps and challenges of the Linda Mama policy

The Linda Mama policy was intended to help the country meet its global targets of skilled birth attendance, antenatal care visits, and eventually maternal mortality reduction. Conversely, current reports show that less than 61.8% of all deliveries in Kenya are attended by skilled health personnel annually (Owuor & Amolo 2019:2). Maternal mortality is persistently high at 362 deaths per 100 000 and pregnant women initiate late for antenatal care visits in Kenya (MOH 2019:4). A study conducted in Kenyan public health facilities, aimed to provide a brief overview of this policy's effect on health facility delivery service utilisation and maternal mortality ratio (Gitobu et al2018:4). The Linda Mama policy intervention appeared to have no significant effect on maternal mortality (Gitobu et al 2018). This lack of effect indicates that low utilisation of health facility delivery services may not be the only factor contributing to pregnancy-related deaths in low income countries such as Kenya (Gitobu et al 2018:3). Provision of maternity services remains a challenge, especially for dispensaries in the counties, which, in addition to being understaffed, often lack basic equipment, facilities and even essentials, such as access to water (UNICEF 2018b:34). These discouraging findings support a body of literature which suggests an increase in the availability of maternal healthcare does not necessarily result in increased access to, or use of, maternal healthcare services (Davidson 2015:25). To improve timely ANC initiation and retention of women in the maternal health service continuum, policy makers must focus not only on optimising health financing schemes to equitably reduce financial barriers to care seeking, but also on reducing non-financial barriers and improving quality of care throughout the continuum (Dennis, Benova, Abuya, Quartagno & Bellows 2019:120). The recent review by Masaba and Mmusi-Phetoe (2020:1) indicated the following challenges facing utilisation of the Linda Mama initiative:

- The quality of care might have declined because of the health systems challenges within the hospitals, such asunder-staffing and inadequate resources vis-a-vis the increased number of patients after introduction of FMS.
- The resources, both human and material, were not increased to meet the demands of the positive effects of FMS policy surge of patients.
- Women may underutilise the FMS policy in place because of hidden charges within the hospital, the indirect cost of transport to the facility, and any other perceived costs related to maternal care within the hospital (Masaba & Mmusi-Phetoe 2020:3).

2.6.2 Kenya family planning initiative

Unintended pregnancy and unsafe abortion are common in Kenya, leading to high levels of unplanned births and avoidable maternal injury and death (Jayaweera, Ngui, Hall & Gerdts 2018:3). To manage the unintended pregnancies, the government set a national family planning initiative target to increase the modern contraceptive prevalence rate (mCPR) from 61% (2017) to 66% by the year 2030 (MOH 2022:1). This is achieved through integration of family planning services included as part of its Free Maternity Policy – Linda Mama programme – in which the Government invests three billion Kenyan shillings annually (MOH 2022:2). To increase access to family planning services among the poor and hard-to-reach segments of the population, the government has made deliberate commitments to scale up long acting and reversible methods through a national strategy that rallied partners and counties, advocacy efforts by National Council for Population and Development (NCPD) with policy makers including parliamentarians; incorporating faith based organisations into the FP agenda; and integration of family planning with the HIV services (Owino, Ochako, Mgamb, Sidha & Adeke 2017:4). The government also established more than 70 youth empowerment centres, with a target of having one in each constituency to provide a “one-stop shop” for youth-friendly information, including FP (Owino et al 2017:4). In addition, the Kenyan government has adopted the following approaches to maintain sustainability of family planning services (MOH 2022:2):

- Strengthening innovative approaches to family planning services provision such as the community strategy and integration of FP into other services.
- Advocating for domestic financing of family planning commodities through the enhancement of the allocation to the FP budget line. Advocating for counties to allocate specific line budgets to support FP services as well as strengthen data management.
- Engaging communities through appropriate health messaging via various channels (mass media) to give information on FP to dispel myths and misconceptions.
- Education of men, religious and community leaders on the importance of family planning in ensuring the health of mothers and children, as well as for socio-economic well-being (World Bank 2019b:3).

2.6.2.1 The gap in the Kenyanfamily planning initiative

According to the Performance Monitoring and Accountability [PMA] (2020) report, the modern contraceptive prevalence rate (mCPR) for all women declined from 46% in 2015 to 43% in 2019. The mCPR was higher in married women than unmarried sexually active women (Performance Monitoring and Accountability 2020:3). The mCPR among married women dropped from 62% in 2015 to 56% in 2019. The mCPR is therefore off-track for attaining the SDG goal of universal access to modern contraceptives (MOH 2022:6). Family Planning Services were found to be one of the most inequitable in a Kenyan study. Findings suggest that mostly upper-class or upper-middle-class women are using family planning services; hence, lowest quintiles should be targeted for intervention (Keats, Akseer, Bhatti, Macharia & Ngugi 2018:2).

2.6.3 Strengthening the KenyanSafe Motherhood Initiative

Safe motherhood services emphasises strengthening and expanding core elements of maternal health, including utilisation of antenatal care, skilled attendance at delivery and postnatal care in order to achieve improved birth outcomes measured by reductions in maternal mortality (Gazi, Hossain, Zaman & Koehlmoos 2018:3). The Kenyan

government has pledged support to the global Safe Motherhood Initiative (SMI) that was launched in Nairobi (MOH 2019:5). It has continuously strengthened the Safe Motherhood Initiative through making maternity services free of charge and improved access to comprehensive obstetric maternal and newborn services (MOH 2019:9). The expected outcome is increased access to and utilisation of quality maternal health services, hence mortality reductions (Barker et al 2016:20). In some Kenyan counties, the improvements are linked to stipends given to mothers for antenatal care visits and delivery at health facilities (Serbanescu, Kruk, Dominico & Nimako 2022:8). For instance, in Kakamega County Kenya, Oparanya Care Services give out Sh1 000 stipend to expectant mothers who attend ANC after the first and second trimesters, while at birth the baby is provided with clothing, toiletries and shawls (Bungei, Kipmerewo, Raballah & Arudo 2017:47).

The Safe Motherhood Initiative has also been facilitated by the engagement of Community Health Volunteers, who continuously follow up with mothers during pregnancy and provide linkage with health facilities, increasing the use of health services at the community level (Tomedi, Stroud, Maya, Plaman & Mwanthi 2015:3). In Machakos County, Kenya, TBAs are recruited to educate pregnant women about the importance of delivering in healthcare facilities and are offered a stipend by the government for every pregnant woman whom they brought to the healthcare facility (Tomedi et al 2015:3).

In-service training of healthcare providers – doctors, nurses and clinicians – through EmOC training workshops has been widely adopted in the country (Lindtj, Mitiku, Zidda & Yaya 2017:e0169304). The study by Banke-Thomas, Madaj and Van den Broek (2019:4) in Kenya indicated that EmOC training led to improved knowledge and skills and improved attitudes towards patients. However, increased workload was reported as a negative outcome by some healthcare providers (Banke-Thomas et al 2019:4).

Additional approaches strengthening the Safe Motherhood Initiative by the Kenyan Ministry of Health in collaboration with UNICEF, Options, the Liverpool School of

Tropical Medicine and USAID are as follows (Liverpool School of Tropical Medicine 2018:20):

- Roll-out of EmONC trainings to the counties – Training on Respectful Maternity Care with many counties having open maternity days.
- County governments constructing and equipping additional maternity units.
- Improvement on the quality of care in facilities as well as strengthening blood availability to avoid maternal mortality due to haemorrhage.
- Improvement of quality of care at health facilities by implementation of Maternal New Born Health adopted the WHO Quality of Care Standards (World Bank 2019b:9).

2.6.3.1 Gaps facing the Kenyan Safe Motherhood Initiative

Despite the improvements in maternal services, Kenya is still losing mothers along the path to safe motherhood (Banke-Thomas et al 2020:12). The initiative has not achieved its full potential because of the low level of government spending on healthcare that is not commensurate with its services (Masaba, Moturi, Taiswa & Mmusi-Phetoe 2020:136). Additionally, donor funding is declining as nations are increasingly funding their own health programmes – external support diminishes and becomes a smaller proportion of overall costs (Stanton et al2018:409). An exploratory qualitative research study on persistent barriers to the use of maternal, newborn and child health services was conducted in Garissa sub-county, Kenya (Kisiangani, Elmi, Bakibinga, Mohamed & Kisia 2020:3). It indicated the barriers to maternal service utilisation as follows: lack of transport, distance from health facilities, lack of information, absence of staff, especially at night-time, and quality of maternity care (Kisiangani et al 2020:3). Similarly, Kenyan study findings of Njuguna, Kamau and Muruka (2017:2) on maternal health services indicated a weak referral system, and inadequate staff, amenities and equipment to deal with the increased workload as possible challenges (Njuguna et al 2017:2).

2.6.4 Kenyan mobile-based interventions towards maternal health

A mobile-based consultation service or tele-health could be used for remote consultations with healthcare professionals for screening, self-care management and referral (Alam, Banwell, Olsen & Lokuge 2019:12). There has been rapid proliferation of a variety of types of mHealth interventions in both high- and low-income countries with some evidence of effectiveness in improving patient behaviours (eg., clinic visits, illness monitoring and medication compliance) (Budhwani, Enah, Bond, Halle-ekane, Wallace 2022:678). The Kenyan integrated mobile Maternal and Newborn Child Health information platform (Kim-MNC-Hip) is a national scale effort to provide affordable and accessible mobile health solutions to all pregnant women and mothers with children under five everywhere in Kenya (World Vision International 2020:3). Its main objective is to strengthen Kenya's community health system/referral services by linking households, community health workers, and health facilities in a real-time health information system that tracks pregnancies, births and maternal deaths and provides updates and reminders for timely interventions (World Vision International 2020:3).

In Homa-Bay, Kenya, an mAccess project was introduced with an overall aim to contribute to a reduction in maternal and newborn mortality by developing a novel mobile phone-based tool with the following suites:

- Free short message (SMS)-based service that sends personalised gestation-based text messages to mothers and reminders to ANC and PNC services.
- Interactive chat service that allows women to chat with a real-life healthcare worker.
- 24 Hours Uber-like transport navigator system, through which women can request transport pickup and the navigator service links her to the nearest, fastest, most reliable and available driver or rider (Onono, Wahome, Wekesa, Adhu, Waguma et al 2019:2). The system then automatically relays to the woman, the community health worker and the link facility, the information about the estimated pickup time and arrival at the health facility (Onono et al 2019:1).

The mAccess project shortened the time taken to reach an appropriate facility for delivery compared with standard care (Onono et al 2019:6). Additionally, participants in the intervention arm were five times more likely to attend more than four ANC visits during the pregnancy and four PNC visits compared with their counterparts in the control arm (Onono et al 2019:6).

2.6.4.1 Gaps of mobile-based interventions towards maternal health in Kenya

In 2019, Kenya Population and Housing Census indicated that only 13.7% of rural dwellers had access to the internet, while only 41% of the population owned mobile phones (KDHS 2020:2). Yet, maternal mortalities remained disproportionately high among these groups compared to those of urban dwellers (KDHS 2022:2). Regarding the impact of mobile applications on maternity education, a quantitative study was conducted in Habaswein, a remote village in the North-Eastern province of Kenya in the county of Wajir (Mohamed, Abdul, Wang & Mimm 2020:314). Mohamed et al (2020:314) noted that (1) It is important to improve infrastructure to increase accessibility in rural areas, thus enhancing the sharing of information, and (2) It would be better to localise the mobile applications in the local languages and use voice recording to share information due to high illiteracy levels in the rural areas (Mohamed et al 2020:314).

2.6.5 The Kenyan Beyond Zero Campaign initiative

The Beyond Zero Campaign, launched in 2013 by Kenya's First Lady under the slogan, "No woman should die while giving life", is aimed at strengthening emergency services for mothers and children by providing fully equipped mobile clinics to the counties (National Council for Population and Development [NCPD] 2015:3). The Beyond Zero campaign initiative intends to complement existing initiatives to improve access and quality of health services to a zero state of maternal and child mortality and zero new HIV infections (Muriuki & Chepken 2017:4). These mobile clinics provide free services on prenatal, antenatal and postnatal care (Muriuki & Chepken 2017:4). However, most of the Beyond Zero clinics in the country are not serving the purpose for which they

were intended as they are un-operational (Odenyo 2022:1). The clinics are struggling with inadequate health personnel and lack of basic items such as laboratory reagents, water and detergents (Odenyo 2022:1).

2.7 STRATEGIES OR INTERVENTIONS TO REDUCE MATERNAL MORTALITY IN MIGORI, KENYA

2.7.1 MAISHA Project 2012-2017

Migori County is one of 15 counties that account for over 60% of maternal deaths in Kenya. The latest estimate of the county's maternal mortality ratio (MMR) is 673 deaths per 100 000 live births (AFIDEP 2017:2). High maternal deaths are linked to high birth rates and limited access to life-saving maternal health interventions (AFIDEP) 2017:3). An interventional five-year maternal and infant health (The MAISHA Project 2012-2017) project was conducted with a primary objective to improve access to and attitudes towards quality healthcare services for women and children living in rural communities within Migori County (Gitonga, Ngure & Echoka 2018:5). Through the project, the following strategies were initiated:

- Health workers' (SBA) training and refreshers on emergency obstetric and neonatal care.
- Assessment and supplementation of basic delivery kit in the health centres, as well as training of community health extension workers and community volunteers on maternal infant health issues.

The MAISHA project realised a 27.2% increase in uptake of SBA for the intervention arm because of having received health education and good service from health providers (Gitonga et al 2018:5). Also, women in the control arm reported a higher proportion of complications which needed health worker attention than in the intervention arm. Complications could probably arise out of poor client education, not adhering to focused ANC follow-ups and poor skills of providers (Gitonga et al 2018:5).

In addition, socio-cultural factors, including beliefs and practices, hindered utilisation of maternal health services in Migori County (Cheptum, Koima, Gitonga, Mutua & Mukui 2014:48). Health facility factors such as inadequate staffing, lack of equipment or negative staff attitudes contribute to lack of utilisation and inaccessibility of maternal and child health services (Cheptum et al 2014:48). In Migori County, the number of women who deliver with skilled attendance is 53.4% and those who attend at least four antenatal visits are 54.6% (Kenya Demographic and Health Survey [KDHS] 2022). Of those who utilised unskilled birth attendance, 28.6% were delivered by TBAs (KDHS 2022). This indicates that the TBAs have a place in the community regarding maternal health (Cheptum, Gitonga, Mutua, Mukui & Ndambuki 2017:55).

2.7.2 Migori County family planning strategy

Adolescent pregnancy remains a major contributor to maternal mortality (Plan International 2020:5). Kenyan Demographic and Health Survey 2014 indicates that 24% of girls aged 15-19 years in Migori County have begun childbearing with 3.4% being pregnant with their first child and 20.9% having ever given birth (KDHS 2022:11). The proportion of adolescents who are already mothers is large, relative to the national level (14.7%) (KDHS 2022:11). As a result, Migori County's age-specific fertility rate for girls aged 15-19 (adolescent birth rate) is 136 births per 1000 girls, which is much higher than the national average of 96/1000 (KDHS 2022:11). An action plan by the Migori County government in response to the surge in teenage pregnancies seeks to implement the following strategies:

- Integrated school health programme including education re-entry.
- Capacity building of healthcare workers, peer educators, religious leaders, community health volunteers and teachers on adolescent and youth sexual and reproductive health
- Promoting community evidence-based interventions

- Advocacy, communication and social mobilisation of adolescent and youth sexual and reproductive health information and services for adolescents and youth (Ministry of Health Migori [MOHM] 2022:7).

2.7.2.1 Gap in the Migori County family planning strategy

Teenage pregnancy increases when girls are denied the right to make decisions about their sexual and reproductive health and well-being (Plan International 2020:3). The Migori County allocated 27% of the budget in 2014/2015 financial year to health, but there was only a paltry 3% to preventive and promotive medicine and no dedicated budget line to reproductive health and family planning despite the dire necessity of investing in such services (MOHM 2022:3). A lack of reproductive healthcare services for adolescents, particularly a lack of comprehensive sexuality education, contraceptive education and affordable, available commodities, means contraceptive use among married and unmarried adolescents is generally low in Migori County (UNICEF 2018a:4). UNICEF (2018a:4) observes that the high teenage pregnancy in the region is a failure of family planning initiatives.

2.7.3 Integrated community case management on access and utilisation of maternal health in Migori County

Integrated community case management was implemented in Migori County. The intervention strategies were integrated community case management training, mentorship/coaching, and supportive supervision of 20 community health volunteers (CHVs) (Shikuku, Masavah, Muganda, Otieno & Orero 2020:6). Through community mobilisation and advocacy for skilled birth attendance by the CHVs during their household visits and sensitisations, it can be acknowledged that the community became responsive to the benefits associated with skilled birth attendance (Shikuku et al 2020:4). The proportion of deliveries conducted by skilled birth attendants (SBAs), now known as skilled health personnel, in the intervention sites doubled (Shikuku et al 2020:4).

2.8 THEORETICAL FRAMEWORK – THE THREE DELAYS OF MATERNAL MORTALITY APPROACH

Notable empirical conceptual frameworks on factors specifically influencing maternal mortality and their related causes are the frameworks proposed by McCarthy and Maine and Thaddeus and Maine (Gebremedhin 2018:e0201990). McCarthy and Maine's framework on maternal mortality conceptualised determinants of mortality into three areas, namely, distant determinants, intermediate determinants and health determinants (Okwan & Kovács 2019:16). In their framework, the sequence of health outcomes involved pregnancy, implications, and disabilities (Okwan & Kovács 2019:16). The intermediate determinants comprised health status, reproduction status, access to health services, healthcare behaviour, use of healthcare services, and unknown and predicted factors (Okwan & Kovács 2019:16). The distant determinants were the socio-economic and socio-cultural status of the pregnant woman and her community (Filippi et al 2018:5). Despite the fact that the Thaddeus and Maine framework was developed a long time ago, it was found to still be relevant and inclusive of most determinants pertinent to maternal health outcomes in rural settings like Migori County (Agena 2018:16). It is estimated that approximately 80% of maternal deaths could be avoided if effective health measures were provided during birth and the first week of the postpartum period (Iqbal, Maqsood, Zakar, Zakar & Fischer 2017:5). Thaddeus and Maine proposed the determinants accountable for maternal mortality as three phases of delay from the beginning of maternal complication to receiving the appropriate treatment (Win et al2015:180). The basic premise of the model is that there are three phases of delays that interrupt a woman from receiving appropriate maternal healthcare and become the pertinent factors contributing to maternal death (Win et al 2015:180).

- First Delay – delay in decisions to seek care by pregnant women, their husbands, or other decision makers in their families.
- Second Delay – delay in arriving at a health facility after a decision is made to seek care.

- Third Delay – delay in receiving appropriate care after arriving at the health facility (Win et al 2015:180).

The “Three Delays” model is a useful conceptual and practical framework that can help identify where and when maternal deaths occur and the most appropriate actions on the pathway to preventing future maternal and infant deaths (Serbanescu, Goodwin, Binzen, Morof, Asiimwe, Kelly & Steffen 2019:50). A strategy designed to reduce the burden of each of these three delays that contribute to maternal deaths can help improve maternal survival (Serbanescu et al 2019:50). The three delays model was adopted to identify and explore the determinants of maternal mortality. In the present study, the first delay factors included factors such as socio-demographic and maternal health variables; maternal age, parity, marital status, educational level, residence, antenatal clinic attendance and gestation. The second delay factors informed analysis of factors such as affordability of care, availability of transport and distance to the hospital. The third delay factors of the model were used to help the researcher assess quality of care and availability of staff and equipment, mode of delivery, status of the baby at birth, mother’s status on admission, reasons for admission, timing of death since admission, stage of pregnancy on admission, stage of pregnancy at death, the reported cause of death and the contributing factors. Lastly the researcher developed a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya along the three-delay factor pathway.

2.9 CONCLUSION

In this literature review chapter, the researcher discussed current trends in maternal mortality from global, regional to national levels. Further discussed were maternal mortality’s causes, socio-economic determinants and healthcare system factors. Lastly, the chapter reviewed and presented strategies and interventions aimed at reducing the maternal mortality ratio internationally, regionally and nationally.

Emanating from the literature review is the fact that most global maternal mortalities are preventable, but in developing countries they are persistently high. Most mortalities are caused by hypertensive diseases, postpartum haemorrhage, infections, obstructed labour, ruptured uterus and unsafe abortion. Socio-economic determinants like education level, wealth index, residence terrain and urbanisation level contribute to most maternal deaths. Most proximal strategies discussed target the pregnancy continuum from family planning (*before pregnancy*), antenatal care, intrapartum care to postpartum care (*after pregnancy*). To reduce maternal deaths in Migori, Kenya, the literature advocates developing a context-specific strategy of care and improvement of social-economic services received by women along the pregnancy continuum.

The next chapter presents the research methodology procedures that were utilised in the current study.

CHAPTER 3

RESEARCH DESIGN AND METHOD

3.1 INTRODUCTION

The previous chapter discussed the literature review on which this chapter is based. This chapter presents the research design and methodological procedures that enabled achievement of the study's purpose and objectives. The purpose of this study was to investigate the determinants of maternal mortality and develop a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya.

The first section of the chapter describes the various research designs deemed to be appropriate for the study processes of data collection and analysis. The research approaches used were explanatory sequential mixed methods design, which has both quantitative and qualitative phases. The second section of the chapter discusses the research methods which in this thesis are the setting, population, sampling and sampling procedures, process and tools of data collection and data analysis. The various ways of ensuring validity and reliability in the quantitative aspect and ensuring trustworthiness under the qualitative method are fully described. The research ethics and ensuring the scientific integrity by considering the rights of the study institutions as well as those of the participants are presented.

3.2 RESEARCH APPROACH AND DESIGN

A research design is a plan, structure and strategy of investigation so conceived as to obtain answers to research questions or problems (Kumar 2012:95). An explanatory sequential mixed methods design was envisaged for this study. Such a design is characterised by an initial quantitative phase of data collection and analysis followed by collecting qualitative data (Polit & Beck 2017:312; Subedi 2016:574). A mixed methods design was appropriate as the present research questions on measurable

maternal deaths and sensitive past experiences of the participants could neither be answered by quantitative nor qualitative methods alone. In other words, the study questions were mixed in nature, that is, it had questions that needed quantitative answers as well as questions that needed qualitative information.

Further, this design informed the researcher what quantitative results needed further explanation using qualitative tools. Lall (2021:144) notes that, explanatory sequential mixed methods research is useful for strengthening the interview tools in the qualitative phase. To achieve this, the researcher added variables in the study tools during the qualitative phase that required clarification by the study participants. Through this, the evidence was enriched and it enabled questions to be answered more deeply (Lall 2021:144). Another value of an explanatory sequential mixed methods approach is its integration component (third phase). It has been found to be beneficial in providing confirmation of findings, more comprehensive data, increased validity and enhanced understanding of studied phenomena (Creswell & Creswell 2018:181). The researcher, obtained a more valid picture about maternal mortality in the selected hospitals by directly comparing the findings drawn from quantitative to those obtained from qualitative phase (Plano Clark & Ivankova, 2016). The summary of the integrated findings informed the development of a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya.

The sequence of phases started with the quantitative phase which was then explored further in the qualitative phase. The study was conducted in three phases as follows:

3.2.1 Phase 1: Quantitative approach

In this quantitative phase, priority is designated by uppercase and lowercase letters: QUAN/qual which designates a mixed methods study in which the dominant approach is quantitative (Polit & Beck 2017:311). Data was extracted from medical records of deceased women and those who survived post hospitalisation due to pregnancy and childbirth complications in the selected health facilities in Migori County between 1 January 2016 to 31 December 2019. Phase 1 addressed objectives 1 and 2, which

were to explore and describe the causes of maternal mortality and to explore and describe the socio-economic determinants contributing to maternal mortality in Migori, Kenya respectively.

3.2.2 Phase 2: Qualitative approach

The second phase utilised qualitative approach methods. This phase was conducted in two stages. Firstly, in-depth interviews were conducted with the midwives working in peripartum units of the selected hospitals and the second group was mothers in peripartum units who were currently hospitalised due to pregnancy and childbirth related complications. In this phase, objectives 3 and 4 were covered, namely, to analyse the current strategies that aim at reducing maternal mortality ratio (MMR) in Migori, Kenya and to explore and describe the socio-economic determinants contributing to pregnancy and childbirth related complications in Migori, Kenya respectively. The selection of the approach depended on the research problem, objectives, or research questions as it allows the benefits of both the quantitative and qualitative methods to answer research questions in this study (Creswell & Creswell 2018:180).

3.2.3 Phase 3: Integration of data from the quantitative and qualitative phases

The final phase was to integrate or link data from the two separate strands of data as described by Creswell and Creswell (2018:181). The researcher utilised study findings gathered from phase 1 and phase 2 to inform development of the envisaged strategy to reduce MMR in Migori, Kenya and in this regard Objective 5 was covered.

3.3 RESEARCH METHOD

A research method refers to the methods/techniques used to collect data for further analysis (Bhaskar & Manjuladevi 2016:647). It is the technical knowhow/techniques researchers use to collect the data for a specific study purpose (Bhaskar & Manjuladevi 2016:647). Methodological standards are followed to ensure that the evidence provided

is reproducible and reliable knowledge; it includes sampling, data collection, measurement validity, internal validity and external validity (Creswell & Creswell 2018:17). The specific research methods employed in the three phases are discussed next.

3.3.1 PHASE 1: QUANTITATIVE APPROACH

3.3.1.1 Study setting

According to Kumar and Oaks (2019:230), a research setting highlights salient characteristics of the study respondents' location and draws attention to any available relevant information regarding the study at hand.

Figure 3.1: A map of Migori County, Kenya

(Adapted from the Migori County Assembly 2022:1)

Migori is a county among the 47 counties in Kenya. Figure 3.1 shows a map of Migori County, located in the western region of Kenya. It borders Homa Bay County to the north, Kisii County to the northeast, Narok County to the east and southeast, Tanzania to the south and southwest and Lake Victoria to the west. It is one of 15 Counties that

account for over 60% of maternal deaths in Kenya with a maternal mortality ratio (MMR) of 673 deaths per 100 000 live births (AFIDEP 2017:3). The county has a population of approximately more than 1 034 289 and it is subdivided into eight sub-counties for administrative functions. They are Rongo, Awendo, Suna East, Suna West, Uriri, Nyatike, Kuria East, and Kuria West. The county has nine county hospitals, 10 private hospitals and 207 health centres. The researcher used purposive sampling to select four major referral hospitals within Suna East, Kuria West and Rongo sub-counties (KDHS 2020:2). The hospitals included three county referral hospitalsand one major private referral hospital. Maternal cases and participants (peripartum mothers and midwives) from the selected hospitals formed the study population.

3.3.1.2 Study population

A population is defined as elements (individuals, objects, events or substances) that meet the sampling criteria for inclusion in a study, which is sometimes referred to as the target population (Polit & Beck 2017:739). The study's population was retrospective document analysis of medical records of all deceased women (cases) and those who survived (controls) during pregnancy, childbirth and puerperium from 1 January 2016 to 31 December 2019 at the four hospitals in Migori County.

3.3.1.3 Case-control design

An unmatched case-control study design that was retrospective in nature was adopted for the quantitative phase. This design is a type of observational study commonly used to look back at factors associated with diseases or mortality (Tenny, Kerndt & Hoffman 2023:11). The case-control study started with a group of cases (in particular the deceased women), which are the individuals who have the outcome of interest. The researcher then constructed a second group of individuals called the controls (women who survived), who are similar to the case individuals but do not have the outcome of interest. Thereafter, the researcher analysed the pattern of determinants to identify if the deceased women were more exposed than those who survived (Dey, Mukherjee &

Chakraborty 2020:S57). The design was appropriate as numerous risk factors could be evaluated in case-control studies since they do not require large numbers of maternal deaths to be statistically meaningful. Additionally, the approach allows for the study of rare diseases and events such as a maternal mortality. Tenny et al (2023:3) explains that, if a disease occurs very infrequently, one would have to follow a large group of people for a long period of time to accrue enough incident cases to study (Gail, Altman, Cadarette, Collins, Evans, Sekula, Woodward et al 2019:2).

3.3.1.4 Sample and sampling procedures

3.3.1.4.1 Sample size

A sample size is one of the important parameters that require caution when planning to conduct research (Anthoine, Moret, Regnault, Sibille & Hardouin 2014:176). Rodriguez (2021:32-33) indicates that objectives of the study, the nature of the population, available resources, and the type of research design are among the issues that have to be considered to decide on the sample size. In mixed-methods research, it is important to look for the sample size that meets the requirements for both quantitative and qualitative research.

3.3.1.4.2 Sample size for quantitative research

As the goal of quantitative research is mainly to produce results that can be generalised to the whole population (Bryman 2016:163), a relatively large number of respondents is therefore crucial. However, this study utilised the entire population as maternal mortality is a relatively rare phenomenon because using some formula to draw samples would reduce the strength of this study (Agena 2018:89). To this end, the entire population was used to calculate the cases' sample size for the quantitative research. For the control sample size, the probability of exposure was set at 40% and the ratio of maternal deaths to survivors was 1:2. This was assumed from a retrospective audit of maternal conducted with detailed analysis of maternal deaths at a referral hospital in

Kenya (Yego, Stewart Williams, Byles, Nyongesa, Aruasa & D'Este 2013:2). Accordingly, the researcher purposively identified two controls for each case sampled in relation to the time and date of the maternal death outcome. A woman preceding and that succeeding the case that were discharged home were picked. The calculation of the respective samples was as follows:

3.3.1.4.2.1 Calculation of sample size for quantitative phase

According to Kenya Demographic and Health Survey (KDHS) estimates; there were 101 maternal mortalities in the four selected hospitals from 1 January 2016 to 31 December 2019 (KDHS 2020:2). The researcher first enumerated all 101 estimated cases using medical registers. For every maternal mortality case, two controls were selected. Having 101 cases and 202 controls, this resulted to 303 as the sample size for the quantitative phase (Table 3.1). Vandenbroucke and Pearce (2012:1480) explain a case-control method as an investigation to the extent in which persons are selected because they have a specific outcome (the cases) and comparable persons who do not have the outcome (the controls) and have been exposed to the disease's possible risk factors (delivery) in order to evaluate the risk factors that caused the outcome.

Table 3.1: Sampling frame (Phase 1)

Sampled hospital pseudonym		**Sample**
AA-County Hospital	Cases	67
	Controls	134
BB-Private Hospital	Cases	19
	Controls	38
CC-County Hospital	Cases	8
	Controls	16
DD-County Hospital	Cases	7
	Controls	14

Total	**N=303**

Table 3.1 shows an overview of how the study sample was selected from the hospitals in Migori County.

3.3.1.4.3 Inclusion criteria

- **Cases:** medical records of deceased women during hospitalisation due to pregnancy and childbirth complications in the selected health facilities in Migori County, Kenya during 1 January 2016 to 31 December 2019. A death occurred in pregnancy or within 42 days of its termination.
- **Controls:** medical records of the women who survived post hospitalisation due to pregnancy and childbirth complications in the selected health facilities in Migori County between 1 January 2016 to 31 December 2019. Hospitalisation should have occurred when the woman was pregnant or within 42 days of pregnancy termination between 1 January 2016 to 31 December 2019.

3.3.1.4.4 Exclusion criteria

- **Cases:** medical records of the deceased women during hospitalisation for reasons not related to pregnancy and childbirth complications; maternal deaths that occurred outside Migori County hospitals; all records of mortalities prior to 1 January 2016 and after 31 December 2019.
- **Controls:** medical records of the women who survived post hospitalisation outside Migori County; women hospitalised between 1 January 2016 to 31 December 2019 for reasons not related to pregnancy and childbirth complications; all records of hospitalisation prior to 1 January 2016 and after 31 December 2019.

3.3.1.5 Data collection

Data collection is the process of collecting information (data) related to research questions in a systematic way to address a research problem (Polit & Beck 2017:725). The researcher collected quantitative data from the medical records at the four selected hospitals' health records departments. The data collection phase was from 3 January 2022 to 6 August 2022. Its detailed procedure is discussed in the subsequent sections.

3.3.1.5.1 Data collection tool development

The tool (checklist) was developed from a publicly available maternal and perinatal death surveillance and response forms advocated by WHO (2022:32). The maternal death reporting form is part of a system of identifying maternal and perinatal deaths, reporting them to relevant actors, learning lessons from qualitative and in-depth root-cause analysis of the causes and circumstances surrounding these deaths (mortality review) (Russell, Tappis, Mwanga, Black, Thapa, Handzel, Moran et al 2022:3). The original checklistwas modifiedinline with the present research objectives and used to extract data from the medical records. For the reliability and validity of the tool see section 3.8. The present tool included the following sections (see the respective sections of Annexure B1):

Section A: Demographic data (*Religion, Age, Employment, Residence, Education and Marital status*).

Section B: Maternal patient's details and reproductive health status (*Gestational age, ANC-visits, History of previous caesarean section (C/S), Gravidity and HIV status*).

Section C: Intervention data (*Referral – case status, Place of delivery, Mode of delivery, Person who conducted delivery, Cause of death, Stage of labour at point death, Duration before death, Status of baby, Partograph use and Type of delay*).

3.3.1.5.2 Piloting

A pilot study was conducted in EE-County hospital within Migori County that was not among the four sampled in the main study; hence its data was excluded from the main study. On 3 February 2021, using the ethical clearance from UNISA Health Studies Research Ethics Committee, permission to collect data was granted from the administrative head of the EE-County hospital for a pilot study within Migori County. Subsequently, the researcher requested informed consent from the selected hospital for a pilot study from the archive manager before conducting the study (see respective Annexures C and E). The archive manager was further requested to sign the information letter of participation. The information letter contains a detailed summary of the study's purpose and ethical principles to be applied (seeAnnexure D).

The pilot study used a study checklist to collect data from medical records of 10 deceased women (cases) and 20 of the women who survived post hospitalisation (controls) (seeAnnexure B1). The medical records were accessed from the archive section within the health records department. In addition, the medical records for piloting were those registered prior to 1 January 2016.

In regard to consideration of the Covid-19 environment, the researcher first requested the archive manager to retrieve the files needed for the present pilot study and put them in a private room two days before the planned day for piloting (see Annexure F). The private room utilised was approximately 10 square metres, with air-conditioning allowing proper ventilation. Room surfaces and furniture were cleaned with 0.1% sodium hypochlorite disinfectant. At the entrance of the room there was an alcohol-based hand sanitizer to disinfect hands. The archive manager was requested to wear a surgical mask and wash hands before retrieving the files. On the day of the pilot study (7 February 2021) only the researcher accessed the private room while wearing a surgical mask. The researcher also washed hands before and after entering the room.

A pre-test is conducted to make sure that a new procedure works as planned (Price et al 2017:99). The data collected in the pre-test was analysed to determine whether it can lead to the achievement of the research objectives. Few flaws were identified on the sequence of the questions and one question on smoking/alcoholism was not answered in all the maternal mortality records. The researcher then modified the questionnaire content and sequence based on the pre-test findings. The data collection instrument was administered by the researcher. It enabled the researcher to estimate the time required to complete one questionnaire. This was approximately 21 minutes. The modified questionnaire was utilised to collect data in the actual study.

Even in a well-designed and controlled study, missing data occurs in almost all research (Hughes, Heron & Sterne 2019:1295). The most common approach to the missing data is to simply omit those participants (records) with the missing data and analyze the remaining data. This approach is known as the complete case (or available case) analysis or listwise deletion (Kang 2013:403). The medical records that had missing variables were dropped from the analysis, leaving only complete records. The researcher assumed that the observed complete records are a random sample of the originally targeted sample. However this assumption was only applied to the data set that had only a few missing observations. Whereas, the researcher omitted a variable that had large data sets of unrecorded information.

3.3.1.5.3 Data collection process

On obtaining ethical clearance from the UNISA Health Sciences Research Ethics Committee (see Annexure AA), permission to collect data was sought and granted from the Kenyan Ministry of Health and the respective administrative heads of the four sampled hospitals within Migori County (see Annexures A1, A2, A3 and A4). Thereafter the researcher requested signed informed consent from the respective four sampled hospitals' archive managers before conducting the study (see Annexures C and E). The archive manager was further requested to sign an information form which was approved by UNISA's Health Sciences Research Ethics Committee. The information form

contains a detailed summary of the study's purpose and ethical principles to be applied (see Annexure D).

The researcher used the medical registers to identify the files from which to collect data from the targeted facilities. The maternal mortality registers were used to identify cases (deceased women) while the maternity discharge register was used for controls (women who survived). All the cases within the register that met the study criteria were selected. A checklist was used to collect data from the selected files. For every single case, surviving women who were hospitalised immediately preceding and following the case were selected. Using the admission numbers from the two mentioned medical registers, files were retrieved from shelves in the health record department.

During the main study phase, only the researcher accessed the private room while wearing surgical masks. The researcher also washed hands before and after entering the room. With all permissions granted, the researcher utilised a study checklist to collect data from the medical health records department of the sampled hospitals. The study's checklist used was in soft copy format (Excel spreadsheet). The collected data was entered in an Excel spreadsheet after a close scrutiny on completeness and possible errors by the researcher. Data collected was then documented (information recorded) and kept safe in locked cupboards for confidentiality purposes to await quantitative data analysis processes.

3.3.1.6 Data analysis procedure

Data analysis is the process of systematically applying statistical and/or logical techniques to describe, illustrate, condense, recap and evaluate data (Creswell & Creswell 2018:293). The quantitative data was entered into the Statistical Package for Social Sciences (SPSS) version-23. Using descriptive statistics by percentage distribution tables the socio-demographic variables were analysed. Further, binary logistic regression was used to make inference of the maternal mortality determinants

by their odds ratio. The significance was set at p≤0.05 and 95% confidence interval (CI) in the analysis (see chapter 4).

3.3.2 PHASE 2: QUALITATIVE APPROACH

3.3.2.1 Study population

For the qualitative phase, the study population was composed of (1) 54 midwives working within the peripartum units in the sampled hospitals, and (2) 142 mothers in the peripartum units presently hospitalised due to pregnancy and childbirth complications within the sampled hospitals.

3.3.2.2 Sample and sampling procedures: qualitative phase

3.3.2.2.1 Sample size for the qualitative phase

A sample is the subset of the overall population the researcher wants to study and include in that study (Elfil & Negida 2017:5). Malterud, Siersma and Guassora (2016:1756) suggest that the sample for qualitative research should be based on the required information. Hence the study sample in this qualitative phase was not predetermined as it was based on the data saturation point. That is, when no new major data, themes or codes emerged in the next few interviews or observations (Vasileiou et al 2018:4).

3.3.2.2.2 Calculation of sample size for qualitative phase

The researcher utilised purposive sampling to enroll all midwives working in peripartum units of the four selected hospitals and all peripartum mothers presently hospitalised in the same facilities until saturation was achieved. Accordingly, data saturation was achieved with 103 participants of which 37 were midwives and 66 were peripartum mothers.

3.3.2.2.3 Inclusion criteria

- **Peripartum mothers:** currently hospitalised women due to pregnancy and childbirth related complications in the selected health facilities in Migori County.
- **Midwives:** working in peripartum units in the selected health facilities in Migori County with experience of more than a year within the department. Migori region faces high turnover rates of the health care providers as they seek greener pastures in developed cities. The majority of the healthcare work force in rural regions in Kenya is of low experience (Okoroafor, Kwesiga, Ogato, Gura, Gondi, Jumba, Asamani et al 2022:3).

3.3.2.2.4 Exclusion criteria

- **Peripartum mothers:** currently hospitalised after experiencing pregnancy and childbirth complications outside the selected health facilities in Migori County.
- **Midwives:** working outside peripartum units in the selected health facilities in Migori County with experience of less than a year within the maternity department.

3.3.2.3 Data collection

3.3.2.3.1 Development and testing of an instrument

The study used an in-depth interview guide as informed by the relevant reviewed literature. The literature tools considered were maternal and perinatal death surveillance and response forms advocated by WHO (2022a:32) and tools utilised in a previous Nepal study on policies and actions to reduce maternal mortality that are publicly available (Karkee, Tumbahanghe, Morgan, Maharjan, Budhathoki & Manandhar 2022:7). However, these standardized literature tools did not contain all the information needed for this particular study. Therefore the researcher modified some information to the original instruments. For example, the Nepal study's tools on policies and actions to reduce maternal mortality did not address information needed on

midwives' maternal mortality encounters and experiences. Further, the researcher added some variables from the quantitative data that needed elaboration and clarification using the interview guide.

The interview guide collected data from the midwives presently working in the peripartum units of the selected hospitals as well as women presently hospitalised due to pregnancy and childbirth related complications (see the respective Annexures B2 and B3). The midwives' in-depth interview guide tool developed in English had open-ended questions on each maternal health intervention the study analysed. Its sections discussed hospital staff capacity, pregnant women's care at antenatal, intrapartum, and postpartum stages, family planning. Additional items assessed respondents on hospital capacity to develop protocols and guidelines; to educate and communicate with the public about safe pregnancy; to develop training arrangements for its staff; and to monitor, evaluate and research maternal mortality (see Annexure B2). The peripartum mothers' in-depth interview guide developed in both English and Dhaluo included both closed and open-ended questions on the following items (see Annexure B3): Section A: Demographic data (*Religion, Age, Employment, Residence, Education and Marital status*). Section B: questions about the three delays of care.

3.3.2.3.2 Piloting

On 7 January 2022, a pilot study was conducted in EE-County Hospital within Migori County that was not among the four sampled in the main study. The data collection tools (interview guides) for the qualitative phase were piloted using 10 study participants for each of the two groups (midwives and peripartum mothers) of participants that were conveniently sampled (see Annexures B2 and B3). Analysis of the pilot study data was done to check the reliability and validity of the data collection tool. No modification of the interview guides was made upon analysing the pilot data collected. With all the needed ethical approvals, the researcher requested the nurse in charge of peripartum units to help him identify the required study participants.

In ensuring safety of the participants (peripartum mothers and professional midwives) in the context of Covid-19; the researcher requested for telephonic interviews with the volunteer sample participants (see Annexure F). To enable this, the researcher initially requested signed informed consent from the peripartum mothers and professional midwives who agreed to the study (see Annexure D). The participants were further requested for their telephone contact details and consent to be audio-taped (see Annexures C and E).

The researcher used audio-taped responses, for example of telephonic interviews, to virtually replicate the face-to-face interview in all the sampled study participants. A few (15%) study participants were unable to use technology or had no phones. In this particular group, a face-to-face interview was organised in line with Covid-19 safety guidelines. A private room within the peripartum unit was requested and utilised for in-depth interviews at the sampled facilities with the participants who voluntarily agreed to attend the interviews.

The researcher and the midwives were free from Covid-19 symptoms as guaranteed by routine daily screening of all persons that entered the hospitals (*also, they had all been fully vaccinated against Covid-19*). The midwives regarded as essential workers were reporting on duty daily according to their working shifts. The peripartum mothers were those presently hospitalised in the selected facilities after experiencing pregnancy and childbirth complications and only those free from Covid-19 symptoms as guaranteed by daily screening during care. Proper referrals were activated if presenting with at least one symptom upon screening. The study participants were health educated on Covid-19 prevention measures. These measures included: study participants covering of mouth and nose with a disposable tissue when coughing or sneezing and using the nearest waste receptacle to dispose of the tissue after use. Those with no disposable tissues were advised to cough or sneeze into their elbows. Each participant was reminded about measures of social distancing, not to touch their faces, and the new greeting etiquette of using elbows to greet.

To prevent Covid-19 spread, the researcher and participants maintained a space of about two metres apart. The researcher provided all participants with surgical masks. Both the researcher and the participants had surgical masks. The participants were assessed psychologically whether they were ready to do the interview as most health professionals and patients were anxious about the Covid-19 pandemic. All Covid-19 protocols were observed.

3.3.2.3.3 Data collection process: qualitative phase

The qualitative phase data collection commenced from 12 March 2022 to 16 May 2022. It unfolded as follows: The researcher, having received all the needed ethical approvals, requested the nurse in charge of the maternity department to help him identify the required study participants. Additionally, interview guides were used (see the respective Annexures B2 and B3).

In ensuring safety of the participants (peripartum mothers and professional midwives) in the context of Covid-19; the researcher requested telephonic interviews with the volunteer sampled participants (see Annexure F). To enable this, the researcher first requested signed informed consent from the peripartum mothers and professional midwives who agreed to the study (see Annexures C and D). The participants were further requested for their telephone contact details and consent to be audio-taped (see the respective Annexures C and E).

The researcher used audio-taped responses, for example telephonic interviews, to virtually replicate the face-to-face interview in all the sampled study participants. A few (15%) study participants were unable to use technology or had no phones. In this particular group a face-to-face interview was organised in line with Covid-19 safety guidelines (see Annexure F). A private room in the peripartum units was requested for the in-depth interviews at the sampled facilities with the participants who agreed to attend the interviews. The potential participants were given information about the study and requested to sign consent forms upon voluntarily agreeing to be interviewed. The

interview guides developed by the researcher through the use of relevant literature and validated by the supervisor were used to collect data. The researcher used the audio recorder and took notes to ensure the accuracy of all the data collected. Participants were assigned unique numbers for the purpose of anonymity. These numbers were used on the consent form as well. For the purpose of anonymity and confidentiality the audio recorder and notes were locked in a locker at the researcher's home and the consent forms were also be locked but separately from the audio and the notes. This data will be kept safe for five years after the thesis has been published.

3.3.2.4 Data analysis procedure: qualitative phase

Data analysis: For the qualitative data NVivo 11 software was used, which has the potential to draw rich insights from qualitative data. Content analysis using a qualitative approach was adopted to analyse data. Qualitative content analysis involves breaking down data into small units, coding and naming the units according to the content they represent, and grouping coded material based on shared concepts (Polit & Beck 2012:564). The data transcripts were synthesised, coded and organised into thematic domains. The researcher identified prominent themes and patterns. Thereafter the themes were categorised, and interpretation was made (see chapter 4).

3.3.3 Data management

The data was managed for both quantitative and qualitative phases of the study. Data for the quantitative phase was collected from the selected hospitals' health records departments in Migori County, Kenya. The collected data for the quantitative phase were entered in an Excel spreadsheet after a close scrutiny on completeness, accuracy and possible errors as well as clarity by the researcher. Data for the qualitative phase was collected from the midwives and hospitalised peripartum mothers in the study's selected hospitals. The hard copy data collection material was stored in a lockable cabinet only accessed by the researcher, while the electronic copy was stored on the researcher's personal computer in a password encrypted folder for confidentiality. The

aim was to prevent unauthorised access, thus ensuring that the data is kept confidentially.

The data for this study will be kept for a period of five years in line with Unisa's research data management policy. Thereafter, the data can be discarded with the approval of the appropriate university official if no query is laid against the study that demands prolonged keeping of the data. The quantitative data was sourced from the medical records of maternal cases (N=101) and controls (N=202) at the selected hospitals' health records departments in Migori County, Kenya, for the period 1 Jan 2016 to 31 Dec 2019. However, data collection for the quantitative phase was effectively from 3 January 2022 to 6 August 2022.

Data for the qualitative phase, generated from the in-depth interviews with the midwives and hospitalised peripartum mothers, was from 12 March 2022 to 16 May 2022.

3.3.4 PHASE 3: INTEGRATION OF THE FINDINGS OF QUANTITATIVE AND QUALITATIVE QUESTIONS

Objective: To develop a strategy to reduce the maternal mortality ratio (MMR) in Migori, Kenya.

Purpose of the strategy: The purpose of the strategy was to inform overall national maternal health policy making, planning, programming and interventions for reducing MMR in Migori, Kenya.

3.3.4.1 Development of a strategy

Based on integration of the results of phase 1 and phase 2 of the present study, the researcher developed a strategy for reducing MMR in Migori, Kenya (see Chapter 5). The identified determinants of maternal mortality and existing strategies for reducing MMR were analysed. Summary statements were made guided by the present study findings. For each summary, an interim strategy statement was formulated, and an intervention stated. Thereafter, review forms of the interim strategy statements were emailed to five reproductive health experts that were purposefully sampled for validation (see Annexure G). The reproductive health experts recruitment was as follows: The researcher requested a detailed list of reproductive health experts from Migori County Ministry of Health. The reproductive health experts were 21 and this formed the population group. A sample was selected from the population purposively based on the following considerations: they (1) were consultants in reproductive health, (2) had experience in policy formulation on maternal health, and (3) were managers in their respective organisations. Of the 21 reproductive health experts only 5 met the recruitment criteria of which all were included into the study. Similar peer review approach has been observed before research papers are published in a scientific journal (Tullu & Karande 2020:2). The editor usually invites (by email) three to five experts in the field of the research paper to review the manuscript. Peer review is primarily the assessment/evaluation of research by an expert in a particular field. It is a critical component of research validation and helps to maintain a high quality of published research (Tullu & Karande 2020:2). The reproductive health experts were oriented on the present study's purpose and protocols before participating in the review process. The researcher requested to be provided with feedback of the completed review and validation forms by email.

3.3.4.2 Validation of review forms

A recent systematic review recommends that for researchers to avoid research waste, implementability (acceptability, applicability, clarity, effectiveness, feasibility, relevance,

sustainability and validity) of strategies should be assessed, and enhancements made, during the evaluation stages of the development (Klaic, Kapp, Hudson, Chapman, Denehy, Story & Francis 2022:4). This would potentially accelerate their uptake into clinical practice (Klaic et al 2022:4). To enhance implementability of the present study, each strategy was validated based on the review forms developed by the researcher. The experts in maternal health reviewed the developed strategy by focusing on the following elements: acceptability, applicability, clarity, effectiveness, feasibility, relevance, sustainability and validity (see Annexure G). A strategic area was accepted in reference to the review comments and score ratings. An average score of >6 of a strategic area by all experts participating in the review was considered. Additionally, review comments were used to revise and improve the formulated strategy (see Chapter 5 for detailed results).

3.4 ETHICAL CONSIDERATIONS

The ethical considerations that need to be anticipated in academic research are extensive and they are reflected through the research process (Creswell & Creswell 2018:142).

3.4.1 Permission to conduct research

The researcher was granted permission of study ethical approval from the University of South Africa (UNISA). Using the ethical clearance from the UNISA Institutional Ethics Review Committee (IERC) (see Annexure AA), the researcher was further requested and granted permission from the study gatekeepers that included the Ministry of Health Migori County and administrative heads (see Annexures A1, A2, A3 and A4) of the respective sampled hospitals in the study. The three primary ethical principles on which standards of ethical research conduct were based were: beneficence, respect for human dignity, and justice (Polit & Beck 2017:134).

3.4.2 Beneficence

Beneficence imposes a duty on researchers to minimise harm and maximise benefits, Human research should be intended to produce benefits for participants or, more typically, for others (Polit & Beck 2017:134). In this research, the researcher ensured minimal risk during the process of the study through physical and psychological preparation of respondents before the actual data collection. Further, personal-identifiers of the study participants were annonymised. However, some respondents (midwives) were not freely open due to fear related to occupational vulnarability. Hence, they were requested to share their perpartum unit experiences rather than their personal experiences.

3.4.3 Respect for human dignity

Respect for human dignity: this principle includes the right to self-determination and the right to full disclosure (Polit & Beck 2017:135). In this research participants had the right to decide voluntarily whether to participate in the study and the researcher respected self-determination throughout the process of the study as well as privacy and confidentiality.

3.4.4 Justice

Justice in the context of research: the National Commission invoked the principle of justice in determining the fair selection of subjects (Kahn, Mastroianni & Sugarman 2018:59). In this research the researcher also applied the same types of assessment tools and methods for all participants irrespective of age group and sex and the study population was treated equally in the study.

3.4.5 Informed consent

The potential participant's choice (about participation) should be fully informed, free and

private and it should be recorded in writing, Justification should be given for any exceptions (Harriss, MacSween & Atkinson 2019:814). The researcher requested informed consent from study participants and the medical records department administrator of each respective hospital. The medical records administrator and the study participants were further requested to sign consent of participation forms (see respective Annexures C and D) which had been approved by the UNISA Institutional Ethics Review Committee (IERC). The consent form contained a detailed summary about the study purpose and ethical principles applied in this study. For the qualitative phase (phase 2), the study participants were requested to give their consent after receiving adequate explanation about the purpose, type of questions and how they could give their responses. They were also told about the significance of the study, that their anonymity was ensured, and about their right to withdraw from the study and not to answer questions whenever they felt uncomfortable (see Annexure D).

3.4.6 Voluntary participation

Participation by the hospital and the study participants involved in this study was voluntary. The hospital authorities or the study participants were free to withdraw from the study at any time with no penalty for doing so and without giving any reason (see Annexure C).

3.4.7 Benefits and risks

There were no direct benefits to the recruited cases (deceased women) or study participants (midwives, peripartum women) within the study. However, analysing their respective variables might help them learn more about maternal mortality determinants and further develop a strategy to mitigate maternal deaths in Migori County. Furthermore, there were no foreseeable risks involved in their respective participation (see Annexure D).

3.4.8 Confidentiality and anonymity

The collected data was only discussed with the supervisor. The study participants and medical records, for instance names and hospital admission/registration numbers, were not collected nor revealed during data collection. The researcher developed and assigned the study participants and medical records unique codes instead of using their names. The hard copy data collection material was stored in a lockable cabinet only accessed by the researcher while the electronic copy was stored on the researcher's personal computer in a password encrypted folder. Data was reported in aggregate form so that identity of the study participants and medical records was not revealed (see Annexure E).

3.4.9 Study tools handling in relation to Covid-19

In relation to Covid-19; the researcher washed hands and wore asurgical mask before and after handling all study tool forms. There were enough forms for each participant to get a copy. Sharing of the study tool forms among study participants was avoided. The study participants sanitized their hands before and after handling the study tools (see Annexure F).

3.5 ENSURING RIGOUR

Rigour is the striving for excellence in research and it requires discipline, adherence to detail and strict accuracy (Grove et al 2015:39). A more rigorous research process results in more trustworthy findings. Trustworthiness or rigour of a study refers to the degree of confidence in the data, interpretation and methods used to ensure the quality of a study (Connelly 2016:435).

3.5.1 Phase 1: Reliability and validity for the quantitative phase

In this quantitative phase of research, validity and reliability of the instrument are crucial for reducing errors that might arise from measurement problems in this research study (Connelly 2016:435).

3.5.1.1 Validity of the instrument

Validity explains how well the collected data covers the actual area of investigation (Taherdoost 2016:28). The research tools (checklists) were based on literature and pilot studies. They were assessed by the supervisor and maternal health experts on whether the tool's items measured the objectives of the study. The checklists were regarded valid if they accurately measured the independent variables in the study.

Validity has two dimensions; that is, internal validity and external validity (Mohajan 2017:58). A study is said to be high in internal validity if the way it was conducted supports the conclusion that the independent variable caused any observed differences in the dependent variable (Price et al 2017:67). The researcher achieved this through delimiting medical records and study participants whose characteristics were far removed from those to be recruited. This involved specifying strict inclusion and exclusion criteria, which has the effect of removing the confounding variables and retaining a relatively homogeneous group for comparison. A study is high in external validity if its results are transferable to other groups of interest (Mohajan 2017:59). As a general rule, studies are higher in external validity when the participants and the situation studied are similar to those that the researchers want to generalise to and participants encounter every day, often described as mundane realism (Price et al 2017:67). Using a mixed methods approach with a sample of 303 for the quantitative phase, that is N=303, the sample was statistically large. Further, the total population of maternal deaths formed the sampled cases hence its selection was without the researcher's discretion and bias. Therefore, the findings could undoubtedly be generalised to a similar setting.

3.5.1.2 Reliability of the instrument

Taherdoost (2016:33) holds that reliability concerns the extent to which a measurement of a phenomenon provides stable and consistent results. A test-retest reliability shows whether the same results are obtained with repeated administering of the same survey or consistency to similar study participants (Polit & Beck 2017:259). The checklist was tested on reliability using analysis of the pilot study results. To ascertain the reliability of the research instrument, a reliability analysis test was conducted and a Cronbach's alpha was determined (Taherdoost 2016:33). The pilot study results showed items that needed modification in the instruments before its use in the research areas. The researcher made the necessary corrections until it achieved an acceptable coefficient alpha of 0.9. Taherdoost (2016:33) indicate that, a Cronbach's alpha value of +8 or greater indicated that the tool was consistent enough. Although reliability is important for a study, it is not sufficient unless combined with validity (Taherdoost 2016:33). In other words, for a test to be reliable, it also needs to be valid (Taherdoost 2016:33).

3.5.2 Phase 2: trustworthiness for the qualitative phase

Athanasou et al (2012:140) cite Perakyla as defining trustworthiness as the way in which data iscollected, sorted and classified. On the other hand, Lincoln and Guba (1985) cited by Du Plooy-Cilliers et al (2014:258) note that trustworthiness embraces credibility, dependability, confirmability and transferability.

3.5.2.1 Credibility, dependability, confirmability and transferability

According to Renjith et al (2021:8), ***credibility*** is used to assess the extent to which the research findings convincingly describe the phenomenon being researched. Du Plooy-Cillers et al (2014:258) explain credibility as precisely how the researcher interpreted the data that was collected. In this study, credibility of the findings was ensured through using purposive sampling to ensure that only those participants who had first-hand

knowledge of the phenomena under investigation actually became the primary informants. Further,the researcher conducted member checking upon analyzing the qualitative approach. An interview was scheduled with 9 respondents selected randomly from the initial 37. The researcher shared a summary of the data with them (during the interview) to check for accuracy and resonance with their experiences, of which they confirmed to be accurate.

Transferability refers to the specific context in which the findings occur, with sufficient background and context details provided by the study for readers to determine whether the conclusions can be transferred to other environments or situations (Krukowski et al 2018:11). The researcher provided a “thick description” of details on the context in which the research was carried out, its setting, sample, sample size, sample strategy, demographics of participants, inclusion and exclusion criteria, interview procedure and tools, changes in interview questions based on the iterative research process, and excerpts from the interview guide. This detailed description enables the transferability of this study on the future studies done in similar contexts (Clark & Ivankova 2016:163).

Dependability, on the other hand, is like reliability and replicability in quantitative research. It is the ability of the researcher to depict the entire research process in a way that others can understand and follow to reproduce the same research in similar or different settings. Athanasou et al (2012:140) cite Borman, Lecompte and Goetz (1984) as stating that dependability (or consistency) is the stability or consistency of the research process and methodology over time. In this study, dependability was assured through addressing research questions that were wholly consistent with the specified research purpose. The use of audio-recorded interview transcripts and functional audio recording devices addressed distortions or inadequacy in portraying phenomena as expressed by the participants.

According to Brink et al (2018:127), **confirmability** ensures that the findings, conclusions and recommendations are congruent with the data collected. The authors further state that the researcher’s interpretation and the actual evidence should be in

harmony. After comprehensively describing the data gathering and data analysis steps, the researcher reported the conclusions in detail and linked these conclusions to the data analysis.

Authenticity refers to the extent to which researchers fairly and completely show a range of different realities and realistically convey participants' lives (Polit & Beck 2017:416). For this study, findings of the in-depth interviews were supported with quotations from study participants to ensure authenticity.

3.6 CONCLUSION

The study design and the research method as well as data analysis techniques were presented in this chapter. An explanatory sequential mixed methods design was employed to conduct the study.

The research methods such as the population, sampling, sampling techniques, data collection, data analysis for each of the quantitative and qualitative phases were discussed in this chapter. In addition, the validity and reliability, ensuring trustworthiness of the measurement instrument and ethical considerations were described.

In the following chapter, Chapter 4, the results of the study will be presented.

CHAPTER 4

ANALYSIS, PRESENTATION AND DISCUSSION OF THE RESEARCH RESULTS

4.1 INTRODUCTION

This chapter describes the results and discusses the findings of the study. The chapter presents the quantitative results (Phase 1) followed by qualitative results (Phase 2). The results for each of the phases are presented in two main sections. The first section is the sample demographics about the study maternal medical records or respondents and the second section is the presentation of the research findings from both quantitative and qualitative research phases.

The research findings are presented in such a way that they are linked to the achievement of the study's objectives. The chapter commences with presenting the aim and objectives of the study. The procedure followed to analyse the data is presented as an introduction to the chapter.

4.2 THE AIM AND OBJECTIVES OF THE STUDY

The purpose of this study was to investigate the determinants of maternal mortality and develop a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya. The research objectives were as follows:

Phase 1: Quantitative

- To explore and describe the causes of maternal mortality in Migori, Kenya.
- To explore and describe the socio-economic determinants contributing to maternal mortality in Migori, Kenya.

Phase 2: Qualitative

- To analyse the current strategies that aim at reducing the maternal mortality ratio (MMR) in Migori, Kenya.
- To explore and describe the socio-economic determinants contributing to pregnancy and childbirth related complications in Migori, Kenya.

Phase 3: Integration of the findings of quantitative and qualitative phases

- To develop a strategy to reduce MMR in Migori, Kenya.

The first, second, third and fourth objectives are addressed in this Chapter 4, while the fifth objective will be covered in the subsequent Chapter 5.

As mentioned in Chapter 3, a mixed methods approach using an explanatory sequential mixed methods design was used to achieve the study objectives.

4.3 DATA ANALYSIS

The quantitative data was entered into the IBM SPSS Statistics 23, a statistical package for the social sciences. Using descriptive statistics by percentage distribution tables the socio-demographic variables were analysed. A medical record that had missing data on a variable of interest was omitted in the general descriptive presentations (see section 3.3.1.5.2 piloting phase). Binary logistic regression was used to make inference of the maternal mortality determinants by their odds ratio. The significance was set at $p \leq 0.05$ and 95% confidence interval (CI) in the analysis. The researcher conducted the analysis in consultation with an expert biostatistician. The result of this binary logistic regression was crude odds ratio that quantified the strength of this association between each potential determinant and maternal mortality occurrence (Polit & Beck 2017:512). Independent variables having a p-value 0.05 or less in binary logistic regression were analysed again by the multiple logistic regression analysis (Ranganathan, Pramesh &

Aggarwal 2017:149). The rationale of multiple logistic regression analysis was to control the confounding effect of the independent variables by analysing the impact of each variable on the probability of the occurrence of maternal mortality. The result of this analysis was adjusted odds ratio. Study variables that had an odds ratio of two or more after adjusting for confounding factors and a p-value of less than 0.05 were considered significantly associated with the maternal mortality. To this end, the results of the multivariate analysis showed several independent variables. These included the following main predictors for having a maternal mortality: Education, Marital, Gravidity, HIV and Referral case (see table 4.11).

The qualitative data was analysed through the use of NVivo 11 software as the latter has the potential to draw rich insights from qualitative data. Content analysis using a qualitative approach was adopted. First the researcher listened to the audio recorded data repetitively, checked for completeness, familiarised himself with it, and transcribed it. Accordingly, the data transcripts were synthesised, coded and organised into thematic domains. The researcher identified prominent themes and patterns. Thereafter the themes were categorised and interpreted. Direct quotations were presented to strengthen the research argument.

4.4 RESEARCH RESULTS

The first section for each of the quantitative and the qualitative phases presents the description of the reviewed maternal medical records as well as the profile of the participants respectively, followed by results of the study to respond to its objectives. The quantitative phase is presented first.

4.4.1 Findings of Phase 1: Quantitative

The quantitative data was analysed and presented based on the objectives order. Causes of maternal mortality were presented followed by the socio-economic determinants. The determinants sub-headings were (see Annexure B1): Demographic

data, mother's details and reproductive health status cover the following aspects: *Gestational age, ANC-Visits; History of Previous C/S; Gravidity and HIV status*. The intervention data is also presented and covers the following aspects: *Referral – case status*; *Place of delivery*; *Mode of delivery; Person who conducted delivery; Stage of labour at point death; Duration before death; Status of baby; Partograph use and Type of delay*.

4.4.1.1 The causes of maternal mortality in Migori, Kenya.

4.4.1.1.1 Maternal mortality trends in four Migori hospitals, 2016-2019

Table 4.1 presents a summary of the four hospitals' maternal mortality trends from 1 January 2016 to 31 December 2019 in Migori County. Most maternal deaths (67) were recorded in AA-County Hospital, followed by BB-Private Hospital (19), CC-County Hospital (8) and lastly 7 in DD-County Hospital. The table further reveals an increase in the trend of maternal deaths in the four hospitals from 15 in 2016 to 32 in 2019 with a persistently high institutional maternal mortality ratio (iMMR).

Table 4. 1: Number of the reviewed cases per hospital (N=101)

Pseudonym		**2016**	**2017**	**2018**	**2019**	**Total**
AA-County Hospital	Maternal deaths	11	18	16	22	67
	Live births	4 037	1 909	4 708	4 110	
	iMMR	272.5	942.9	339.8	535.3	
BB-Private Hospital	Maternal deaths	3	4	6	6	19
	Live births	1 207	1 731	1 053	1 423	
	iMMR	248.6	231.1	569.8	421.6	
CC-County Hospital	Maternal deaths	0	1	4	3	8
	Live births	1 379	631	1 273	1 134	
	iMMR	0	158.5	314.2	264.6	

DD-County Hospital	Maternal deaths	1	2	3	1	7
	Live births	748	470	1 149	956	
	iMMR	133.7	425.5	261.1	104.6	
Total	**Maternal deaths**	**15**	**25**	**29**	**32**	**101**
	Live births	7 371	4 741	8 183	7 623	27 918
iMMR		203.5	527.31	354.39	419.78	Av.**376.2**

Specifically, the iMMR of the four hospitals was as follows; 203.5/100 000 live births in 2016, 527.31/100 000 live births in 2017, 354.39/100 000 live births in 2018, and 419.78/100 000 live births in 2019. According to the WHO (2022a:4), the iMMR is calculated by dividing recorded maternal deaths in health facilities by total recorded live births in health facilities in the same period and multiplying by 100 000. The iMMR expresses obstetric risk, or a woman's chances of dying from a given pregnancy, while maternal mortality rate (MMR) is the number of maternal deaths per 1 000 women of reproductive age (usually 15–49 years). This is an indicator of the risk of maternal death among women of reproductive age and provides an indication of the burden of maternal death in the adult female population (Patwardhan, Eckert, Spiegel, Pourmalek, Cutland & Kochhar 2016:6077). The average iMMR in the four-year period was 376.2/100 000 live births. The present study's iMMR is higher when compared to the Central Kenya region trends. The iMMR in Central Kenya were: 127/100 000 live births in 2008/09; 124/100 000 live births in 2009/2010; 129/100 000 live births in 2010/2011 and 111/100 000 live births in 2011/2012 (Muchemi et al 2016:2).

4.4.1.1.2 Cause of maternal deaths

Pregnant mothers in Migori County, Kenya, like in most parts of Sub-Saharan Africa, are vulnerable to pregnancy-related complications. These complications are grouped into direct and indirect causes of mortality (Baharuddin et al 2019:60). Direct causes that are related to obstetric complications during pregnancy, labour or the postpartum

period contribute to higher mortalities in developing nations. Some examples include haemorrhage, hypertensive disorders and sepsis (Baharuddin et al 2019:60).

Table 4. 2: Percentage distribution of cause of death of the reviewed maternal records

VARIABLE		CASES N=101		CONTROLS N=202	
		Number	Percentage (%)	Number	Percentage (%)
Illness	Haemorrhage	35	34.7	11	5.5
	Eclampsia/Hypertension	21	20.8	9	4.5
	Sepsis	16	15.8	4	2.0
	Ruptured uterus	7	6.9	0	0
	Anaemia	6	5.9	8	4.0
	Heart disease	1	1.0	0	0
	Any other	15	14.9	5	2.5
	Normal Labor (No illness)	0	0	165	81.7

Table 4.2 shows that pregnancy complications that affected most women were haemorrhage 35(34.7%) cases and 11(5.5%) controls, 21(20.8%) cases and 9(4.5%) controls suffered from eclampsia (20.8%), while 16(15.8%) cases and 4(2.0%) controls had sepsis. This was followed by anaemia 6(5.9%) cases and 8(4.0%) controls. ruptured uterus and heart disease was recorded among 7 (6.9%) cases and 1(1%) cases respectively. Also, 15(14.9%) cases and 5(2.5%) controls had complications that were not specifically listed on the study's checklist that was used to collect data. Majority of the controls 165(81.7%) had no illness at the point of discharge. The reason noted on the maternal medical records for hospitalization of this group was normal labor. These findings are in line with those of a systematic review of studies published from 2015 to 2020 in 57 SSA countries (Musarandega et al 2021:7). In the review,

obstetric haemorrhage was the leading group of maternal mortality causes, with a proportion of 28.8% of the deaths, followed by hypertensive disorders in pregnancy (22.1%), non-obstetric complications (18.8%), and pregnancy-related infections (11.5%) (Musarandega et al 2021:7).

4.4.1.2 The socio-economic determinants contributing to maternal mortality in Migori, Kenya.

4.4.1.2.1 Religion

Religion is a multidimensional construct that includes beliefs, behaviors, rituals, and ceremonies that may be held or practiced in private or public settings, but are in some way derived from established traditions that developed over time within a community (Hordern 2016:589).

Table 4. 3: Percentage distribution of religion of the reviewed maternal records

VARIABLE		**CASES N=101**		**CONTROLS N=202**	
		Number	**Percentage (%)**	**Number**	**Percentage %)**
Religion	Christian	94	94.9	185	91.6
	Muslim	5	5.1	17	8.4
	Not recorded	2	-	-	-

Judaism, Christianity, Islam, Hinduism and Buddhism are five of the great religions of the world (Hordern 2016:589). The study observed only two religious groups from the reviewed secondary data of maternal medical records. Table 4.3 illustrates that most 94(94.9%) cases and 185(91.6%) controls were Christians while only 5(5.1%) cases and 17 (8.4%) were Muslims. Similarly, the Kenya Demographic and Health Survey (KDHS) (2020:2) indicate that the vast majority of Migori- residents are Christians, and

the Anglican and Roman Catholic Churches are the most established Christian denominations.

4.4.1.2.2 Age

Regarding maternal age as observed from the maternal medical records, 47(46.5%) cases and 86(42.5%) controls were between 21 to 29 years old, 27(26.7%) cases and 34(16.8%) controls were below 20, 24(23.7%) cases and 82(40.6%) controls were 30-39 while only 3(2.9%) cases were 40-49 years old (Table 4.4).

Table 4. 4: Percentage distribution of age of the reviewed maternal records

VARIABLE		CASES N=101		CONTROLS N=202	
		Number	Percentage (%)	Number	Percentage %)
Age	21−29	47	46.5	86	42.5
	Below 20	27	26.7	34	16.8
	30−39	24	23.7	82	40.6
	40−49	3	2.9	0	0

Black et al (2016:6) indicate that women at the extreme ends of the reproductive age range (younger than age 20 years and older than age 35 years) have a higher risk of dying due to both physiological and socio-cultural reasons; but the largest number of deaths might be in the middle group, because this is when most births occur (Black et al 2016:6).

4.4.1.2.3 Employment status

Figure 4.1 demonstrates that 45(44.6) of the cases and 75(37.1%) controls were unemployed, 38(37.6%) cases and 76(37.6%) controls were in informal employment,

while 18(17.8%) cases and 51(25.2%) controls were formally employed. Literature indicates that, unemployed or informally employed women are likely to face challenges to afford the direct and indirect cost associated with pregnancy care (Karkee et al 2021:7).

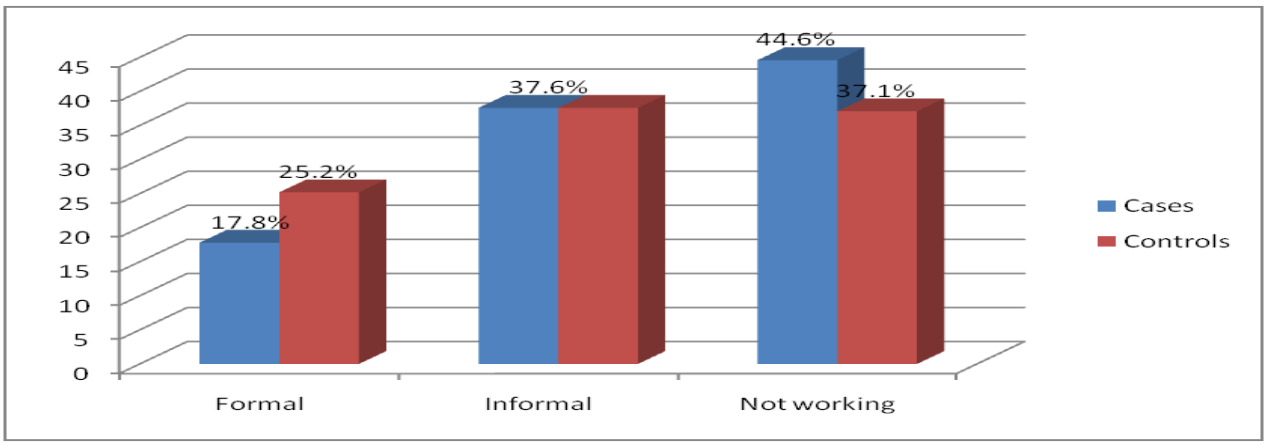

Figure 4. 1: Percentage distribution of employment status of the reviewed maternal records

It is argued that the fear of cost and lack of money can deter mothers from seeking treatment from higher level hospitals or reaching there on time (Karkee et al 2021:7). For instance, a case in a Nepal study spent a whole night and day in pain at home before going to hospital after managing to obtain some money (Karkee et al 2021:7).

4.4.1.2.4 Residence

According to Figure 4.2, most cases 69(68.3%) and 96(47.5) controls were from rural regions, 22(21.8%) cases and 90(44.5) controls were from urban areas. While 10(9.9%) cases and 16(7.9%) controls were from informal settlements.

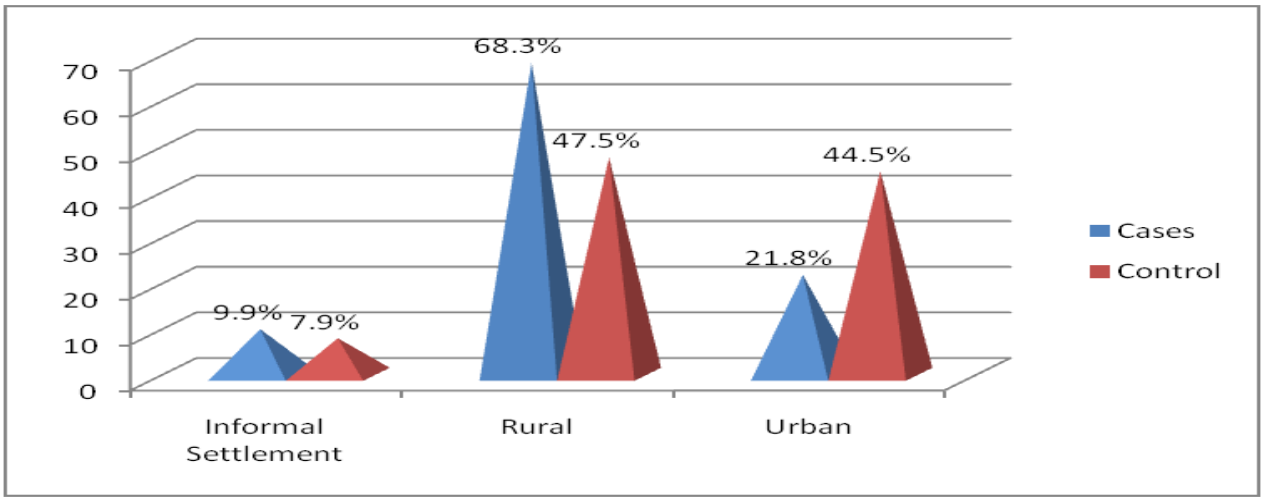

Figure 4. 2: Percentage distribution of residence of the reviewed maternal records

Correspondingly, in Thailand a community-based verbal autopsy noted that of 863 maternal deaths, most (82%) of the cases were from rural areas (Win et al 2015:179). Therefore, distance and time taken to reach the nearest health centre and hospital showed significant association with the delay to decide and delay to get to the hospital (Win et al 2015:179).

4.4.1.2.5 Education level

As illustrated in Table 4.5, most 45(44.6%) of the cases and 73(36.1%) controls had a primary level of education, 33(32.7%) cases and 54(26.7%) controls had secondary while 10(9.9%) cases and 61(30.2%) controls had attained tertiary education. Of the reviewed medical records, 13(12.9%) cases and 14(6.9%) controls had no formal education.

Table 4. 5: Percentage distribution of educational level of the reviewed maternal records

VARIABLE		CASES N=101		CONTROLS N=202	
		Number	Percentage (%)	Number	Percentage (%)
Education	Primary	45	44.6	73	36.1

	Secondary	33	32.7	54	26.7
	Tertiary	10	9.9	61	30.2
	No education	13	12.9	14	6.9

More educated mothers are likely to have better knowledge for understanding danger signs and birth preparedness and hence are prompt in seeking care to avoid first maternal care delays compared to their counterparts (Win et al 2015:179). Similarly, a retrospective observational study of all maternal deaths that occurred in a tertiary Nigerian hospital showed that 22 (42.3%) of the cases had no formal education (Akaba et al 2021:e0244984).

4.4.1.2.6 Marital status

Regarding Table 4.6, most 72(71.3%) of the cases and 166(82.2%) controls were married, 22(21.8%) and 28(13.9%) controls were single, while 7(6.9%) cases and 8(4.0%) controls were divorced.

Table 4. 6: Percentage distribution of marital status of the reviewed maternal records

VARIABLE		**CASES N=101**		**CONTROLS N=202**	
		Number	**Percentage (%)**	**Number**	**Percentage (%)**
Marital Status	Married	72	71.3	166	82.2
	Single	22	21.8	28	13.9
	Divorced	7	6.9	8	4.0

4.4.1.2.7 Gestational age

Table 4.7 below shows that of the 101 cases 57(56.4%) were at 37 to 42 weeks of gestational age while 42(41.6%) were below 37 weeks and only 2 (2%) were above 42 weeks. Of the 202 controls, 132 (65.3%) were 37-42 weeks of gestation, 70(34.7%) were below 37 weeks while nil was above 42 weeks.

Table 4. 7: Percentage distribution of gestational age of the reviewed maternal records

VARIABLE		**CASES N=101**		**CONTROLS N=202**	
		Number	**Percentage (%)**	**Number**	**Percentage (%)**
Gestational age in weeks	37−42	57	56.4	132	65.3
	Below 37	42	41.6	70	34.7
	Above 42	2	2.0	0	0

4.4.1.3 Maternal details and reproductive health status

This section reported the maternal and reproductive health status such as attendance of ANC, history of previous caesarean section (C/S), gravidity level and HIV status

4.4.1.3.1 Attendance of ANC

The study examined ANC attendance in the site. According to Table 4.8 below, most cases and most controls, that is 76(80.9%) and 184(91.1%) respectively at least attended ANC and only 18(19.1%) cases and 18(8.9%) controls did not attend ANC.

Table 4. 8: Percentage distribution of ANC attendance of the reviewed maternal records

VARIABLE		CASES N=101		CONTROLS N=202	
		Number	Percentage (%)	Number	Percentage (%)
ANC	Yes	76	80.9	184	91.1
	No	18	19.1	18	8.9
	Unrecorded	7	-	0	-

Birth preparedness and complication readiness are among the important components of ANC to reduce maternal morbidity and mortality as a result of severe complications (Mengist et al 2021:6). The present study's findings maybe explained from the point of view that women with high-risk pregnancies receive ANC while women with low-risk pregnancies do not book for ANC (Mohammed et al 2020:4). One could also conclude that mothers attended the ANC visits because it was a free service in the study setting (Afulani et al 2019:10).

4.4.1.3.2 History of previous caesarean section (C/S)

As illustrated in Table 4.9, the majority 84(84.8%) of the cases and 168(83.2%) controls had no history of C/S, as opposed to 15(15.2%) cases and 34(16.8%) controls.

Table 4. 9: Percentage distribution of history of previous C/S of the reviewed maternal records

VARIABLE		CASES N=101		CONTROLS N=202	
		Number	Percentage (%)	Number	Percentage (%)
history of	No	84	84.8	168	83.2

C/S	Yes	15	15.2	34	16.8
	Unrecorded	2	-	0	-

In a multi-country study that was conducted in Lebanon, Peru, Pakistan, VietNam, Jordan, Sri Lanka, Ecuador, China, Qatar, Palestinia, Thailand, Argentina, Kenya, Philippines, Mongolia, Congo, Japan, India, Uganda, NPL = Nepal, Nigeria, Angola, Cambodia, Nicaragua, Niger and Afghanistan; researchers observed no significant mortality risk among women of prior C/S when compared to the spontaneous vertex delivery (SVD) group (Kietpeerakool, Lumbiganon, Laopaiboon, Rattanakanokchai, Vogel & Gülmezoglu 2019:2). However, these researchers noted that a previous C/S was significantly associated with increased risks of uterine rupture, morbidly adherent placenta, MNM, severe maternal outcomes, and placenta previa (Kietpeerakool et al 2019:2). Based on literature, one could argue that, the 15(15.2%) cases and 34(16.8%) controls that had C/S history were more vulnerable to pregnancy complications such as uterus rupture.

4.4.1.3.3 Gravidity level

Regarding Figure 4.3, the gravidity of most of the women 43(43.6%) cases and 87(43%) controls was less than 2: 23(22.8%) cases and 23(11.4%) controls had been pregnant more than 7 times. While 19(18.8%) cases and 22(10.9%) controls 5-6 times. Lastly, 15(14.9%) cases and 70(34.7%) controls had been pregnant 3-4 times. This could suggest that most women that visited the selected hospitals were 1-4 times pregnant.

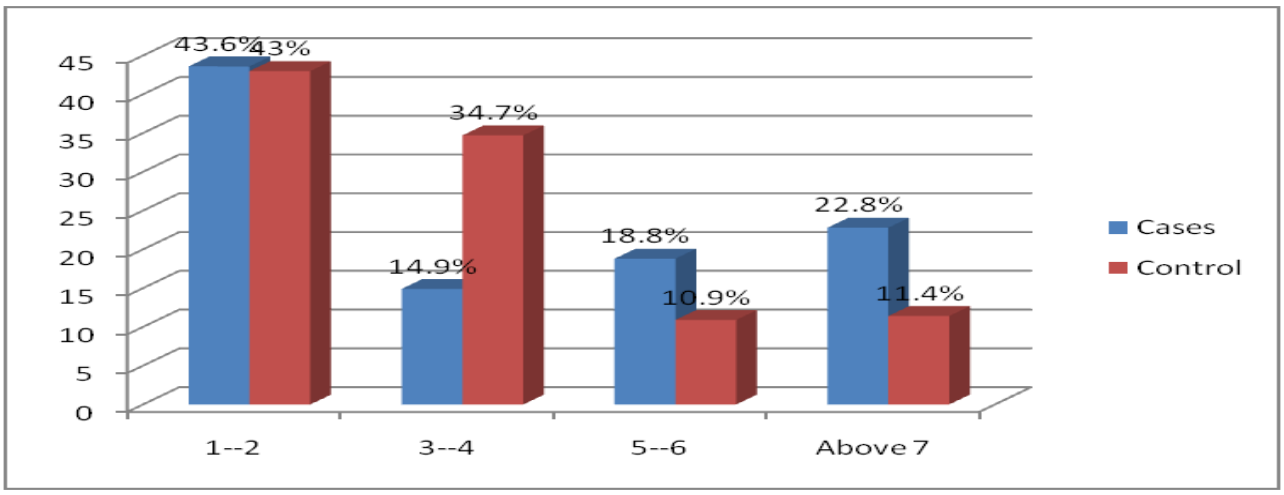

Figure 4. 3: Percentage distribution of gravidity of the reviewed maternal records

Yemane and Tiruneh (2020:1125), in an Ethiopian prospective cross-sectional study, observed that the odds of maternal near misses among primiparous and multiparous women were twice as high when compared with nulliparous women (Yemane & Tiruneh 2020:1126). Women in their first pregnancies have longer duration of labour while women with multiple pregnancies are more likely to suffer postpartum haemorrhage (Black et al 2016:6).

4.4.1.3.4 HIV status

According to Figure 4.4, women whose HIV test was non-reactive were 66(65.3%) cases and 161(79.7%) controls while 16(15.8%) cases and 35(17.3%) controls were reactive. Women who were reactive were associated with negative health outcomes, including increased risk of intrauterine infection (MHTF 2022:3).

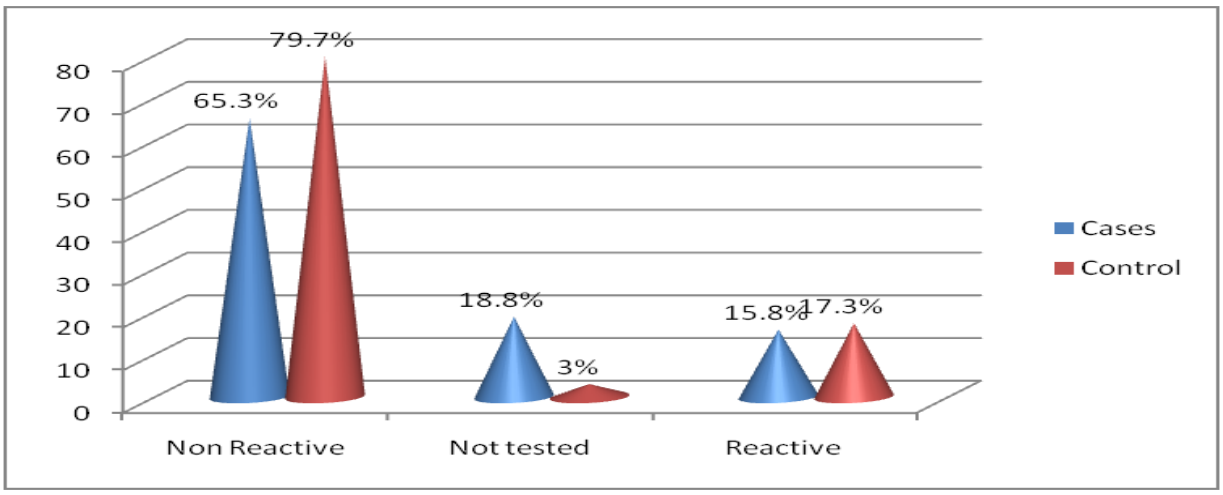

Figure 4. 4: Percentage distribution of HIV status of the reviewed maternal records

Lathrop et al (2015:216) suggest that there is an increased risk of mortality from both puerperal sepsis, especially after caesarean delivery, and abortion-related sepsis among HIV-infected women (Lathrop et al 2015:216). Of the reviewed medical records, 19(18.8%) cases and 6(3%) controls did not reflect the HIV test results, implying that they were not tested during hospitalisation. One could conclude that it is a gap in patient assessment/care, or the cases never conceded to the test when hospitalised.

4.4.1.4 Intervention data

This section reported the intervention data such as Referral case status; Place of delivery; Mode of delivery; Person who conducted delivery; Stage of labour at point death; Duration before death/discharge; Status of baby; Partograph use and Type of delay.

4.4.1.4.1 Referral status

A referral means the case or control was transferred from a lower-level hospital to the current higher-level facility for further management. Figure 4.5 demonstrates that most (66.3%) of the cases were referrals as opposed to 33.7% of the cases. Contrarily,

majority 120(59.4%) controls were non referred mothers compared to 82(40.6%) controls.

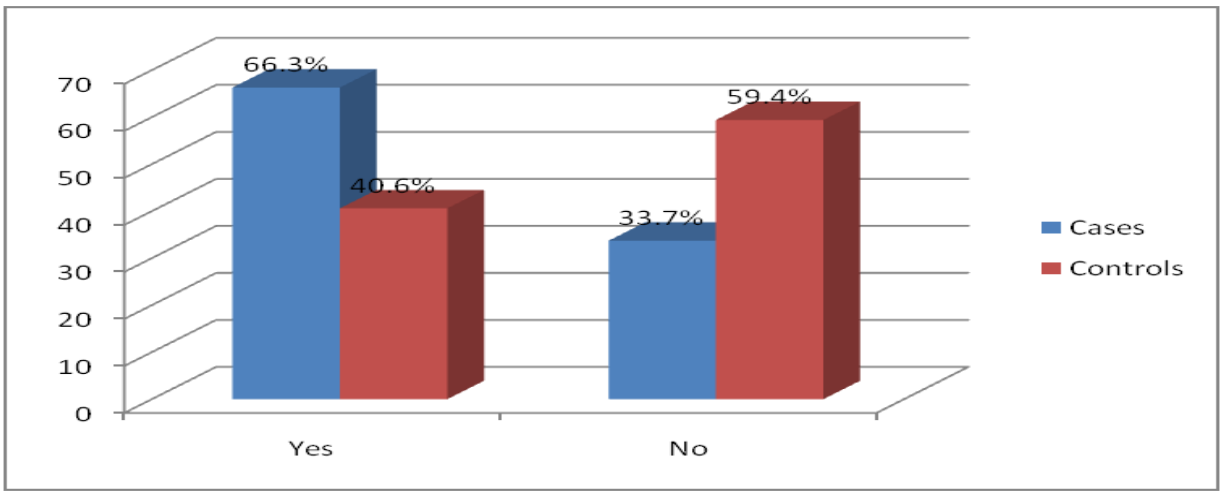

Figure 4. 5: Percentage distribution of referral status of the reviewed maternal records

The present findings are similar to those of a Ugandan study conducted to estimate the risk of maternal death at admission (Alobo et al 2022:5). Researchers noted that women who were referred from other health centres and hospitals were at a higher risk of dying than non-referred patients (Alobo et al 2022:5).

4.4.1.4.2 Place of delivery

As illustrated in Figure 4.6, most of the women 93(92.1%) cases and 198(98%) controls delivered in hospital while 8(7.9%) cases and 4(2%) controls had home deliveries. Literature recommends hospital deliveries as women with home deliveries face higher risk factors associated with lack of skilled care during pregnancy complications (Abebe et al 2021:e0254146).

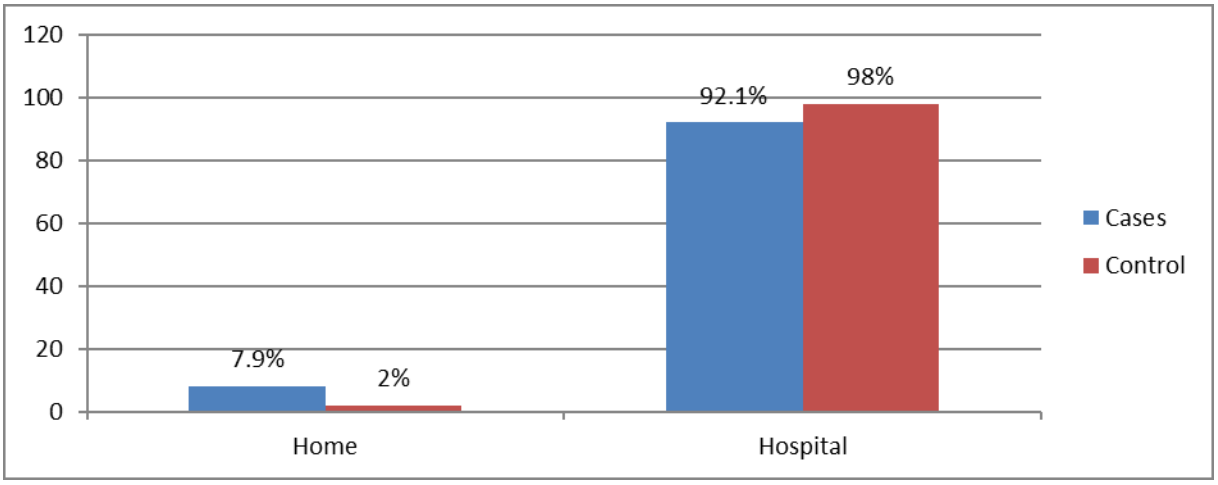

Figure 4. 6: Percentage distribution of place of delivery of the reviewed maternal records

A population-based longitudinal study in Northern Ethiopia indicated that women giving birth at health institutions compared to home deliveries could prevent maternal deaths through getting skilled birth attendance, drugs to address labour complications, and referrals to more advanced health institutions (Abebe et al 2021:e0254146).

4.4.1.4.3 Mode of delivery

Regarding mode of delivery of the cases, 45(44.6%) cases and 52(25.7%) controls had a C/S, 39(38.6%) cases and 81(40.1%) controls had SVD, 1(1%) cases had vacuum assisted delivery, while 16(15.8%) cases and 69(34.2%) controls cases had not yet delivered at time of death or discharge from the hospital respectively (Figure 4.7). Gupta and Saini (2018:QE01) explain that maternal haemorrhage after C/S, pre-eclampsia, complications of anaesthesia, sepsis and embolism are associated with higher fatality rates than vaginal birth.

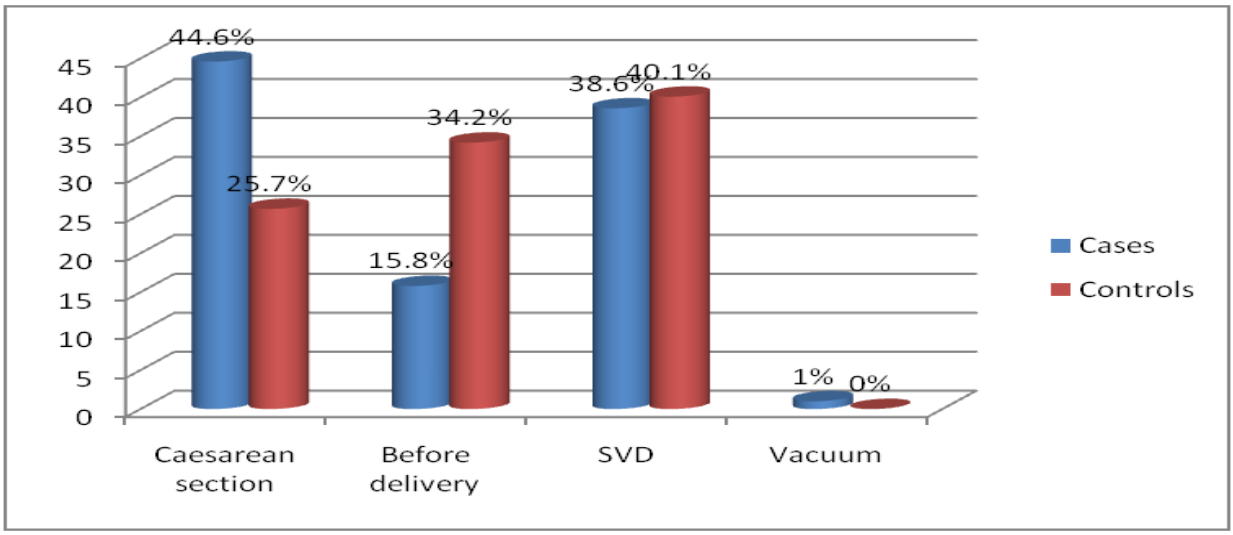

Figure 4. 7: Percentage distribution of mode of delivery of the reviewed maternal records

4.4.1.4.4 Person who conducted the delivery

As demonstrated in Figure 4.8, most women 49 (48.5%) cases and 132(65.3%) controls of the deliveries were conducted by nurses, 45(44.6%) cases and 60(29.7%) controls by doctors. While 7(6.9%) cases and 10(5%) controls were cared by TBAs.

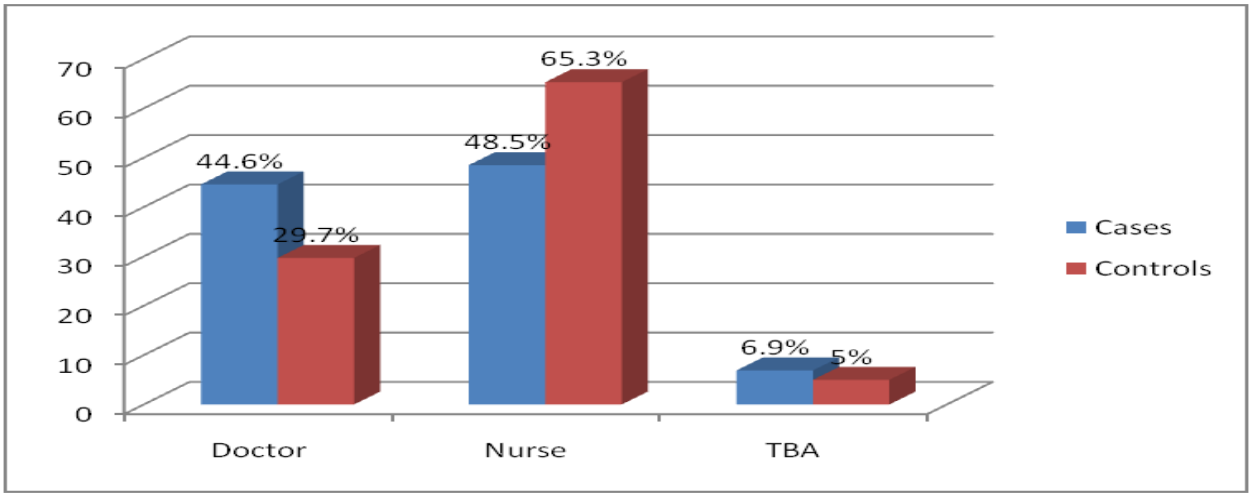

Figure 4. 8: Percentage distribution of person who conducted the delivery of the reviewed maternal records

Most women sought SBA (nurse & doctor) care. Abebe et al (2021:e0254146) explains that, women who seek TBA services are more vulnerable as the TBAs have no capacity to manage pregnancy-related complications. As was noted in a Northern Ethiopian study, women delivering under TBAs might face potential complications such as bleeding, retained placenta, ruptured uterus and infection which TBAs are unable to manage, leading to death (Abebe et al 2021: e0254146).

4.4.1.4.5 Stage of maternal care at point of death

Maternal mortality occurs along a pregnancy continuum of care from antenatal care, intrapartum care to postpartum care. The findings indicate at what immediate point of care the mother was before she died (cases) or was discharged (control).

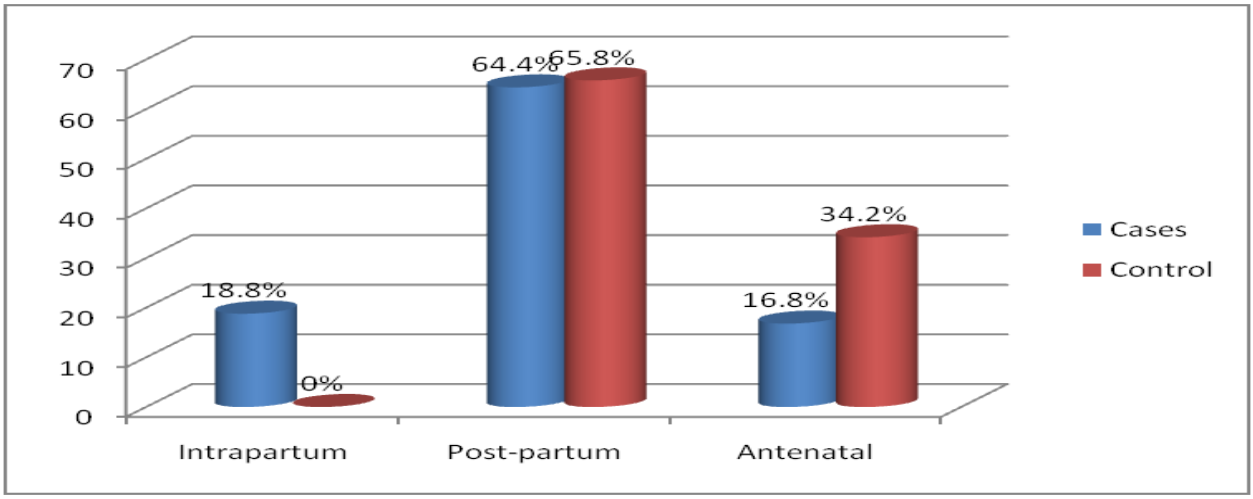

Figure 4. 9: Percentage distribution of stage of maternal care at point of mortality (cases) or discharge (controls)

As shown in Figure 4.9, most women, 65(64.4%) cases and 133(65.8%) controls were in the postpartum period, 19(18.8%) cases and no controls in the intrapartum, while 17(16.8%) cases 69(34.2%) controls were in antenatal care. Globally, over 65% of maternal deaths occur during the first 42 days postpartum (Tessema et al 2020:4). McCauley, McCauley et al (2022:2) note that potential postpartum life-threatening complications include postpartum haemorrhage, persistent high blood pressure as a

result of pre-eclampsia, postpartum sepsis and puerperal psychosis (McCauley, McCauley et al 2022:2).

4.4.1.4.6 Duration of hospital stay

In this study the duration of hospital stay refers to the time (hours) the mother spent in the hospital before she died (cases) or was discharged (control).

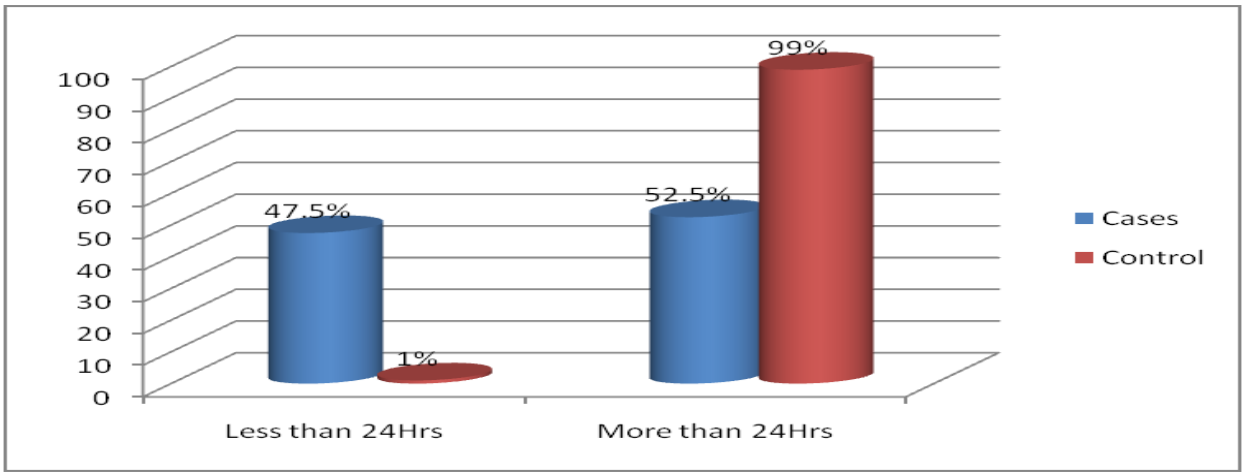

Figure 4. 10: Percentage distribution of duration from hospital admission to mortality occurrence (cases) or discharge (controls)

According to Figure 4.10, most of the women had a hospital stay of more than 24 hours 53(52.5%) cases and 200(99%) controls while 48(47.5%) cases and 2(1%) controls spent less than 24 hours in the hospital.

4.4.1.4.7 Outcome status of baby

With regard to a birth outcome, the present study analysed the immediate status of the newborn (alive or dead) upon delivery (during intrapartum phase) as recorded in the medical case records.

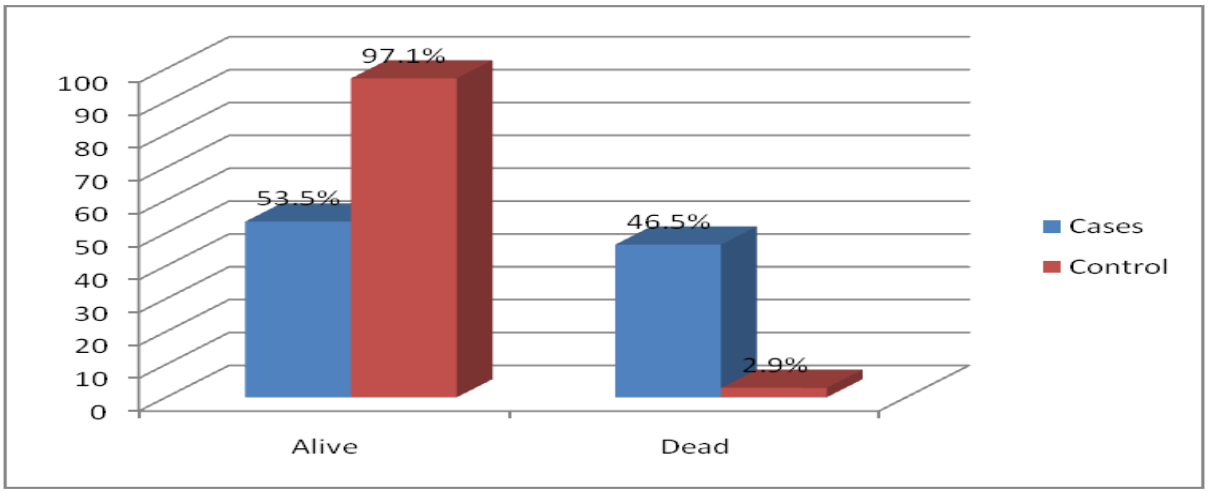

Figure 4. 11: Percentage distribution of baby outcome status of the reviewed maternal records

As noted in Figure 4.11, most of the newborns of 54(53.5%) cases and 196(97.1%) controls survived, while newborns of 47(46.5) cases 6(2.9%) controls died. Newborn health and survival are closely linked to the mother's care and survival (Masaba 2019:89). For some obstetric complications, particularly haemorrhage, the window of opportunity to respond and save the life of the baby, either in utero or just born, can be in minutes and any delay may have fatal consequences (Masaba 2019:89).

4.4.1.4.8 Use of partograph

A partograph is an essential labour observation tool that has relevant measurements to include cervical dilation, uterine contractions and vital signs. The partograph can prompt a healthcare provider to take action, especially in low-resource settings where delay in decision-making is significant cause of adverse obstetric outcomes (Otolorin et al 2015:S47). For instance, it helps identify obstructed labour and thus helps to prevent uterine rupture, a cause of maternal death (Otolorin et al 2015: S47).

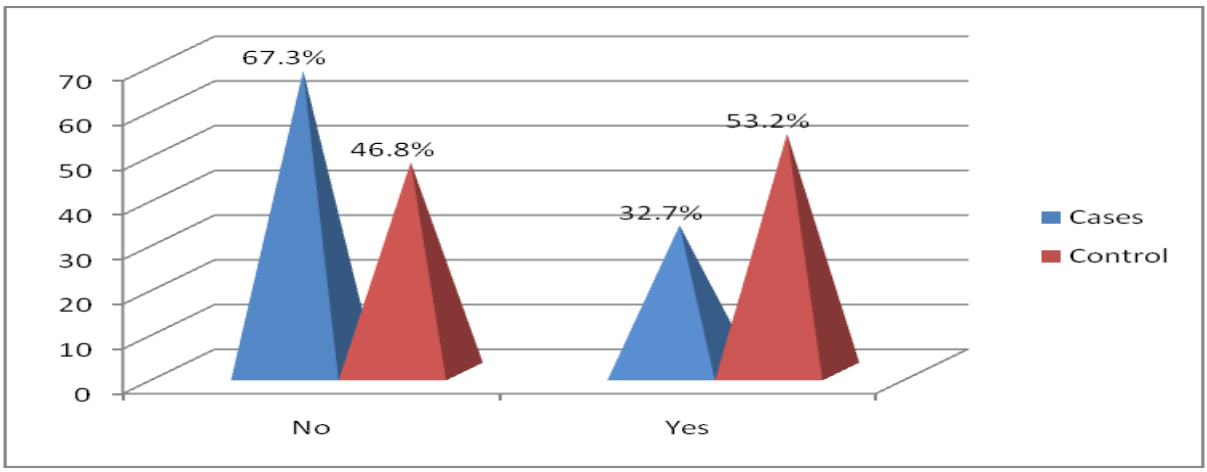

Figure 4. 12: Percentage distribution of utilisation of partograph in care of the reviewed maternal records

As demonstrated in Figure 4.12, most of the cases 68(67.3%) were not monitored through the use of a partograph, which was used in only 33(32.7%) of the cases. In the contrary, most 107 (53.2%) controls had partograph utilization compared to 95(46.8%) controls to whom it was not used. Mothers in labour need their care monitored through the use of a partograph. Also noted in the case review was that most of the cases indicated for C/S were infrequently monitored using the partograph. In Norway, a maternal audit study was conducted to identify suboptimal factors in treatment (Nyfløt et al 2018:976). In one case, blood pressure measurements were not taken between the woman's last antenatal visit one week before the onset of labour and her sudden collapse four hours after delivery of the infant (Nyfløt et al 2018:976).

4.4.1.4.9 Type of delay recorded

Maternal complications require mothers to promptly receive life-saving care in hospital. However, any delay (*from home to the point of care*) either in decision-making to seek treatment (*first delay*), reaching the hospital (*second delay*) or receiving appropriate treatment (*third delay*) reduces survival chances among the cases.

Table 4. 10: Percentage distribution of type of delay associated with maternal mortality (N=101)

VARIABLE		CASES N=101	
		Number	**Percentage (%)**
Maternal delays	First	19	20.4
	Second	5	5.4
	Third	47	50.5
	All delays	22	23.7
	Unrecorded	8	-

As illustrated in Table 4.10, most cases 47(50.5%) had third delay-related factors, 19(20.4%) and 5(5.4%) had first and second types of delays respectively. Some 22(23.7%) cases had all the delays to receiving care. Third delay is delay in receiving appropriate care after arriving at the health facility (Win et al 2015). This can imply that the cases in the study were exposed to failure of health systems. Similar trends were observed in a study conducted in Georgia (Berdzuli et al 2021:206). The researchers noted that delayed recognition and inappropriate management of maternal complications were common across almost all cases (Berdzuli et al 2021:206). However, different patterns were observed in a study conducted in Mozambique (Chavane et al 2018:2). Second delay was observed in 40.4% of maternal deaths and third delay in 14.2%. Both types of delay occurred in 13.9% of the cases (Chavane et al 2018:2).

4.4.1.5 Multiple regression analysis of determinants contributing to maternal mortality in Migori, Kenya

This section presents major significant determinants to maternal mortality in the four selected hospitals in Migori County. Accordingly, multivariate analysis was conducted

using logistic regression model to determine associations between key determinants variables that are considered risk factors and the outcome variable, which was maternal mortality. These independent variables included determinants related to maternal socio-economic and reproductive health variables. Adjusted Odds ratio (aOR) was used to measure the differential in exposure to maternal socio-economic and reproductive health variables and how these factors affected the chances of experiencing maternal mortality compared to maternal survival. Study variables that had an odds ratio of two or more after adjusting for confounding factors and a p-value of less than 0.05 were considered significantly associated with the maternal mortality. Following the analysis, the main predictors for having a maternal mortality were: Education, Marital, Gravidity, HIV and Referral case (table 4.11).

- **Referral status**

A case being referred from a lower level hospital to a tertiary hospital was a strong predictor of maternal mortality when compared to non referred cases. The adjusted odds ratio (aOR) of the referred cases was aOR 49.708(8.689-284.374) and a p-value of 0.00. As indicated in the three delays framework of maternal health care in this thesis, time is essential to the survival of a mother in urgent need of care. This can imply that most of the cases had delays to receive care while in transit to the referral facilities and were fifty times at risk of mortality. Similarly, Khan and Pradhan (2015:3) conducted a verbal autopsy to identify factors associated with maternal deaths in Jharkhand, India. Data revealed that 37% of the cases went to a facility where the required care was not available (Khan & Pradhan 2015:3). They (cases) then decided to go or were referred to another facility, with substantial delays resulting in deaths (Khan & Pradhan 2015:3).

Table 4. 11: Results of multiple regression analysis related to key socio-economic determinants contributing to maternal mortality in Migori, Kenya

		Controls n(%)	Cases n(%)	Crude OR	Adjusted OR(CI)	P-Value
Education	No education	14(6.9)	13(12.9)	5.664 (2.066-15.528)	55.357(1,212-2528.338)	0.040
	Primary	73(36.1)	45(44.6)	3.643(1.690-7.852)	1.954(0.245-15.595)	0.527
	Secondary	54(26.7)	33(32.7)	3.728(1.681-2.269)	1.226(0.184-8.166)	0.834
	Tertiary	61(30.2)	10(9.9)	**Reference**		
Marital	Married	166(82.2)	72(71.3)	**Reference**		
	Single	28(13.9)	22(21.8)	1.826(0.978-3.407)	10.587(1.532-73.158)	0.017
	Divorced	8(4)	7(6.9)			0.998
Gravidity	1--2	87(43)	43(43.6)	2.279(1.168-4.448)	0.456(0.073-2.855)	0.401
	3--4	70(34.7)	15(14.9)	**Reference**)		
	5--6	22(10.9)	19(18.8)	4.030(1.759-9.9236)	2.562(0.372-17.622)	0.339
	above 7	23(11.4)	23(22.8)	4.667(2.090-10.418)	17.775(2.483-127.225)	0.004
HIV	Non reactive	161(79.7)	65(65.3)	**Reference**		
	Not tested	6(3)	19(18.8)	7.844(2.997-20.525)		0.993
	Reactive	35(17.3)	16(15.8)	1.166(0.602-2.256)	20.439(1.823-229.178)	0.014
Referral case	No	120(59.4)	34(33.7)	**Reference**		
	Yes	82(40.6)	67(66.3)	2.817(1.708-4.646)	49.708(8.689-284.374)	0.000

*OR = Odds Ratio; **CI = Confidence Interval

- **HIV Status**

A HIV test is routinely conducted to all hospitalized mothers upon obtaining an informed consent in the four selected hospitals. Cases that were reactive on a HIV test were more vulnerable as compared to non reactive cases. The adjusted odds ratio (aOR) of the HIV reactive cases was aOR 20.439(1.823-229.178) and a p-value of 0.014. This can imply that, mothers who were HIV reactive were twenty times more likely to die compared to non reactive mothers in the case group. Pregnancy and HIV/AIDS both increase women's susceptibility to acquiring malaria and sepsis with potentially serious drug interactions that hamper effective treatment for both infections (MHTF 2022:3) In an Eastern and Southern African study, researchers indicated that there was strong evidence that HIV increased the rate of direct maternal mortality across all the study sites in the period antiretroviral therapy was widely available, with the rate ratios varying from 4.5 in Karonga, Malawi [95% confidence interval (CI) 1.6–12.6] to 5.2 in Kisesa, Tanzania (95% CI 1.7–16.1) and 5.9 in uMkhanyakude, South Africa (Calvert, Marston, Slaymaker, Crampin, Price, Klein & Reniers 2020:1397). Women living with HIV may need more closer monitoring for complications such as sepsis (Calvert et al 2020:1397).

- **Gravidity level**

The inferential analysis revealed that there was an increase in risk to maternal mortality proportionate to the number of times that a woman had been pregnant. The adjusted odds ratio (aOR) of the gravidity more than 7 times was aOR 17.775(2.483-127.225) and a p-value of 0.004. In other words, mothers who had been pregnant for seven times or more were seventeen times likely to die in the case group. In a study conducted at a major referral hospital in Northern Uganda, results showed that grand multiparous women were at an increased risk of dying (Alobo, Reverzani, Sarno, Giordani & Greco 2022:4). Moreover, this group was further associated with poor knowledge of danger signs in pregnancy and a lack of screening for risk factors, all of which increase the risk of maternal death (Alobo et al 2022:4).

- **Marital status**

In regard to marriage, the data was grouped into three categories; married, single and divorced. The mothers that were single were more likely to die in the case group compared to their counterparts. The adjusted odds ratio (aOR) of being single was aOR 10.587(1.532-73.158) and a p-value of 0.017. This can suggest that single mothers likely lacked spousal support in pregnancy that is needed to mitigate the delays across

the three delays of maternal health framework. The husbands or spouses provide material and moral support in seeking maternity services, and accompanying mothers to maternal health care services. A study conducted in Rural Tigray, Northern Ethiopia, pointed out that women's access to health services is frequently determined by their husbands, which can serve to inhibit women's utilisation of formal health resources, in addition to the expectation that the husband is widely expected to be available for decisions and financial support if complications arise (Godefay, Byass, Graham & Kinsman 2015:6).

- **Educational level**

The level of formal education that cases and controls had completed was categorized into; no education, primary, secondary and tertiary levels. Findings indicate that the odds of maternal mortality reduced disproportionally to the level of education. The adjusted odds ratio (aOR) of having no formal education was aOR 55.357(1,212-2528.338) and a p-value of 0.04. This implies that tertiary education was a protective factor to maternal mortality occurrence. Generally, a higher level of the mother's education leads to more exposure to information about pregnancy and delivery care, danger signs, and birth preparedness for themselves (Win, Vapattanawong & Vong-ek 2015:179). A retrospective record of maternal deaths was reviewed in Lofa County, Liberia, 2015- 2017 (Alpha, Dolopei, Argbah, Ballah, Kortimai, Frimgpong & Monday 2021:5). Of the 46 maternal deaths reported, women with no formal education experienced more maternal deaths compared to those who had formal education (Alpha et al 2021:5).

4.4.2 Findings of Phase 2: Qualitative

4.4.2.1 Outline of the presentation

This section presents findings of the data that was collected from the midwives and the hospitalised peripartum mothers in the study's selected hospitals in Migori, Kenya. Based on the methodology of the study, which was an explanatory sequential mixed methods approach, the collection and analysis of the qualitative data were done after the analysis of the quantitative data. The data collection for the qualitative phase took place from 12 March 2022 to 16 May 2022. The precautions for prevention of the spread of Covid-19 were observed (see 3.5.3.3 Data collection). The researcher used

in-depth interviews to collect data from the professional midwives and peripartum mothers at the sampled facilities. In-depth interview guides which were developed in English and Dhaluo were used to collect data. Data was audio recorded and notes taken to ensure the accuracy of the collected data. The audio recorder and notes were locked in a locker at the researcher's home to ensure confidentiality. Data saturation was reached with 37 professional midwives and 66 peripartum mothers.

4.4.2.2 Demographic characteristics of qualitative study participants

4.4.2.2.1 Midwives' characteristics

The data saturation level was reached with 37 respondents. Most (15) midwives interviewed were working at AA-County Hospital, followed by 12 at BB-Private Hospital. CC-County Hospital and DD-County Hospital had five respondents each. Table 4.12 shows the qualifications of the health professionals interviewed. To maintain anonymity, pseudonyms such as N1, N2 will be used for the narration/quotes of the nurses and D1 or D2 for the doctors. CO1 and CO2 will be used as a pseudonym for a clinical officer. Lastly, P1 and P2 indicate narration/quotes of the peripartum mothers.

For this study, a midwife is a trained healthcare provider (doctor, nurse or clinician) who is licensed to practice midwifery in Kenya. The midwife was currently working in peripartum units in the selected health facilities in Migori County, Kenya.

Table 4. 12: Frequency distribution of professional midwives interviewed (n=37)

Demographic characteristics	Category	Pseudonyms	Number
Professional midwives	a. Nurse	N	27
	b. Doctor	D	4
	c. Clinical Officer	CO	6

As illustrated in Table 4.13, of the health professionals (midwives) interviewed, 27 were nurses, four doctors, and finally, six clinical officers. In addition, 14 midwives had less than three years of experience in maternal health, 11 had four to seven years in the same service. Lastly, six midwives had eight to 10 years and six had more than 11 years of experience.

Table 4. 13: Frequency distribution of midwives' years of experience (n=37)

Demographic characteristics	Category	Number
Years of experience in maternal health	a) 0-3	14
	b) 4-7	11
	c) 8-10	6
	d) Above 11	6

4.4.2.2.2 Peripartum mothers' demographics

In regard to the interview with the hospitalised peripartum mothers, the data saturation level was reached with 66 respondents. Most (28) peripartum mothers interviewed were currently hospitalised at AA-County Hospital, followed by 19 at BB-Private Hospital. CC-County Hospital and DD-County Hospital had 11 and 8 respondents respectively.

Table 4. 14: Frequency distribution of peripartum mothers' demographics (n=66)

Demographic	Category	Numbers
Religion	Christian	63
	Muslim	3
Maternal age	Below 20	12
	21-29	25
	30-39	29
	40-49	0
Employment status	Formal employment	17
	Informal employment	26
	Not working	23
Residence	Urban	31
	Rural	30
	Informal	5
Maternal education	Primary	22

Demographic	Category	Numbers
Religion	Christian	63
	Muslim	3
	Secondary	20
	Tertiary	20
	No education	4
Marital status	Married	52
	Single	10
	Widow	4
Current pregnancy planned	Yes	26
	No	40

As illustrated in Table 4.14 in regard to religion, most (63) hospitalised mothers were Christians compared to three Muslims. In terms of age groups, 29 were 30-39 years old, 25 were 21-29 years old, and 12 were below 20 years old. Based on occupation status, 26 were informally employed, 23 were jobless, while 17 were formally employed. Rural residents were 30 compared to 31 who were urban dwellers. The majority (22) had primary level education, 20 had attained secondary and tertiary respectively. Most respondents (52) were married compared to 10 single and only four (4) were said to be widowed. Interestingly, the current pregnancy was not planned in 40 hospitalised peripartum mothers as opposed to 26.

4.4.2.3 Themes developed from interviews with midwives and peripartum mothers

Four themes emerged from interview transcriptions data, namely existing interventions to improve maternal survival and the three associated maternal care delays. Table 4.15 illustrates the themes and sub-themes as discussed based on three delays model.

Table 4. 15: Themes developed from interviews with midwives and peripartum mothers (three delays model)

Themes	Sub-themes
Strategies	
1. Existing programmes/interventions to improve maternal survival	a) Available family planning initiatives b) Mass media c) mHealth for follow-up d) Beyond zero campaign (outreaches) e) Linda Mama Policy f) Men involvement g) Non-pneumaticanti-shock garment (NASG) programme h) Community health volunteers' involvement i) Routine maternal death audits j) Capacity building trainings k) High-risk clinics
First delay	
2. Reasons for non-utilisation of maternal healthcare interventions	a) Culture, religion and tradition b) Myths, fear and hospitals' negative image c) Mothers' health illiteracy and ignorance d) Use of herbal drugs e) Traditional birth attendants f) Patriarchy's decision-making power
Second delay	
3. Challenges of access to maternal healthcare interventions	a) Long distance and unaffordable indirect costs b) Poor road network and few public transport vehicles
Third delay	
4.1 Challenges experienced during hospital referral of mothers with obstetric	a) Referral decision delays

Themes	Sub-themes
emergencies	b) Verbal referrals c) Ambulance poorly equipped (staff and equipment) d) Inadequate filling out of referral forms e) Inadequate ambulance vehicles f) Out-of-service ambulances and no fuel g) Unaffordable ambulance services h) Inappropriate referral
4.2 Challenges that hinder maternal care interventions within the hospital	a) Inadequate birth plan preparedness b) Care non-adherence c) Unaffordable service cost d) Inadequate resuscitation supplies, drugs and general consumables e) Theatre-related delays f) Inadequate skills by healthcare workers and inappropriate care g) Protocols and guidelines non-adherence h) Patient monitoring and documentation i) Lack of blood j) Inter-departmental communication/teamwork/ coordination **Inadequate hospital capacity** k) Radiological and laboratory equipment/services l) Infrastructure m) Congested maternity ward n) Staff shortage o) Healthcare providers' attitude p) Slowness in service

Themes	Sub-themes
	q) Demotivated staff

4.4.2.3.1 Existing programmes/interventions to improve maternal survival

1a) Available family planning initiatives

In regard to family planning initiatives, findings indicate that some staff had undergone training on long-term family planning methods. Youths in the study were provided with contraceptives, they were trained on life career goals and given HIV prevention health education. Preventing unintended pregnancies is a first step to preventing maternal deaths (National Council for Population and Development [NCPD] 2015:34). For women, contraceptives have been found to reduce the number of abortions and lower the incidence of disability related to complications of pregnancy and child- birth, primarily by reducing the number of times a woman has to go through the potentially deadly process of child-birth (Keen, Begum, Friedman & James 2017:45). Contraception further helps women avoid closely spaced pregnancies that increase the risk of poor outcomes (Starbird, Norton & Marcus 2016:195).

A maternity unit nurse in-charge at AA-County hospital said:

> "Mentorship of some staffs has been done on intra-uterine contraceptive devices and implants to support the family planning initiatives." (N3).

A doctor working at DD-County hospital said:

> "We have a programme targeting the youths on family planning so that we curb early pregnancies." (D2).

Family planning (FP) awareness and health promotion on birth spacing is routinely done at antenatal and postpartum clinics. Mothers are encouraged to have postpartum family planning.

A senior nurse working at BB-Private hospital said:

> "During ANC visits mothers are counselled on the available family planning methods." (N4).

An ANC nurse working at AA-County hospital further explained:

> "Here at ANC, we routinely have morning pregnancy health education sessions … to include family planning messages … with mothers before we start offering clinic services." (N5)

Another nurse at AA-County hospital noted:

> "We have free contraceptives given immediately after delivery." (N6)

An ANC nurse working at CC-County hospital also highlighted that:

> "Some mothers opt to get family planning services after 2-6 weeks after delivery." (N7)

In regard to the cost of FP, the findings were mixed, as some midwives noted that both the FP methods and service were absolutely free while others noted that clients were charged for the services. This can indicate that the cost contributes to the inequality of FP method uptake in the study. In a Burkina Faso survey, most health workers under the gratuité scheme (a user fee exemption scheme) noted that in the event of stockouts of medical consumables, it was common practice for the user to have to buy these supplies at their own cost, which might create an additional financial deterrent to seeking FP services (Koulidiati et al 2020:20). While in an Ugandan study, the number of clients participating a four year family planning social franchise and voucher programme (offered a voucher to enable poor women to access family planning services at franchised facilities) increased substantially, with more than 330 000 services provided in total (Bellows et al 2016:360).

A labour ward nurse at AA-County hospital noted:

> "The whole family planning services are absolutely free, and they are covered by Linda Mama." (N15)

A clinical officer at DD-County said:

> "The family planning commodity is free, but we charge for insertion and administering the services." (CO5)

A nurse at CC-County explained:

> "We currently charge 2 US dollars for implant and intrauterine device insertion which is unaffordable to some clients. Initially we had uptake challenges even before introduction of the charges; so with the charges the uptake will only worsen as most women expect free services." (N35)

Midwives illustrated that some mothers in the study might access and utilise the hospital but miss opportunities on family planning services. This is caused by early closing times at antenatal clinics, high workload at the postnatal wards (for those admitted) and inadequate number of staff with competencies on insertion (*intrauterine device*) and administration of FP methods. Inadequately trained staff could be a barrier to the provision of family planning, especially long-acting reversible contraception (Lemani, Kamtuwanje, Phiri, Speizer & Singh 2018:37). It suggested that programmes seeking to increase contraceptive use, need to consider training providers so that mothers could have access to injectables, intra-uterine contraceptive devices and implants without any restrictions (Tumlinson et al 2016:145).

A senior nurse at AA-County Hospital explained:

> "Postnatal health education … including family planning … is inadequately done because of large workload of patients to attend to. You end up just telling the mother ... Just go and make sure to come back after six weeks." (N3)

Another senior nurse at AA-County Hospital added:

> "Some patients, post C/S mothers, go home without health education because of the situation … sadly … recently … one later on come back pregnant in less than a year time after giving birth." (N3).

In support, a nurse at CC-County Hospital said:

> "Here, family planning services are not available after lunch." (N8)

Also, a nurse at AA-County Hospital said:

> "Immediate postnatal family planning services ... more so intrauterine device … are not routinely offered as only few staffs have competencies on intrauterine device insertion." (N20)

A maternity nurse at BB-Private Hospital commented:

> "Our hospital is affiliated to Roman Catholic; we do not offer family planning services." (N1)

The religion of some mothers in the study prohibited their members from FP method utilisation. This can imply that these mothers are vulnerable to close birth spacing pregnancy complications.

A doctor in charge of programmes at CC-County Hospital said:

> "Some religion groups like Legio and Roman Catholics present in this County do not advocate for family planning among their groups." (D1)

Midwives noted that school health family planning education was a challenge. They indicated that schools did not permit outreaches packaged with family planning awareness. However, some mothers in the labour rooms were school-going students. A doctor incharge of programmes at CC-County Hospital said:

> "We thought of promoting family planning message in schools since we admit pregnant students here, but we were not permitted by the school." (D1)

In support, a clinical officer in charge of programmes at DD-County Hospital added:

> "We have challenges when it comes to hospital-inter-school activities." (CO4).

1b) Mass media

The respondents noted that the county reproductive health management does radio campaigns on pregnancy complication education and maternal interventions available. However, midwives illustrated that they had not been involved fully in the mass-media campaigns. As an intervention, mass media through the radio, television or print media is an appealing strategy for the promotion of pregnancy education because of its potential reach and ability to address often culturally taboo issues in an entertaining way (Mwaikambo, Speizer, Schurmann, Morgan & Fikree 2013:920). A review in low- and middle-income countries indicated that local and television and radio FP programming were significantly and positively associated with increased modern contraceptive methods use (Duminy et al 2021:5).

A clinical officer incharge of programmes at DD-County Hospital said:

> "At the hospital level we are not having the radio-campaigns as we are not supported." (CO4)

A nurse working at BB-Private Hospital revealed:

> "I have never heard of such mass media initiatives by the hospital." (N14)

A doctor working at CC-County Hospital added:

> "We wish to do the radio-campaigns as the message gets to many households." (D2)

However, a nurse incharge of programmes at AA-County Hospital noted:

> "The County is having such initiative … we have always heard on radio advertisements on Linda Mama services; to create awareness of skilled birth uptake by radio." (N24)

1c) mHealth for follow-up

The midwives at antenatal units highlighted that they were involved in an mHealth programme. The initiative promotes antenatal visits adherence and uptake. Mothers enrolled into the programme are reminded of their subsequent visits through text messages. Emphasis on the mHealth reminder is among those mothers identified as high risk. However, in labour wards of most hospitals, midwives noted that mHealth is unavailable. They attributed this to unavailable credit (airtime) to call patients and high number of admissions. In a Kenyan experimental study, an SMS and a phone call reminder were administered in the intervention arm while the non-intervention group received routine care (Muvengei et al 2021:750). A targeted mobile-phone intervention improved ANC attendance in a pastoralist community in Narok, Kenya (Muvengei et al 2021:752). However, clients' challenges could be illiteracy, cultural restrictions, technological discomfort, issues of trustworthiness, and technology cost (Feroz et al 2017:4), while healthcare providers' challenges could be difficulties in management of complex health problems and misuse of technology (Feroz et al 2017:4).

A nurse working at AA-County Hospital explained:

> "Once we see the mother, we enlist her into the mHealth programme, and her contact details are used to remind her of when to come back again … more so the special clients." (N3)

Another nurse working at the same facility added:

> "On every initial ANC visit, a photo of the mother's ANC booklet demographic page is taken. This is used to enroll her into an ongoing follow-up mHealth programme." (N13)

A labour ward charge nurse at AA-County Hospital said:

> "We … at labour ward … are not provided with credit (airtime) to call and follow up mothers." (N20)

1d) Beyond zero campaign (outreaches)

The beyond zero campaign is a national initiative to reduce maternal mortalities by moving health – antenatal and postnatal – services closer to the people through outreaches. The campaign was launched in 2013 by Kenya's First Lady under the slogan, "No woman should die while giving life", is aimed at strengthening emergency services for mothers and children by providing fully equipped mobile clinics to the counties (National Council for Population and Development [NCPD] 2015:3). The programme has medically equipped vehicles (lorries and vans) that are used as clinics to carry out maternal community outreaches in collaboration with the county health facilities. The respondents felt that the initiative has logistical challenges in terms of accessing the movable clinics. The respondents implied that rare outreaches were conducted using this approach. Odenyo (2023:2) observed that, most of the Beyond Zero clinics in Kibera Kenya, are not serving the purpose for which they were intended. The clinics are struggling with inadequate health personnel and lack of basic items such as laboratory reagents, water, and detergents (Odenyo 2023:2).

A clinical officer managing programmes at CC-County Hospital said:

> "The Beyond Zero vehicles are stationed at the headquarters; rarely do we see them in this periphery side of the county. Further, there is a problem on putting up requisition of the vehicle; the process is too long and complex." (CO5)

A doctor managing programmes at DD-County Hospital said:

> "We do not go for outreaches; funds facilitation of the outreach is a challenge." (D2)

A labour ward charge nurse at AA-County Hospital said:

> "We used to have maternity open days (outreaches) but I no longer hear of them." (N20)

1e) Linda Mama policy

In the study, hospitalised mothers were pleased with the Linda Mama policy– a free maternal service initiative by the national government. This can indicate that the free maternal service policy has reduced barriers to skilled birth associated with direct costs. In return, it reduces home deliveries and TBA utilisation that make mothers more vulnerable. However, a study conducted in Kenyan public health facilities, aimed to provide a brief overview of this policy's effect on health facility delivery service utilisation and maternal mortality ratio (Gitobu et al2018:4). The Linda Mama policy intervention appeared to have no significant effect on maternal mortality (Gitobu et al 2018). These discouraging findings support a body of literature which suggests an increase in the availability of maternal healthcare does not necessarily result in increased access to, or use of, maternal healthcare services (Davidson 2015:25).

A 30-year-old postpartum mother admitted at AA-County Hospital said:

> "Since I had Linda Mama card the care is affordable." (P26)

In support, a 23-year-old postpartum mother admitted at CC-County Hospital said:

> "Services were affordable and I had good experience." (P27)

Similarly, a 28-year postpartum mother admitted at DD-County Hospital noted:

> "The facility is affordable, the charges are not expensive; everyone can afford." (P2)

However, midwives noted that mothers were often requested to buy drugs/ investigations which were commonly unavailable in the hospital. This implies that maternal services were limited to mothers who were able to afford the extra charges. This lowers the uptake of maternal health interventions.

A nurse at CC-County Hospital explained:

> "Due to frequent stockouts of reagents at the laboratory unit, we request mothers to get the antenatal investigations done elsewhere; this makes some end up not carrying out the needed antenatal profile investigations." (N21)

A nurse at BB-Private Hospital noted:

> "The Linda Mama is not covering for routine ultra-sound for clients with normal pregnancy, but if the client is admitted with a complication like pre-eclampsia, they will be covered." (N6)

In agreement, a 21-year-old antenatal mother admitted at AA-County Hospital observed:

> "There are problems with hospital drug availability in this facility, so I have been asked to buy from outside since admission." (P28)

A 26-year postpartum mother admitted at DD-County Hospital said:

> "There is something I was told to buy which costs 30USD which is not affordable to me." (P29)

Similarly, the Linda Mama programme fund takes too long to be reimbursed back to the facility. This leads to financial challenges in managing and running the hospital. Other challenges noted were that the funds reimbursed were not commensurate with the services offered and some of the hospitals did not utilise the funds received well. Examples of responses are as follows:

A nurse manager at DD-County Hospital said:

> "Reimbursement of the Linda Mama programme funds takes too long." (N19)

A doctor managing programmes at CC-County Hospital lamented:

> "You will find that, once the Linda Mama cash has been reimbursed to the hospital account; the county government demands that the same is transferred to county revenue account for budgeting. This means (at their liberty) we at times end up being allocated less from the county than what the programme reimbursed." (D3)

A labour ward charge nurse at AA-County Hospital complained:

> "I blame the hospital management; because after the county treasury has sent the funds to us; at times we do not see any new supplies and consumables bought by the facility." (N6)

Challenges of utilisation of the Linda Mama programme also affect those mothers without national identification (ID) cards. Since an ID is needed during enlisting to the Linda Mama programme, those without are forced to pay out of pocket or the hospital is forced to discharge them without cost. Interestingly, midwives noted that mothers with multiple pregnancies were disadvantaged too, since the Linda Mama policy only covers singleton births.

A nurse at AA-County Hospital said:

> "Some mothers have no IDs … above 18 but have never registered for IDs …; they cannot be enrolled into or benefit free delivery policy." (N23)

Similarly, a nurse at BB-Private Hospital noted:

> "Mothers who are teenagers cannot be registered into the FMS because of no ID; meaning their deliveries are not reimbursed." (N25)

A nurse at AA-County Hospital added:

> "The policy only covers singleton births … if you give birth to twins you pay." (N17)

Just a year after maternity services were declared free in all Kenyan public health facilities, there was a reported 26.8% increase in the number of deliveries in hospitals (Wausi 2018). However, women may under utilise the free maternal policy in place because of hidden charges within the hospital, the indirect cost of transport to the facility, and any other perceived costs related to maternal care within the hospital (Masaba & Mmusi-Phetoe 2020).

1f) Men involvement

In the study, midwives indicated that couples were encouraged to seek maternal services. Respondents explained that priority of maternal service is given to mothers accompanied by their male partners. This can imply that male involvement is encouraged, which promotes antenatal visit adherence and skilled birth attendance. Male participation improves women's uptake and continuity maternal service approaches by increasing spousal coordination and decreasing opposition (Wondim et al 2020:198). Women lack resources to pay for them even though women are seen as responsible for maternal services (USAID 2022a:4). For instance, a survey was conducted on community and health systems enablers to family planning use in Kabwe District, Zambia (Silumbwe et al 2018:5). It demonstrated that couples counselling services targeting male involvement in contraceptive choices are important enablers to contraceptive services provision and use (Silumbwe et al 2018:5).

A nurse at DD-County Hospital said:

> "When a mother comes to clinic with her spouse; she is served first." (N5)

A nurse at AA-County Hospital added:

> "Some mothers are motivated with this … male involvement; as they come with their partners to jump the queue on a busy day." (N22)

A nurse at CC-County Hospital said:

> "At times we conduct outreaches and we incorporate male maternal related issues and we are able to discuss with them." (N10)

However, findings show that the approach has low uptake as in the study only a few male partners accompanied their spouses.

A nurse at AA-County Hospital observed:

> "Most men shy away from the clinic." (N2)

1g) Non-pneumaticanti-shock garment (NASG) programme

In response to the maternal mortalities caused by postpartum haemorrhage (PPH) in the study, a non-pneumatic anti-shock garment (NASG) programme was initiated by Lwala Community Alliance in collaboration with county government. NASG works by reducing the blood flow to the uterus and stabilizes the women suffering from severe PPH while they are waiting to receive definitive care (Downing, El Ayadi, Miller, Butrick, Mkumba, Magwali, Kaseba-Sata & Kahn 2015:5). NASG is needed if the first response with uterotonics, tranexamic acid, IV fluids and uterine massage are not sufficient to stop the bleeding, or if the haemorrhage has been extensive before the application of uterotonics and the woman is in danger of developing hypovolemic shock (Escobar, Füchtner, Carvajal, Nieto, Messa, Escobar, Monroy, Forero, Casallas, Granados& Miller 2017:3). The Lwala Community Alliance programme supplies the NASG- garments to some hospitals within the county.

Labour ward nurse at AA-County Hospital explained:

> "The programme trains staffs on how to use the NASG garments and development of PPH protocol." (N12)

A nurse at BB-Private Hospital narrated:

> "The garments are owned by the programme and specific hospitals … not all … were supplied with it. When a mother is referred to us with the garment, we only need to give the referring nurse an NASG garment from our stock and not removing the patient's garment." (N22)

However, midwives noted that full coverage of the NASG programme is needed among all the hospitals. Mothers attending hospitals without the NASG are more vulnerable when diagnosed with PPH. In Colombian study, researchers noted that even in women who required rescue strategies to control bleeding, the concomitant use of the NASG was not associated with any major complications, and could be associated with better outcomes in women with an 80%, or higher, likelihood of dying at the time of the placement of the NASG (Escobar et al 2017:5). Researchers in Zambia and Zimbabwe analysed the cost-effectiveness of the non-pneumatic anti-shock garment (NASG) by utilising evidence from a cluster randomized controlled trial (Downing et al 2015:5). The studies observed cost-effectiveness of early application of the NASG at the primary health care level compared to waiting until arrival at the referral hospital (Downing et al 2015:5). Thus early NASG application at the primary health care facilities for women in hypovolemic shock has the potential to be cost-effective across many clinical settings (Downing et al 2015:5). A scenario illustrating the vulnerability was narrated by a labour ward nurse at AA-County Hospital as follows:

> "A mother delivered in the ambulance while on transit from the referring facility before arrival to the referral facility. She was delivered by the midwife who reported the mother's PPH development. On reaching the first referral facility they didn't have blood, the facility offered NASG which they tied to the patient as they went to the second referral facility where the patient was received. The NASG was removed by the referring person as to return it to the first referral facility where it had been borrowed from." (N8)

1h) Community health volunteers' involvement

The respondents noted that the CHVs programme encourages mothers to have skilled birth attendance. Midwives revealed that the TBAs in the study were incorporated into the programme and therefore they were as well identified as CHVs. Community healthcare workers are an essential cadre of healthcare workers in low- income countries, where human resources for rural healthcare infrastructure are often limited (Maru, Nirola, Thapa, Thapa & Kunwar 2018:56; Nishimwe, Mchunu & Mukamusoni 2021:2515). In Ngara, Tanzania, the Lady Health Worker Programme (LHWP), a community-based intervention aimed at improving access to antenatal care in predominantly rural environments (Bailey 2019:13). It trains local women to be

community healthcare workers who are capable of providing preventative primary care in their communities (Bailey 2019:13). The intervention improved access to and early initiation of antenatal care, as well as recognition and referrals of pregnancy complications associated with maternal morbidity and mortality (Bailey 2019:13). They (CHVs) accompanied and referred mothers to hospitals.

A nurse with 20 years of working with community health workers explained:

> "Community health workers' logbooks are filled for every mother brought to the hospital for delivery. The logbooks are later used for reimbursement of incentives (5 USD per client) provided by the county government." (N4)

A nurse incharge of community programmes at AA-County Hospital added:

> "Community health volunteers identify the pregnant mothers and refer them to hospitals." (N9)

A clinical officer at DD-County Hospital as an administrator said:

> "We offer pregnancy related trainings to CHVs through monthly meetings." (CO6)

Gaps noted with the community initiative are lack of and delays in reimbursement of incentives. This could imply that CHVs are unmotivated and reduce the implementation of patient community referral to hospital.

A nurse in charge of community programmes at AA-County Hospital lamented:

> "Some CHVs have not received their incentives for two years from the county government … making them demotivated." (N9)

1i) Routine maternal death audits

A maternal death audit is an in-depth systematic review of maternal deaths to delineate their underlying health social and other contributory factors, and the lessons learned from such an audit are used in making recommendations to prevent similar future

deaths (WHO 2022a:4). It is also defined as a broad term intended to include every different method of reviewing deaths, that not only identifies the medical cause of death, but also attempts to identify avoidable factors that contributed to the death and make recommendations for avoiding such deaths in the future (Willcox, Price, Scott, Nicholson, Stuart, Roberts, Allott, Mubangizi, Dumont & Harnden 2020:2). The midwives noted that all maternal deaths were audited at the ward level; then by maternal and perinatal death review (MPDR) committees within the hospitals. The reviews were mostly conducted within a month of maternal death.

A maternity nurse at AA-County Hospital said:

> "We have MPDR committee in the hospital for every maternal death." (N20)

Another nurse at BB-Private Hospital noted:

> "We are doing maternal audits, even the most recent one we did." (N4)

A nurse at AA-County Hospital said:

> "A review is first done at the ward level followed by MPDR-review." (N7)

Regarding challenges facing maternal mortality audits, the midwives complained of slow implementation of the MPDR-suggested recommendations. Additionally, midwives felt that no reviews were done to the MPDR reports In Malawi, the inability to implement institutional policies to improve the quality of maternal healthcare due to a weak system and negative attitude was identified as a hindrance to the midwives' contribution to the implementation of facility - based maternal death reviews (Chirwa, Nyasulu, Modiba & Limando 2023:5). The Malawian researchers pointed out that the success and failure of the initiative are determined by the institutional political will, governance and skillful leadership to timely mobilise needed financial, human and material resources (Chirwa, et al 2023:5). Similarly, a Rwandan study was conducted to assess the implementation of maternal and perinatal death surveillance and Response at 10 hospitals and three health centers (Tayebwa, Sayinzoga, Umunyana, Thapa, Ajayi, Kim, van Dillen & Stekelenburg 2020:8). It observed that, maternal death audits were conducted regularly, and facilities had action plans to address modifiable factors (Tayebwa et al 2020:8).

However, implementation was challenged by lack of enough motivated staff, heavy workload, lack of community engagement, no linkages with existing quality improvement efforts, no guidelines for review of stillbirths, incomplete medical records, poor classification of cause of death, and no sharing of feedback among others (Tayebwa et al 2020:8).

A maternity charge nurse at AA-County Hospital said:

> "I am a member of the MPDR team, I feel we have not utilised our data enough, especially the surveillance part." (N2)

A programme manager nurse at AA-County Hospital said:

> "There are challenges on the implementation phase of the MPDR review's recommendations. You will find that some recommendations have never been implemented for years." (N17)

A nurse at AA-County Hospital said:

> "It is as if maternal audits are just carried out for a formality, no action steps are seen." (N15)

1j) Capacity building trainings

A substantial body of evidence is emerging that documents low provider skills and limited facility capability to provide good quality routine and emergency care at birth (Gabrysch et al 2019: e1074). This evidence might explain the mismatch between high coverage of facility birth and persistently high mortality burdens in many settings (Gabrysch et al 2019: e1074). Therefore, building the capacity of healthcare providers via 'in-service' or 'on the job' training has become a common approach (Ameh, Mdegela & White 2019:257). It is noted that training programmes improve healthcare providers' knowledge, skills and attitudes as well as care out- comes for women and their newborns by all stakeholders (Banke-Thomas et al 2020:12). In the present study, the midwives noted that some non-governmental organisations in collaboration with the county government had staff training initiatives. The trainings and mentorships ensured

that service providers were up to date with maternal health knowledge. Elsewhere, in a cluster randomised trial in South Africa, effectiveness of 'skills and drills' training of maternity staff in EmOC was evaluated (Van den Broek, Ameh, Madaj, Makin, Whiteet al 2019:2). Maternal case fatality rates did not significantly reduce but a significant increase was noted in the number of women recognised by healthcare providers to need and who received EmONC (Van den Broek et al 2019:2). In Northern Bangladesh, a study was conducted to explore the current knowledge and skills of healthcare providers already trained by SIMESON (simulation for essential skills for obstetrical and neonatal care) (Das et al 2022:802). There were improvements in the quality of care for maternal and neonatal health services at the intervention–government healthcare facilities (Das et al 2022:802).

A nurse at AA-County Hospital said:

> "We routinely (weekly) hold maternal related continuous medical education within our unit." (M7)

Another nurse at DD-County Hospital added:

> "Though the trainings are there, sponsored by some NGOs, they only train very few staff." (M18)

However, some midwives lamented that the refresher trainings were inadequate and rare within their facilities. Furthermore, most of those who were recruited for maternal refresher trainings were not assigned in peripartum units. This could imply that the managers responsible for selecting staff were biased; hence the knowledge acquired was unutilised in healthcare.

A nurse at BB-Private Hospital said:

> "Since I joined this facility – 3 years ago – I have not had any refresher training." (N2)

Similarly, a nurse at DD-County Hospital said:

"Only one staff has ever gone for refresher training on PPH management." (N20)

A nurse at AA-County Hospital added:

"Unit-in-charges are the ones going for the trainings, not us." (N2)

1k) High-risk clinics

In regard to high-risk clients, especially at the ANC; they were identified and booked for consultant review. The findings indicate that the appointments were not always prompt due to shortages of gynaecologists within the hospital. The shortage of staff in the public sector influences maternal care outcomes in a negative manner. It may cause delays in initiating emergency interventions; delays in authorising referral or referring upwards to busy senior staff; or lack of performance of the EmOC signal functions (Bradley, Kamwendo, Chipeta, Chimwaza & Pinho 2015:8). A qualitative study analysed the impact on obstetric care providers and on quality of care in Malawi (Bradley et al 2015:4). The study observed that, providers faced challenges of having too few staff and too many patients that was further exacerbated by the lack of an adequate skill mix to address obstetric complications (Bradley et al 2015:4). For instance, Nurse-midwives who identified obstetric problems were obliged to chase the few doctors on duty to secure care for their patients (Bradley et al 2015:4).

A nurse at BB-Private Hospital said:

"High risk mothers are booked for gynaecologist review." (N12)

A nurse at AA-County Hospital said:

"Let us assume I identify a high-risk clinic mother right now; …she will be told to book for gynaecologist review appointment instead of being seen promptly the same time." (N13)

4.4.2.3.2 Reasons for non-utilisation of maternal healthcare interventions

2a) Culture, religion and traditions

Some respondents felt that the negative influence of a community's culture, religion and traditions hinders utilisation of maternal healthcare interventions. For instance, some women hide their pregnancy from being seen in the public places, including the hospital. They have cultural beliefs that people will see and talk ill of their pregnancy, causing them to experience a negative outcome. In addition, other women's religion practices taught them that pregnancy should not be intervened with by the hospital care services. In a Zimbabwe study titled, "Praying until Death" researchers observed that ultra-conservative apostolic sects discourage members from seeking medical care (Kenneth, Marvellous & Stanzia 2016:10). Generally, apostolic beliefs increase women's life time risk of maternal mortality (Kenneth et al 2016:10). Beliefs around God's desire for high fertility, low status of women, stance against contraception and non-utilization of health care facilities all heighten maternal risk (Kenneth et al 2016:10). Therefore apostolic beliefs and practices exacerbate delays between onset of maternal complications and receiving help, thus increasing maternal risk (Kenneth et al 2016:10). Contrarily, a study was conducted to evaluate religious influences on the utilization of maternal health services among Muslim and Christian Women in North-Central Nigeria (Al-Mujtaba, Cornelius, Galadanci, Erekaha, Okundaye, Adeyemi & Sam-Agudu 2016:4). There were no significant religious influences identified among barriers to maternal service uptake (Al-Mujtaba et al 2016:4). All participants stated preference for facility-based services (Al-Mujtaba et al 2016:4). An Indian study was conducted to assess risk factors for maternal mortality among 1.9 million women in nine empowered action group states (Horwood, Opondo, Choudhury, Rani & Nair 2020:4). It indicated that, religion status was not associated with maternal mortality after adjusting for access to a healthcare facility (Horwood et al 2020:4).

A nurse at DD-County Hospital said:

> "In this area mothers hide from being seen when pregnant; and only come to hospital when they are already in labour for delivery, due to culture." (N2)

A nurse at CC-County Hospital said:

> "Because of the Legio religion beliefs … it has it that mothers should not be injected with modern medicine while pregnant." (N11)

A doctor at AA-County Hospital said:

> "Most of the community does not believe in medical services; so we still have mothers who do not come totally for hospital interventions." (D1)

A doctor at BB-Private Hospital said:

> "In this area, the Jehovah Witness members refuse blood transfusion even if the mother is having a haemoglobin (Hb) of 3." (D2)

2b) Myths, fear and hospitals' negative image

Negative perceptions of higher referral facilities and community myths lower uptake of maternal health interventions. Midwives demonstrated that mothers feared being referred as they associated it with severe outcomes. In addition, some believed that healthcare providers were unfriendly. This could imply that mothers influenced by these fears and hospitals' negative image were likely to have home deliveries. In an Ethiopian study, women reported having experienced feelings of being infantilized, losing self-control and being overlooked (Gebremichael, Worku, Medhanyie & Edin 2018:6). These women were further made aware of the bad news without proper preparation, repeated examination without being properly communicated/informed, disallowed companions and left unattended during labor (Gebremichael et al 2018:6). Ethiopian researchers posit that, for ensuring sustainable increase in institutional delivery; quality, compassionate and caring services in all health facilities is required (Gebremichael et al 2018:6). Further, disrespect and abuse (D&A) affects women's trust in care providers and the health system deterring them from seeking and using maternity care (Adinew, Hall, Marshall & Kelly 2021:6). This highlights the need for maternity care to be competent and respectful if women are to use it (Adinew et al 2021:6).

A doctor at AA-County Hospital said:

> "Women around have the notion that nurses harass and beat up mothers in labour … the perception is true, as some are so stubborn and uncooperative…so we beat them up in order to save life." (D1)

Illustrating a previous patient scenario, a nurse at AA-County Hospital said:

> "I even had a mother who believed that…her negative pregnancy outcome was caused by a nurse touching her womb when she was pregnant." (N4)

A clinician at DD-County Hospital commented:

> "Some mothers' belief is that going to hospital when in early phase of labour, they will have bad luck, hence poor outcome." (CO5)

A maternity nurse at AA-County Hospital commented:

> "You find a mother using herbal medicine believing that the disease is caused by evil spirits, yet she has anaemia in pregnancy." (N24)

A clinician at CC-County Hospital said:

> "Mothers perceive that if they are referred up the ladder they will die." (CO3)

2c) Mothers' health illiteracy and ignorance

Midwives in the study highlighted that some women were health illiterate and failed to promptly seek healthcare services even with obvious life-threatening signs. This could imply both inadequate health education on danger signs and low literacy levels among the mothers. This caused them to underestimate the gravity of the complications (Kanchan et al 2019:6).

A case scenario described by a senior nurse at AA-County Hospital was as follows:

> "I blame the whole family for being ignorant. I … admitted a mother with sepsis; she had convulsions at home and the family kept her home for one week while unconscious before seeking healthcare." (N7)

A doctor at BB-Private Hospital narrated a case scenario as follows:

> "Some mothers have themselves to blame. For instance, we admitted a mother who had home abortion; sadly, she had bled close to a month before seeking healthcare service when severely ill to be resuscitated." (D2)

ANC is an opportunity to educate the woman about her health, pregnancy and childbirth, and recognising danger signs (Miltenburg et al 2017:2). In a Somalia study, lack of knowledge about danger signs and warnings during pregnancy and failure to seek prompt treatment from a health facility were the causes of delay in deciding to seek healthcare (Aden et al 2019:5).

2d) Use of herbal drugs

Herbal medicine is a healing approach based on the use of plants or plant extracts. In the study, some mothers with pregnancy complications opted for herbal medicine instead of modern medicine. Others routinely used herbs to induce labour. This could imply that the appropriate maternal care is delayed or unutilised and they are further exposed to herbal toxicities. A study was conducted to analyse the associations between the use of herbal medicines and adverse pregnancy outcomes in rural Malawi (Zamawe, King, Jennings & Fottrell 2018:3). The use of Mwanamphepo was associated with adverse pregnancy outcomes in rural Malawi (Zamawe et al 2018:3). In Malawi, Mwanamphepo (cissus/vitaceae plants species) is a local name used to describe a group of herbal medicines that are commonly used by pregnant women to induce or hasten labour (Zamawe et al 2018:3). Thus, herbal medicines may not be safe in pregnancy (Zamawe et al 2018:3).

A nurse at AA-County Hospital illustrated a case scenario as follows:

> "I was caring for a pregnant mother. Once a maternal diagnosis of eclampsia was made; the mother surprisingly requested to go home to be initiated on herbal treatment." (N1)

A clinical officer at CC-County Hospital commented:

> "Sometimes a mother is referred to a higher facility but opts to go for a traditional herbalist." (CO3)

A nurse at DD-County Hospital commented:

> "The community still believes in traditional herbs practice… more so for labour induction." (N24)

2e) Traditional birth attendants

The study's midwives highlighted that some women preferred home deliveries, which sometimes complicated their situation, resulting in poor outcomes. Worse, mothers who had home deliveries never promptly sought post-natal medical attention upon delivery. This indicates that they were vulnerable, especially when complications arose.

A nurse working at DD-County Hospital said:

> "This society is still using the TBAs, and we have lost many mothers because of this. Further, you will find some TBAs having their own clinics while some conduct deliveries in the patients' home." (N17)

A midwife at AA-County Hospital illustrated a case scenario as follows:

> "A mother had home delivery but waited for three days at home before coming to hospital; later on [she] developed PPH." (N6)

A doctor at BB-Private Hospital demonstrated a case scenario as follows:

> "A mother with pre-eclampsia had home delivery. Upon the complication, she noted of having four convulsions at home. Sadly, the mother came to hospital nine hours after delivery. Had very high blood pressures on admission and worsening Glasgow Coma Scale; management was appropriately commenced but never survived, [succumbing a] few hours later." (D2)

Similar findings of verbal autopsy in Nepal noted a case where the mother had thought that she would deliver at home and everything would be fine because she had delivered four babies at home before (Karkee et al 2021:5). But this time, during delivery, the placenta did not come out; then the mother-in-law sought help (Karkee et al 2021:5). Most women in developing countries make extensive use of and rely on traditional maternal care and remedies, even when they are suffering serious emergency obstetric complications leading to poor outcomes (Monchari et al 2018:10).

2f) Patriarchy's decision-making power

Hospitalised mothers in the study revealed that it was the husband, mother-in-law, or close relatives who permitted them to use hospitals and health procedures. A few mothers mentioned making the decision by themselves. This could indicate the power of the patriarchy culture in the study. In addition, respondents indicated that male partners were more commonly economically empowered. Women lack resources to pay for both direct and indirect costs even though they are seen as responsible for their own obstetric care (USAID 2022a:4). This could imply that mothers who over rely on male permission are at risk of delays of their own health. A study conducted in Pakistan indicated that, the society is strongly patriarchal and thus men largely dominate household decision-making and finances (Omer, Zakar, Zakar & Fischer 2021:4). There were certain social and cultural practices, such as purdah (the veil system), dependency on a male guardian, and other social restrictions on the independent mobility of women that deprived them of the ability to seek timely medical care during pregnancy and childbirth (Omer et al 2021:4).

A nurse working at AA-County Hospital illustrated as follows:

> "A mother is in need [of] urgent consent signing, but will insist to have the husband make the decision before the procedure – even if he is not around." (N20)

A mother with anaemia hospitalised at AA-County Hospital said:

> "My husband makes hospitalisation decision." (P43)

A mother in postpartum hospitalised at AA-County Hospital commented:

> "My husband was away, and he sent us fare that covered for my transport together with my mom who took me to the hospital." (P48)

A 32-year-old mother in postpartum hospitalised at DD-County Hospital said:

> "I only go to hospital if it is a market day, that way I am able to convince my partner that I am going for grocery shopping. Further, I will be funded to cater for fare." (P7)

A 23-year-old mother with sepsis hospitalised at BB-Private Hospital said:

> We both make the decision on hospitalisation with my husband and if he is not around, I make the decision (P44)

An ANC mother hospitalised at CC-County Hospital said:

> "I used motorbike and my aunt made the decision for me." (P45)

A mother with pre-eclampsia in postpartum hospitalised at AA-County Hospital said:

> "I have no challenges to the hospital, had funds and made decision together with my husband and mother-in-law." (P49)

4.4.2.3.3 Challenges of access to maternal healthcare interventions

3a) Long distance and unaffordable indirect costs

In the present study, within the rural areas, the facilities are far distances apart. This makes mothers in need travel for more than two hours to a comprehensive emergency obstetric and newborn care (CEmONC) health centre. However, findings show that some mothers who reside in close proximity to the hospital are able to walk to the facility. This can imply that most mothers (those from remote zones) are exposed to second delay of maternal mortality – that is, longer time taken before reaching a health

centre with a complicated pregnancy. This can also indicate the low socio-economic status of hospitalised mothers in the study as they reside in distant remote areas with low wealth level index. Hence, they are unable to afford the indirect costs associated with care such as fare. A retrospective cross-sectional study analysed case notes of all maternal deaths and deliveries that were recorded from 2010 to 2014 in a regional maternity hospital in Kuando Kubango province of Angola (Umar & Kabamba 2016:61). Of 131 maternal deaths, women living in rural areas accounted for 96.2% and the difference in the place of domicile (rural versus urban) was significantly associated with maternal deaths (Umar & Kabamba 2016:61).

A 34-year-old mother at AA-County hospital said:

> "Due to long distance from home … I took three hours … to get to the facility and lack of finance was also an issue." (P52)

A senior nurse at BB-Private hospital said:

> "Sometimes mothers come very late as they are from distant remote area." (N4)

A clinician at DD-County hospital said:

> "Some mothers reside very distant areas from the facility, and they are poor, they opt for home delivery as they are unable to afford private transpor." (CO4)

However, a 25-year-old mother at AA-County hospital said:

> "I had no challenge on transportation since I come from around and I had planned for transportation means – motorbike." (P4)

3b) Poor road network and few public transport vehicles

There was a poor road network (very few tarmac roads) in the study location, making movement to hospital a challenge, especially during rainy seasons. Furthermore, the fare is unaffordable. Hospitalised mothers in the study shared that they mostly used a motorbike as a means of transport. This could imply that more hours are spent on

transit due to poor roads with few public transport vehicles hence delay to timely maternal care. Further, some turn to traditional medicines and TBAs for maternal healthcare services and home deliveries. In a rural coastal Kenyan cross-section study on why mothers still delivered at home; results revealed that staying ≥10 kms from the nearest health facility was associated with nearly four-fold risk of home delivery (Moindi, Ngari, Nyambati & Mbakaya 2016:4). Most pregnant women are not able to timely access transport services when they develop labour, mostly due to the poor road network and infrastructure, especially in rural and poor urban regions in Africa (Moindi et al 2016:4).

A 30-year-old mother in postpartum at AA-County hospital said:

> "Poor roads and bad weather hindered my hospital delivery." (P7)

A 21-year-old mother with PPH at DD-County hospital said:

> "There are greater challenges of means of transport following poor road network, more so during rainy season." (P3)

An ANC mother admitted at CC-County hospital said:

> "The motorbike rider I had called delayed … as he did not arrive on time to take me to the hospital." (P12)

4.4.2.3.4 Challenges experienced during hospital referral of mothers with obstetric emergencies

4.1a) Referral decision delays

Referral delays noted in the study by the midwives were often caused by the logistical process of ambulance ordering. The periphery hospitals have to call the headquarters for the ambulance. This is because all ambulances are stationed at the county headquarters. This indicates that the delay reduces the survival chances of the mother.

A doctor at AA-County Hospital illustrated a scenario as follows:

> "There is a day I admitted a referral mother with retained placenta who had three hours delay at the referring facility." (D1)

A doctor at CC-County Hospital complained:

> "A lot of referral delays are caused by the current referral protocol; where you have to call the headquarters to be given the ambulance as none is stationed here. The back and forth of the ambulance consume time." (D3)

A clinician at DD-County Hospital sadly noted:

> "Unfortunately, we lost a mother recently because of this referral delays." (CO4)

4.1b) Verbal referrals

Findings reveal that some mothers were referred without any referral forms or discharge notes. This implies that mothers were exposed to a breakdown of the continuity (quality) of care. One can also deduce that there is a communication gap between facilities. Ideally the peripheral referring facility ought to alert the referral facility before initiating the referral. As a result of verbal referrals, those unable to afford private transport opted to go home to solicit funds hence delay occurred in reaching the referral facility.

A nurse at AA-County Hospital illustrated a scenario as follows:

> "I even received a mother not identified as high risk … in postdatism verbally referred from a peripheral facility. The mother came in with septic shock that could not be reversed." (N16)

A nurse at AA-County Hospital shared her experience as follows:

> "… sometimes a mother is verbally referred with no medical notes given to her from referring facility." (M32)

A clinician at AA-County Hospital illustrated a scenario as follows:

> “A referral of a mother to higher facility was done verbally by the referring facility only for a mother to ignore the medical advice and went home. Unfortunately, she was brought here ... at the … [the] referral facility … with per vaginal bleeding and diagnosed of ruptured uterus but no blood at the referral facility.” (C01)

4.1c) Ambulance poorly equipped (staff and equipment)

The referring personnel accompanying the patient are expected to be trained health professionals. Furthermore, the ambulance ought to be equipped with emergency resuscitative equipment. However, in the study, midwives shared that patients were referred by training students and some ambulances were inadequately equipped.

A nurse at BB-Private Hospital said:

> “Our ambulance is just like a public transport vehicle van, it got no emergency resuscitating equipments.” (N11)

A nurse at AA-County Hospital said:

> “Routinely you will find that the ambulance goes to pick the patient (from the periphery) with no qualified staff; mostly a student and driver only because the unit is understaffed.” (N12)

4.1d) Inadequate filling out of referral forms

The referral tool/form entails patient health details, care received, and any recommendations made by the referring facility. The study respondents noted that some hospitals referred mothers with poorly completed referral forms.

A nurse at AA-County Hospital said:

> “A facility may refer a mother with inadequate information filled on the referral forms.” (N6)

4.1e) Inadequate ambulance vehicles

Based on the transcripts from the respondents, ambulance services are not available 24 hours when needed, especially at the peripheral facilities. This leads to some mothers using private vehicles to get to the referral facility. Midwives highlighted that ambulances were inadequate to meet the demand.

A nurse at DD-County Hospital illustrated her referral experience as follows:

> "I had a mother who missed ambulance services because it had taken a patient to another county." (N11)

A clinician at DD-County Hospital said:

> "We do not have our own ambulance; we rely on the one from county headquarters." (CO3)

4.1f) Out-of-service ambulances and no fuel

Servicing, fuelling and up-to-date maintenance remained a challenge in the study. Midwives demonstrated that sometimes the few ambulances available could not be utilised because of maintenance problems. In addition, when hospital ambulances were taken for routine maintenance; there was no back-up plan.

A doctor at AA-County Hospital said:

> "At times the ambulance may be available, but there is no fuel; hence it cannot get to the periphery to pick up a client." (D1)

A nurse in charge at DD-County Hospital lamented:

> "You call the headquarters for the ambulance only to be told it is out of service; hence it cannot be used." (N4)

A nurse at AA-County Hospital observed:

> "Although the ambulances are stationed here, you will find that servicing is done like at the same time for all, hence all are grounded at the same time." (N1)

4.1g) Unaffordable ambulance services

Findings reveal that ambulance services were not free within the study. Charges were directly proportional to the distance covered by the ambulance. This could also indicate that mothers who fail to afford the extra cost use private transport (cheaper means) which is associated with maternal delays.

A nurse at AA-County Hospital observed:

> "Mothers are asked to pay 10 USD for the ambulance cost if the referral is within the county and 100 USD if outside the county." (N1)

A nurse at BB-Private Hospital observed a case scenario as follows:

> "A mother with retained placenta used a private vehicle (probox) as she was unable to pay for the ambulance." (N10)

4.1h) Inappropriate referral

In the study, midwives noted that some mothers who did not meet referral criteria were referred. Most often these mothers had no pregnancy related complications. Findings reveal that the lower-level facilities might refer a mother with no complications when they felt understaffed or when the client was expected to deliver at night.

A nurse at AA-County Hospital illustrated her experience as follows:

> "You will find that a mother with normal labour is referred because the referring facility is understaffed, especially at night." (N2)

In Malawi, verbal autopsy and facility-based medical records were reviewed on factors associated with maternal mortality in Malawi (Mgawadere et al 2017:5). Researchers

noted that there were delays in the necessary referrals of deceased mothers from one healthcare facility to another due to the lack of emergency transport (Mgawadere et al 2017:5). Ensuring that those who develop obstetric emergencies during childbirth are quickly transported to facilities where they can receive quality EmONC can be the difference between life and death for the pregnant woman and her foetus (Alaofe et al 2020:2).

4.4.2.3.5 Challenges that hinder maternal care interventions within the hospital

4.2a) Inadequate birth plan preparedness

Hospitalised mothers in the study indicated that they had inadequate birth plan preparedness prior to hospitalisation. Mostly, they had not saved funds to cater for their transport as required in a birth plan. This can indicate a gap in ANC visits health education to the hospitalised mothers within the study, making them vulnerable to second delay of maternal mortality.

A 29-year-oldmother admitted at AA-County Hospital said:

> "I never had money for transport, so I had to walk from home to hospital." (P23)

Another mother in the antenatal unit admitted at DD-County Hospital said:

> "I could not afford the part of the transport, so I had to walk." (P33)

4.2b) Care non-adherence

The midwives in the study shared that some pregnant women attended a suboptimal required number of ANC visits. Unfortunately, some were high risk clients, hence there was poor monitoring of their progress. This implies that although most women in the study attended ANC visits, there were adherence gaps.

A case scenario illustrated by a nurse at AA-County hospital was as follows:

> "We even lost a mother who bled overnight and come the following morning. The mother did not attend any ANC visits." (N3)

A charge nurse at BB-Private hospital noted:

> "I admitted a mother who came in at term gestation with severe eclampsia but had only attended only one ANC visit in the first trimester." (N10)

A charge nurse at DD-County hospital observed:

> "I have even received a mother that was not attending ANC despite a positive history of frequent blood transfusions and hospital contact." (N2)

It is recommended that expectant mothers receive at least eight antenatal visits to check and monitor the health of mother and foetus (Orjingene & Morgan 2020:10). Mothers who attend more ANC visits are also more likely to learn danger signs and to deliver under a skilled healthcare attendant (Muvengei et al 2021:750).

4.2c) Unaffordable service cost

Midwives of this study noted that most of the women referred from peripheral hospitals attended ANC visits during pregnancy. However, there was sometimes a lack of vital content information in their booklets when most needed, especially antenatal profile investigation and routine ultrasound data. The tests in the ANC profile include urine routine and microscopy, complete blood count, glucose (fasting), HIV antibody, blood grouping, hepatitis B antigen and hemoglobin level. Lower-level peripheral hospitals are not equipped to carry out the investigations, hence the referral of patients. Findings indicate that the costs associated with the investigations deter mothers from the needed interventions.

A clinician at DD-County hospital observed:

> "We charge 2 USD for the ANC profile investigations. This cost is unaffordable to some. You will find a mother went eight times to ANC … clinic but some important investigations like profiles were not done." (CO4)

A doctor at CC-County hospital noted:

> "Interestingly, mothers will move to lower-level hospitals (dispensaries) which are completely free; but they miss out having ANC profile investigations services since at the dispensary we do not have laboratories equipped to carry out this investigations." (D3)

A case scenario demonstrated by a nurse at AA-County hospital was as follows:

> "We admitted a mother with undiagnosed multiple pregnancies although she was regularly attending ANC visits, no ultrasound was done; delivery of the first twin was at a peripheral level facility that has no theatre services, she was referred to our hospital; she had C/S for the second twin." (N1)

Previously a study in Kenya noted that while many women received basic ANC services such as blood pressure monitoring and urine tests at least once during pregnancy, many were not receiving these consistently at every visit as recommended by the Kenya National guidelines (Afulani et al2019:10). The situation is even more dire for more advanced services such as ultrasounds, which less than one out of every five women in our sample received, with women who had complications (the group for whom it is recommended) were less likely to receive it (Afulani et al 2019:10).

4.2d) Inadequate resuscitation supplies, drugs and general consumables

From the interview with the midwives, it emerged that hospitals within the study were poorly equipped with essential supplies to manage the most common causes of maternal mortality. It was not uncommon to have stockouts of portable oxygen and normal saline when critically needed. This could indicate that there is inadequate readiness to handle an emergency mother. Hospitalised mothers also lamented the stockouts of drugs forcing them to buy elsewhere with only very few noting the opposite. In addition, they noted that some supplies were inadequate, such as water, nets and linens. This could imply that hospitalised mothers who were unable to afford the drugs elsewhere went without treatment. This could also indicate that lack of water in the hospital can predispose the hospitalised mothers to more hospital acquired pathogens.

A nurse working at AA-County Hospital said:

> "We often lack of portable oxygen when wheeling a mother to theatre." (N13)

Another nurse with five years' service at AA-County Hospital observed:

> "We have erratic supply of commodities; Sometimes you will find a mother is prescribed for misoprostol, but the drug is not administered due to stock-out." (N14)

Similarly, a mother admitted to DD-County Hospital observed:

> "Some medications we were asked to buy from outside this facility." (P51)

Further on supplies, a doctor at CC-County Hospital noted:

> "Another challenge affecting us (peripheral health hospital) is the inadequate commodity and supply, like clean gloves." (D3)

A postpartum mother at AA-County Hospital said:

> "Linens are insufficient, such that we got to use them for 24hrs before they are changed and if you get soiled you stay without one." (P11)

Antenatal unit mother at CC-County Hospital said:

> "No mosquito treated nets provided for in-patient." (P13)

A mother of 36 weeks' gestation at AA-County Hospital complained:

> "We only usually have water during the morning hours and at times there is none." (P14)

A study was conducted to unravel the circumstances that lead to maternal death in rural Ghana (Awoonor-Williams & Apanga 2018:4). In its highlighted case, moderate anaemia was an indirect cause of maternal mortality (Awoonor-Williams & Apanga

2018:4). The absence of oxygen and readily available blood at the district hospital exposed how weak rural healthcare services can be (Awoonor-Williams & Apanga 2018:4). It is most likely that if oxygen and blood were readily available, the deceased's life could possibly have been saved (Awoonor-Williams & Apanga 2018:4).

4.2e) Theatre-related delays

In the study, midwives shared that theatre-related delays were caused by unavailability of blood, long theatre lists, stockouts of essential supplies like sutures, water and unavailability of specialist personnel. This could imply gaps in procurement of essential supplies and maintenance of inventory within the study. Furthermore, all hospitals in the study had no operational maternity theatre. This implies that they exposed mothers to delays as they had to wheel mothers to the general theatre (that was overwhelmed).

A nurse working at AA-County Hospital said:

> "Lack of sutures and water missing in theatre is often a reason for referral to another hospital." (N25)

A clinician at DD-County Hospital noted:

> "There is often lack of supplies, especially intravenous fluids, which delay transfer of a mother to theatre." (CO3)

A nurse at CC-County Hospital shared her experience as follows:

> "A mother had 48 hours delay before she could be taken to theatre because of lack of blood supplies and long theatre list problems." (N7)

Another nurse at AA-County Hospital said:

> "We do not have operational maternity theatre; hence we wheel our patients to the main theatre which is 15 minutes away. This contributes to delays." (N21)

4.2f) Inadequate skills by healthcare workers and inappropriate care

In the study, the midwives painfully narrated instances of mismanagement of mothers either referred to them or occurring within their hospitals. They highlighted that the inadequate care might have reduced survival chances of the mothers. This could illustrate negligence and incompetencies of skills among healthcare workers in the study to adequately manage the mothers with life-threatening conditions.

A nurse at AA-County Hospital shared her experience of negligence as follows:

> "A mother is noted to have been admitted of antepartum haemorrhage and unfortunately oxytocin drug was administered as part of care." (N5)

A case scenario by a clinician at BB-Private Hospital is as follows:

> "A mother had gauze packing of a cervical tear … she died due [to] haemorrhage." (CO6)

A doctor at AA-County Hospital had experienced the following scenario:

> "A mother was given haematinics with severe anaemia instead of blood transfusion" (D1)

Another case scenario by a clinician at AA-County Hospital was as follows:

> "I have recently observed a case of inappropriate care as a mother that was taken to theatre with no blood while severely anaemic unfortunately … no transfusion intra-operative." (CO5)

A scenario by a nurse at BB-Private Hospital wasas follows:

> "A mother who was admitted with sepsis died before appropriate antibiotics were administered." (N19)

Lack of good quality routine care may lead to more complications or late detection of these (Miltenburg et al 2018:5). A substantial body of evidence is emerging that

documents low provider skills and limited facility capability to provide good-quality routine and emergency care at birth (Gabrysch et al 2019:e1074). Gabrysch et al (2019:e1074) add that to bring women into a building with a health worker labelled as being skilled is not enough; rather, women should give birth in a health facility with good care that can save lives and prevent ill health (Gabrysch et al 2019:e1074).

4.2g) Protocols and guidelines non-adherence

Midwives shared some instances of gaps experienced in regard to hospital policies and international care protocols required. The narratives demonstrate that although the protocols were available, sometimes there was non-adherence to implementation. Of note from the midwives is that rarely are perimortem C/S attempted to save the baby as required by the guidelines.

A scenario noted by a nurse at AA-County Hospital was as follows:

> "Early discharge can be made that is not in line with the guidelines. For example, a mother had anti-malarial drugs started but not continued only to return in irreversible severe state." (N1)

A nurse at AA-County Hospital observed:

> "Recently the healthcare team missed to do a perimortem C/S when the mother had cardiac arrest, perimortem C/S could have been done to save the newborn." (N20)

A case scenario experienced by a nurse at CC-County Hospital was as follows:

> "A mother had investigations ordered (urinalysis, ultra-sound, chest X-ray) but not done." (N9)

A nurse at DD-County Hospital observed:

> "A mother started ailing six days postdelivery, was admitted and treated for sepsis and discharged. Five days later she is readmitted and never survived." (N4)

A similar study conducted in the Upper-East Region of Ghana revealed maternal healthcare system obstacles (Awoonor-Williams & Apanga 2018:5). Non-adherence of healthcare workers to treatment protocols and standard operating procedures were found as major barriers to the provision of effective and quality maternal healthcare services in the region (Awoonor-Williams & Apanga 2018:5).

4.2h) Patient monitoring and documentation

The midwives in the study highlighted gaps in mother monitoring and documentation. Sometimes mothers had charts that were inadequately completed, or no comprehensive history was taken during clerking. Patient monitoring that entails history taking, continuation notes on care and charting of several tools like input/output, vitals and partographs are essential in care and during shift changes.

A nurse at AA-County Hospital observed:

> "Although mothers awaiting C/S are to have their partographs charted, it is not routinely done; I guess it is a failure on the staff side … we are acutely under-staffed." (N1)

A nurse at BB-Private Hospital observed:

> "Due to under-staffing and heavy workload, you will find patient vitals and charting only done during the medication time." (N5)

An ANC mother at AA-County Hospital shared:

> "I went for my normal ANC and was told I could give birth anytime from that date. I returned to the clinic the following day for blood pressure check since the nurse did not to take my blood pressure. The blood pressure were so high and I was referred here." (P33)

A nurse at AA-County Hospital observed:

> "I have experienced lack of patient observation and monitoring within care. Example is a mother delivered at night developed PPH because of the cervical tears that had not been promptly identified, took two hours bleeding, theatre was delayed due to lack of blood. Later she was indicated for dialysis which she could not get because of renal-dialysis machine breakdown and central venous catheters to be used were out of stock too." (N9)

A senior doctor at BB-Private Hospital observed:

> "Partograph is sometimes inconsistently used in monitoring a mother in labour, … or instance a mother in labour had an initial review at 22:00 hours by a doctor, the next review was noted at 06:00 hours the following day." (D1)

Unit charge nurse at AA-County Hospital observed:

> "There are input-output charts gaps in documentation … you find a mother on magnesium sulphate being managed for eclampsia but no urine and output monitoring chart." (N10)

A nurse at DD-County Hospital observed:

> "A mother was not frequently monitored as expected hence realising the PPH late when the patient was gasping." (N18)

A nurse at AA-County Hospital observed:

> "An unconscious mother admitted was not known to be in labour, until she was in second stage." (N22)

A nurse at CC-County Hospital observed:

> "Documentation gaps, illegible doctor's notes and inadequate charting/history taking on admission/nursing cardex." (N15)

A nurse at AA-County Hospital observed:

> "A mother was on oxygen management had no monitoring of SpO2 [oxygen saturation]."(N25)

4.2i) Lack of blood

Midwives in the study strongly indicated inadequate blood supplies in the hospitals. This reduces the survival chances of mothers, especially those diagnosed with postpartum haemorrhage (PPH). Peripheral referring facilities tend to refer mothers in the hope of getting blood at the referral hospitals, yet most often there is lack of blood in the entire Migori County. This can indicate the need for blood availability in order to save mothers. Hospitalised mothers added that it often took long for them to be transfused. The hospitals further requested them to have their relatives donate to replace the transfused blood. This could indicate the vulnerability of pregnant women in need of blood in the study as Migori County blood bank is not adequately meeting the demand.

A unit charge nurse at AA-County Hospital said:

> "Most often attempts to get blood from nearby facilities are futile and we end up losing a mother in need." (N6)

A doctor at AA-County Hospital said:

> "We do not have a blood bank screening centre in the county; we rely on the Kisumu City. This means blood donated in Migori has to go first to Kisumu for screening before it is brought back." (D1)

A nurse at AA-County Hospital illustrated her experience as follows:

> "There is a time; a mother had anaemia due to PPH secondary to retained placenta. On successful manual removal there was no blood for transfusion and [she] failed to survive." (N9)

A mother awaiting theatre at BB-Private Hospital illustrated her experience as follows:

> "I went to the nearby hospital at home when labour began. The provider told me my level of blood is too low and I cannot give birth at that facility. So, I was

referred here. The doctor told me to look for someone who would donate blood for replacement of the one I will go with to theatre." (P24)

A mother admitted at CC-County Hospital shared:

"I waited for days before the needed blood was eventually administered to me." (P25)

A mother admitted at DD-County Hospital shared:

"There was no blood in the hospital for my transfusion." (P26)

4.2j) Inter-departmental communication/teamwork/coordination

Midwives in the study shared instances of lack of coordination as a unit during management of a mother. This could imply that the mother is exposed to more unnecessary delays caused by gaps in the team. They highlighted that the peripartum unit works in close co-ordination with other units such as theatre, laboratory, high dependency unit (HDU), outpatient department (OPD) and radiological centre for the survival of the mother.

A nurse working at AA-County Hospital shared:

"Sometimes there is communication breakdown at interdepartmental level, contributing to delay in care. Like, lack of prompt communication from laboratory to maternity on stockouts of reagents." (N18)

A clinician at AA-County Hospital said:

"Often a mother's care is delayed when the junior healthcare provider fails to promptly escalate for senior specialist review." (CO1)

A nurse working at AA-County Hospital explained:

"At times when with an emergency case and in need of urgent lab investigation, we sent student. However, lab personnel like assuming students until you go

there yourself for them to act promptly … we do not have hospital intercom or phone in this unit." (N3)

A charge nurse at BB-Private Hospital shared:

> "There is a time nurse covering … did not communicate early to whole team/departments to anticipate critically ill mother arrival. Hence the case arrived with the team unprepared." (N2)

A nurse working at AA-County Hospital illustrated his experience as follows:

> "There was lack of communication of functionality of anaesthetic machine … when I was on duty … hence theatre delayed when in need." (N23)

4.2k) Radiological and laboratory equipment/services

As illustrated by the transcriptions from the study's midwives, there was persistent lack of radiological services, especially portable scans. Most hospitals within the study lacked portable X-ray machines. In addition, the laboratory services were often out of stock with needed reagents for investigations or machine breakdowns. This could imply that an urgent radiological/laboratory investigation is delayed, hence suboptimal service delivery to the mother.

A nurse working at AA-County Hospital illustrated her experience as follows:

> "A mother who reported at ANC around 30wks gestation at referring hospital later on had rupture of membranes at 38wks and was advised to deliver in a referral hospital (higher). Sadly, she delivered at home, went to her former referring hospital for management after one week. The referring hospital referred her to referral hospital for further management. At the referral hospital liver function tests and urea and electrolyte test machines had broken down so no investigation done." (N8)

A case scenario shared by a nurse at BB-Private Hospital was as follows:

> "A mother with clinical signs of tuberculosis disease was admitted in labour and delivered. The mother later complicated with no chest X-ray done as hospital has no portable X-ray." (N11)

A nurse at CC-County Hospital said:

> "No portable X-ray, stent services and those mothers in need are referred." (N6)

A nurse at AA-County Hospital said:

> "It is … not uncommon to have a mother die before lab results are out-delay." (N9)

A nurse at AA-County Hospital noted:

> "Shortages of reagents in the lab as multiple mothers' urea and electrolyte tests are not done when needed." (N11)

4.2l) Infrastructure

The common hospital incapacity as narrated by the study's midwives was the lack of an intensive care unit (ICU) in entire region and inadequate high dependency unit (HDU) bed capacity for those hospitals that have them. This implies that patients in critical conditions were referred to the neighbouring counties. Sadly, most often there was scarce availability of ICU beds in the neighbourhood.

A doctor working at AA-County Hospital illustrated his experience as follows:

> "A mother prepared for C/S delivered normally, suffered a cervical tear which was repaired, bleeding continued, and explorative surgery was done. It was realised that she had uterine rupture and hysterectomy was done. On airway extubation the mother could not reverse and needed ICU services which are unavailable, and she succumbed on table. Sadly, the patient was breathing spontaneously with no BP recordings; efforts to get oxygen from maternity ward were unsuccessful hence left on theatre table." (D1)

A nurse in AA-County Hospital noted:

> "A mother critically ill in need of ICU but was not referred as it is not easy to get ICU." (N4)

A nurse in AA-County Hospital noted:

> "A mother missed antibiotics because of stockout and never got to HDU [high dependency unit] because beds were full." (N17)

A case scenario experienced by a clinician at AA-County Hospital was as follows:

> "A mother had multi-organ failure, respiratory failure and was on highly active antiretroviral drugs [and] was taken for emergency C/S. Developed secretions making intubation a challenge. Mother required HDU but there was no bed." (CO1)

A theatre nurse at AA-County Hospital shared:

> "A high-risk mother not linked to the clinic came in with multiple organ failure at 36 weeks. However, she was taken to HDU a day after surgery because there was no bed available despite saturating at 80%." (N3)

Charge nurse at BB-Private Hospital shared:

> "A mother with poly-hydramnios and IUFD [intrauterine fetal death] was taken to theatre, the condition worsened in theatre. ICU was recommended but no bed was found in the neighbouring facilities. Mother remained in theatre as the ICU was being sought though in vain." (N9)

In line with the present findings, a cross-sectional study was carried out to audit near miss events and their causes in South Sudan (Alemu et al 2019:177). Researchers argued that nonexistence of an ICU unit contributed to the higher proportion of women experiencing organ dysfunction or dying due to lack of intensive care (Alemu et al 2019:177). This also entails another third delay (Alemu et al 2019:177).

4.2m) Congested maternity ward

Findings show that hospitals' peripartum wards are often full to capacity. This can imply that mothers are vulnerable to poor sanitation and privacy ethical challenges. Further hospitals have inadequate delivery couches.

A mother admitted at BB-Private Hospital noted:

> "No privacy between patients in congested wards." (P35)

A nurse at AA County-Hospital revealed:

> "It is possible those not admitted in the acute room missing drugs because of high number of patients we are serving against few staffs." (N5)

A charge nurse at AA County-Hospital observed:

> "We are overcrowded by patients from the peripheries. Further our labour room has only four delivery couches, yet we are having 360 deliveries per month." (N1)

4.2n) Staff shortage

Midwives of the study highlighted that they were overwhelmed with the number of admissions with poorly staffed units. Additionally, there was lack of specialised personnel for most complicated cases in the study. This could imply that care was suboptimal as there was a high patient to staff ratio or lack of specialised teams. Hospitalised mothers corroborated that understaffing in the peripartum unit caused more waiting times during admission and delays of care because of inadequate numbers of doctors to perform surgeries. In addition, high staff turnover was noted among the peripartum units in the study.

A doctor at AA County-Hospital observed:

> "There is no critical care physician, haemoncologists and anaesthesiologists in the hospital." (D1)

A senior nurse at BB-Private-Hospital noted:

> "We are generally understaffed; it is worse at night where you will find two nurses covering 20-30 patients and if there is a theatre case; then only one remains in the whole unit as the other accompanies the C/S case to theatre … to … scrub ... Further we do not have patient porters." (M1)

A nurse at BB-Private-Hospital noted:

> "There is high staff turnover in this unit." (M9)

A mother hospitalised at DD-County Hospital recommended:

> "There should be increase of doctors, as one had to be called from the county headquarters to provide C/S service at this peripheral hospital." (P5)

A mother hospitalised at CC-County Hospital observed:

> "The staff who was on duty that night was overwhelmed with work since she was alone on duty. This delayed my admission." (P6)

A nurse at AA County-Hospital explained:

> "Routinely there are three nurses on duty taking care of the whole 65-bed maternity unit at night." (N2)

The study by Ackers et al (2018:4) explain that, on a typical day in Ugandan public health centres, it is not unusual for no doctors to be present for work (Ackers et al 2018:4). This has led to a total breakdown in referral systems and highly congested referral hospitals where women are treated by intern doctors and students, usually with no supervision (Ackers et al 2018:4).

4.2o) Healthcare providers' attitude

In the study, hospitalised mothers reported mixed feelings about healthcare providers' attitude. Though not a maternal mortality determinant, experience of providers' negative attitude in the study lowered future health seeking behaviour among hospitalised mothers. This could also imply that skilled birth delivery was avoided in their subsequent pregnancies.

A mother with three days after surgery at AA-County Hospital noted:

> "I felt unwelcomed and discouraged as healthcare provider was so harsh to me." (P16)

An antenatal unit mother hospitalised at CC-County Hospital said:

> "Fair care but the nurses need to improve on attitude." (P18)

A mother hospitalised at DD-County Hospital noted:

> "Quality of care is good, but some nurses have bad attitude." (P21)

A mother hospitalised at AA-County Hospital observed:

> "The attitude I receive from students is good, but nurses need to change and improve on their attitude." (P24)

Karkee et al (2021) explain that a negative birth experience might lead to subsequent home deliveries, as mothers would argue that there is no need to go out to health facilities which they perceived as unfriendly (Karkee et al 2021:5). However, some hospitalised mothers noted the healthcare providers being welcoming and having a positive attitude.

A 23-year-oldmother with anaemia hospitalised at AA-County Hospital noted:

> "The staffs were just okay and were willing to help." (P6)

A mother with eclampsia hospitalised at BB-Private Hospital observed:

> "The attitude of the healthcare providers was positive." (P7)

A mother hospitalised at AA-County Hospital said:

> "I was well received by maternity nurses and immediately reviewed by the medical officer." (P8)

4.2p) Slowness in service

Slowness in service delivery was noted in the study, such that what the hospitalised mothers felt needed urgent intervention was contrary to the actions of the healthcare providers.

A mother hospitalised at AA-County Hospital said:

> "There is laxity and slowness in implementing nursing and medical services. The nurses do not give reports on [to] the next staff, hence … no continuity of care. Unless I remind them on what the doctor said, no service will be given to me, and the day will just go like that." (P40)

A mother hospitalised at DD-County Hospital noted:

> "On admission I explained my situation and they never recorded my complaints." (P17)

4.2q) Demotivated staff

The midwives narrated that most often they felt demotivated from a myriad of work environment challenges. These included staff shortages, inadequate equipment, and high workloads.

A nurse at AA-County Hospital said:

> "Staff motivation is an issue. We are poorly treated; no staff lunch or tea." (N1)

A nurse at DD-County Hospital observed:

> "There is persistent salary delay for county government employees." (N2)

A nurse at CC-County Hospital noted:

> "We have poor working environment, we feel frustrated. Can you imagine sometimes we got no gloves, no running water, no supplies, no blood pressure machine, inadequate delivery packs … the list is endless, my friend." (N7)

A nurse at AA-County Hospital lamented:

> "You feel unmotivated when a patient does not get any drug from those prescribed from the hospital." (N10)

4.5 KEY FINDINGS FROM THE INTEGRATED QUANTITATIVE-QUALITATIVE PHASES

The integrated qualitative-quantitative data collection and analysis processes were juxtaposed side-by-side through a joint display in order to support the researcher's process of drawing meta-inferences (McCrudden & McTigue 2019:381). According to Creswell and Creswell (2018:66), a joint display refers to a visually presented integration of both the qualitative and quantitative data for purposes of drawing out new understanding of the data from the two (qualitative and quantitative) approaches. Further, integration facilitated the detection of the differences and similarities among the information generated from different sources (Bazeley 2018:74). A mixed methods approach using an explanatory sequential mixed methods design was used to address the above mentioned research objectives. "What strategy can reduce MMR in Migori, Kenya?" was the overall question that steered the study.

4.5.1 The causes of maternal mortality in Migori, Kenya

The researcher found that the leading causes of maternal mortalities in the selected hospitals were haemorrhage 34.7%, eclampsia 20.8% and sepsis 15.8%. The findings also indicated that the Migori region has chronic blood shortages. This can mean that the cases that developed haemorrhage were inadequately managed. In-depth interviews indicated that drug shortages, inadequate patient monitoring, and slowness in care might have reduced the survival chances of cases with eclampsia. For sepsis cases, they were vulnerable to inappropriate care, and erratic drug and water supply in the hospitals. The researcher posits that 70% of the identified maternal deaths could have been prevented with an effective strategy.

4.5.2 The interventions including the strategies that are currently being implemented to reduce maternal mortality in Migori, Kenya

The current maternal initiatives are overwhelmingly focused on haemorrhage (NASG Programme), which was a top cause of maternal mortality in the study. The persistent problem (haemorrhage) indicates ineffectiveness of the programme. The findings show that the programme is limited in coverage and implementation with only a few staff members and hospitals enlisted. Other interventions with similar limitations in the present study were capacity building trainings and mHealth for follow-up programmes. It is the researcher's view that the narrow scope of application of the NASG Programme needs to be addressed for successful reduction of haemorrhage cases. In addition, strategies to stem the other neglected top causes (eclampsia and sepsis) of maternal mortality are needed as well.

Linda Mama (free maternal services) was initiated to encourage more skilled birth by overcoming the cost-associated barriers. As a result, it was envisaged to reduce maternal mortalities. However, the present study findings indicate a trend of an increasing institutional maternal mortality ratio (iMMR). Participants noted that Linda Mama is ineffective as follows: it is inadequately funded, reimbursements are delayed, and only limited services are covered. This makes the healthcare system dysfunctional, with stockouts. The Linda Mama policy is further silent on most vulnerable teenagers-(*who are yet to have national IDs*), as it only enlists adults above 18 years with IDs. Mothers with multiple pregnancies (*vulnerable*) are further neglected as only singleton

births are covered. To reduce maternal mortalities, a strategy that strengthens this policy and mitigates its challenges is urgently needed.

The researcher further investigated development and implementation of family planning strategies by the government. However, they face implementation and utilisation challenges. Rural county hospitals charge for FP services, unlike urban county hospitals, which indicate the inequality of access to the most vulnerable (*poor women*). The findings further reveal that there are missed opportunities of FP in urban hospitals. This is caused by the under-staffed peripartum wards, limited numbers of staff with prerequisite skills of intra-uterine insertion, and early closure of FP clinics. This thesis contends that although managing direct maternal complications is important, a key strategy is needed to prevent mothers from having unwanted pregnancies that increase their vulnerability.

Identified community initiatives in Migori County include outreaches, CHV involvement and media health promotions; however, they face similar implementation obstacles. The findings revealed that CHVs encounter stipends delays, inadequate funds are allocated to outreaches and mass media. The researcher contends that a community empowerment strategy is essential to transform the negative cultural influences, promote behavioural change, and ensure that mothers in need are transported to hospital promptly.

Based on this analysis, a different approach is required to reduce maternal deaths. It would strengthen the implementation of existing strategies while appreciating the current challenges of health systems and inequalities of access to health by the poor women in Migori County.

4.5.3 Factors that cause delays in maternal care and contributing to increased maternal mortality in Migori, Kenya

The basic premise of the three delay model is that there are three phases of delays that interrupt a woman from receiving appropriate maternal healthcare and become the pertinent factors contributing to maternal death (Win et al 2015:180). First Delay – delay in decisions to seek care by pregnant women, their husbands, or other decision makers in their families. Second Delay – delay in arriving at a health facility after a decision is

made to seek care. Third Delay – delay in receiving appropriate care after arriving at the health facility (Win et al 2015:180).

4.5.3.1 Causes of first delays

The study findings noted causes of first delays and non-utilisation of maternal healthcare interventions. Medical records' review revealed that most (44.6%) of the cases had a primary level of education, while 32.7% had attained secondary education. Although the study was facility based, 7.9% of women had home deliveries. Most (93.1%) of the reviewed cases were Christian, 71.3% were married, and 21.8% were single. In-depth interviews indicated that most vulnerable mothers were ignorant of obvious danger signs and poorly schooled; they were negatively influenced by old traditions, myths, perceptions and culture. This caused them to opt for home deliveries with use of TBAs and herbal drugs. Patriarchy's decision-making power hindered some mothers in need from getting prompt services. Participants further noted negative influences of Roman Catholic and Legio religions that are dominant in the county. It can be concluded that both data sets reveal that most mothers vulnerable to first delays are those poorly educated and those negatively influenced by religion, culture and traditional practices and beliefs.

4.5.3.2 Causes of second delays

Findings demonstrate that once a mother decides to get hospital interventions, she is vulnerable to second delays (*challenges of access to maternal healthcare interventions*). Quantitative data indicated that most cases (68.3%) were from rural regions, 44.6% were unemployed, and 37.6% were working in the informal sector. On the other hand, participants' interviews revealed that most mothers were from remote areas that are more than two hours away from the hospital, the region has a poor road network, the cost of transport is prohibitive and public vehicles are limited. Both data sets therefore illustrate that rural residence and unaffordable transport due to poor roads are major causes of second delays.

4.5.3.3 Third delays – hospital system failures

Mothers with obstetric emergencies need prompt referral services to tertiary hospitals for the appropriate care. Quantitative data showed that most (66.3%) of the cases were referrals. Additionally, 52.5% of the cases spent less than 24 hours in the hospital upon admission, whilst the qualitative data revealed several referral challenges mothers face, including protocol delays, poorly staffed ambulances, inadequate and out of service ambulances. It can therefore be concluded that both sets of results revealed that mothers were vulnerable to referral delays.

The findings indicate that multiple hospital system challenges and failures are hindering maternal care interventions. Quantitative data reveals that 75.2% of the cases at least attended ANC. Interviews demonstrated that there are gaps in ANC care, such as inadequate birth plan preparedness, non-adherence to ANC visits, and unaffordable service cost of ANC profiles. The qualitative data sets explain (*quantitative data*) that the majority of cases (deceased mothers) who attended ANC visits were vulnerable to suboptimal ANC care and associated unaffordable direct charges.

Phase1 data show that 44.6% had C/S, 38.6% had spontaneous vertex delivery (SVD), 1% had vacuum assisted delivery. In addition, phase2 data yielded sub-themes such as inadequate resuscitation supplies, theatre related delays, inappropriate care and lack of blood. The qualitative data sets explain (*quantitative data*) that although most of the cases had complications warranting C/S, the hospitals were poorly prepared to handle the emergencies.

In regard to point of care, most (64.4%) of the cases were in the postpartum period compared to 18.8% in intrapartum. This emphasises the need for more efforts during postpartum care where most mothers are vulnerable.

Further, quantitative data reveal that 67.3% were not monitored using a partograph, the latter was used for only 32.7%. Qualitative data illustrated non-adherence to patient management guidelines and poor monitoring. It can therefore be concluded that both sets of results revealed that hospitalised mothers were poorly monitored.

Lastly, quantitative data illustrate that delivery of the majority (48.5%) of the cases was cared for by nurses, 44.6% by doctors and 6.9% by TBAs. The qualitative data demonstrates staff shortages, healthcare providers with negative attitudes, staff slowness in service, and demotivated staff. The qualitative data sets explain (*quantitative data*) that although the cases were cared for by SBAs, they were vulnerable to suboptimal care caused by staff challenges.

4.6 CONCLUSION

This chapter presented the findings of the quantitative and qualitative phases of the study. Quantitative phase findings show that the key determinants of maternal mortality among the cases in the study were as follows: Cause of death, the non-use of partograph for women in labour (67%), postpartum (64%), referral case (66%) and residence (68%). This indicates that mothers most at risk were those who were diagnosed with haemorrhage and eclampsia, who had their labour poorly monitored during hospitalisation, who were in the postpartum period, were referred from periphery facilities and resided in rural areas.

Qualitative phase findings generated from in-depth interviews demonstrate that various initiatives were present in Migori County to improve maternal survival. Examples are: the Linda Mama policy, NASG programmes, capacity building and family planning. However, there was inadequate implementation and coverage of these strategies across the sampled hospitals. This implies mothers were unable to fully access, utilise and benefit from the initiatives. Noteworthy is that more initiatives are covering the third delay, with limited programmes tackling the first delay.

Migori mothers are poorly educated as some have never attended school. This allows them to be influenced easily by negative old culture and traditions that encourage non-utilisation of hospital interventions. In addition, some prefer TBAs to skilled birth at the hospital. Thus, they are at risk of first delays of maternal mortality.

The study shows most of the population (mothers vulnerable) resides in rural parts of Migori County that have a poor road network. The common means of transport is the motorbike. This is additionally unreliable for mothers from remote areas in rainy seasons; hence, this contributes to second delays; the poor roads hinder mothers from

reaching the hospital in time and causes more travel costs.

A myriad hospital system challenges were identified in the study related to third delays. For instance, findings indicate that drills, simulations and refresher training are inadequately carried out. Hospitals often are out of stock of emergency supplies and consumables. Blood is rarely available when needed in all selected hospitals. Worse, data revealed that some cases were inappropriately managed due to incompetency of the healthcare team. The county referral system protocol faces challenges of inadequate ambulances and delays. The delays are caused by the current protocol that stations all the ambulances at county headquarters and none in the periphery hospitals. Lastly, referral charges deter mothers from utilising the ambulance services when in need.

The next chapter will present a proposed strategy (phase 3) to reduce MMR in Migori, Kenya.

CHAPTER 5

PROPOSING A STRATEGY FOR REDUCING MATERNAL MORTALITY IN MIGORI, KENYA

5.1 INTRODUCTION

This second-last chapter presents the proposed strategy for contributing to reducing maternal mortality in Migori, Kenya. The study employed a mixed methods design. The findings from the quantitative and qualitative phases of the study were integrated to provide a complete and comprehensive picture of the investigation in order to address the research objectives and respond to the research questions on strategy development (Phase 3). In addition, the researcher gained insights to develop the strategy from the reviewed literature, an investigation into the current interventions that aim at reducing the maternal mortality in Migori, Kenya, and the theoretical framework of the study. The purpose of the study was to explore and identify the determinants of maternal mortality and develop a strategy for reducing maternal mortality in Migori, Kenya.

To reiterate, the objectives of the research study were:

- To explore and describe the causes of maternal mortality in Migori, Kenya
- To explore and describe the socio-economic determinants contributing to maternal mortality in Migori, Kenya
- To analyse the current strategies that aim at reducing maternal mortality ratio (MMR) in Migori, Kenya.
- To develop a strategy to reduce MMR in Migori, Kenya.

Based on the objectives above, the causes of maternal mortality in Migori, Kenya in line with objective 1 of the study were discussed in the third section of Chapter 4. The socio-economic determinants contributing to maternal mortality in Migori, Kenya in line with Objective 2 were discussed in sub-section 4.5.3.2. The analysis of the current strategies that aim at reducing the maternal mortality ratio (MMR) in Migori, Kenya (objective 4) was also presented in Chapter 4, sub-section 4.5.3.1. The fourth objective, developing a

strategy to reduce MMR in Migori, Kenya will be addressed in this chapter, Chapter 5, hence the researcher is of the view that all the study objectives have been met.

This chapter commences with presenting key findings from the integrated quantitative and qualitative phases, followed by development of the strategy for reducing the maternal mortality ratio in Migori, Kenya. The validation process will further be presented.

5.2 STRATEGY DEVELOPMENT

5.2.1 Introduction

A strategy is regarded as an action plan for achieving the desired goals. The strategy proposed is based on the findings of the study and specifically the causes and socio-economic determinants of maternal mortality in Migori, Kenya. In addition, the proposed strategy was guided by analysis of the current strategies that are being implemented to reduce the maternal mortality ratio in Migori, Kenya and an extensive literature review. The two phases of the study's findings were anchored on the three delays of maternal mortality theoretical framework.

The objective to be addressed: To develop a strategy to reduce maternal mortality ratio (MMR) in Migori, Kenya.

Purpose of the strategy

The purpose of the strategy is to inform overall national maternal health policy making, planning, programming and interventions for reducing MMR in Migori, Kenya.

5.2.2 SWOT analysis

A SWOT analysis − Strengths, Weaknesses, Opportunities and Threats − identifies internal strengths and weaknesses within a programme or organisation and external opportunities and threats within the operating context (Ahmadi, Danesh, Makharashvili, Mishkin & Mupfukura 2015:10). In the present study, the Migori healthcare system and its community formed the operating context for the analysis (Table 5.1). The SWOT

analysis gave a clear overview of the summarised factors that were identified based on the research results. These factors are not described in detail in this section as they are a summary of the already discussed results (see Chapter 4).

Strengths were internal factors of the selected hospitals that facilitated maternal mortality reduction. The quantitative phase results showed that, most cases and controls attended antenatal care which helps to detect and prevent early pregnancy complications. Respondents in the qualitative phase noted that, the hospitals had developed maternal mortality review committees and community health volunteers system. In the present study, maternal death reviews were used to identify gaps in clinical practice, and recommendations are made after identification and discussion of avoidable factors that contributed to maternal death. While community health volunteers promoted skilled birth deliveries through identifying and linking the pregnant women to healthcare facilities.

Weaknesses were internal barriers of the selected hospitals that hinder maternal mortality reduction. The respondents in the qualitative phase highlighted that, the hospitals are generally understaffed with limited refresher trainings. They further noted inadequate supply of blood products and ambulances for obstetric emergencies. These weaknesses exposed pregnant mothers to second and third delays in maternal care.

Opportunities were factors external to the selected hospitals that were likely to promote maternal mortality reduction within Migori County. In the present study, findings revealed that the external support from the Kenyan Ministry of Health and non-governmental organisations boasted the efforts of maternal mortality reduction through initiatives such as obstetric care capacity building and resource allocation. Respondents noted that, most initiatives were targeting prevention of PPH that was indicated as the leading cause of maternal mortality in the Migori region. Further, the respondents noted that, the county government sponsors mass media campaigns that target to increase awareness of pregnancy related complications within the community.

Table 5. 1: A description summary of SWOT analysis

Strengths	Weaknesses	Opportunities	Threats
• High antenatal visit attendance • Maternal Mortality Review-Committees • CHVS in communities	• Staff shortage of midwives • Inadequate supplies of blood and blood products • Inadequate skills and inappropriate care • Delays in referral system • Limited refresher trainings • Lack of eclampsia and sepsis refresher programmes	• Availability of non-governmental support • Obstetric care training to increase clinical skills • Increased advocacy for addressing the leading cause of maternal deaths • Availability of integrated of mass media campaigns and hospital	• High staff turnover • Limitation in budgetary allocation and delays due to economic constraints • Inadequate resources, especially, human resources • Government Non-compliance with policies − Linda Mama • Lack of human and financial resources which curtail NGO programmes • □ Heavy rains andfloods limiting access to hospital (poor public transportation system)

Threats were barriers external to the selected hospitals that prevented the midwives or pregnant mothers from successfully reducing maternal deaths. Findings revealed that, most direct and indirect maternal health programs such as Linda Mama and transport sector respectively were poorly funded by government in the rural Migori County. Accordingly, there was inadequate material and human resources to support optimal obstetric care in the selected hospitals. Further, poor road networks contributed to delays of access to hospitals by the pregnant mothers in need.

5.2.3 Methodology for development of a strategy

A strategy is proposed that will respond to make a difference in reducing maternal mortality in Migori, Kenya. The development of the strategy employed the nine interrelated tasks of strategy formulation by Pearce and Robinson (2009:2). Figure 5.1 demonstrates the nine steps followed to develop the strategy.

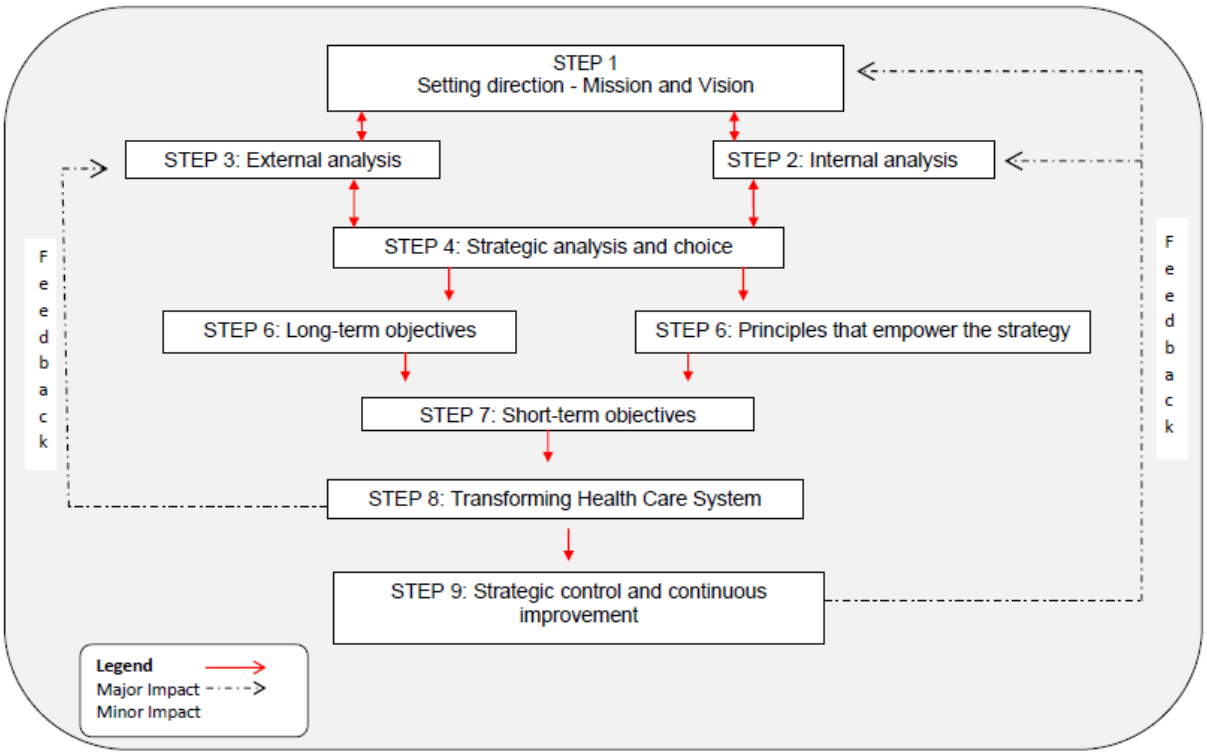

Figure 5.1: Steps of strategy development

(Adapted from Pearce & Robinson 2009:2)

As illustrated in Figure 5.1, it is clear that the entire strategy formulation process aids the transformation of the healthcare system. A consequence of the integrated nature of

the strategy development process is that if a step in a phase or stage is neglected or poorly executed, it has a knock-on effect on the rest of the process. A change in the dynamic environment in which the healthcare system operates can also result in a change in the process (Pearce & Robinson 2009:7).

Vision

Every Kenyan pregnant woman to receive timely, effective quality care during childbirth and the immediate postpartum period.

Mission

To guide Migori healthcare system and its community in identifying and developing appropriate and effective ways for addressing the delays to reduce maternal mortality and morbidity (Figure 5.2).

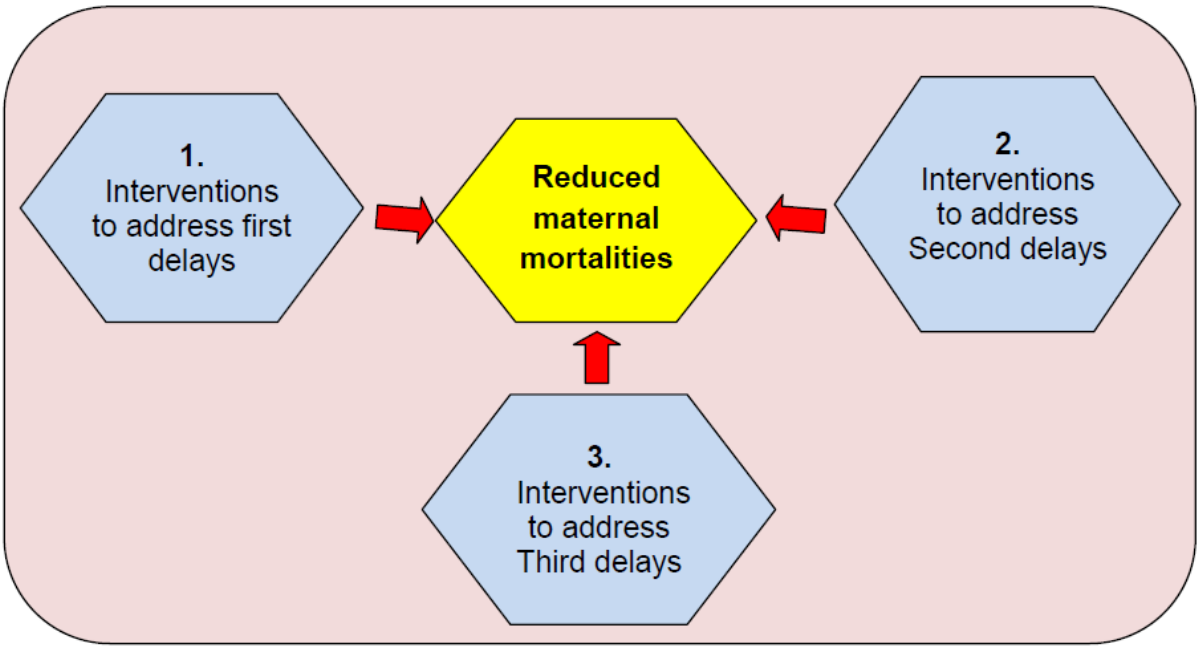

Figure 5.2: Diagrammatic presentation of interventions proposed to address maternal delays

Goal of the strategy

To reduce the number of maternal deaths/MMR by 70% from the current 673 to 471/100 000 live births in Migori County, Kenya, by the end of 2030.

Principles of the strategy

The principles of the proposed strategy are based on the previous Ending Preventable Maternal Mortality (EPMM) strategy and principles by the United Nations (Moran et al 2016:10). The strategies outlined in the EPMM report are exemplified by 11 key themes that are grounded in a human rights-based approach to health and focus heavily on the principles of equity and non-discrimination, transparency, participation, and accountability to ensure that reproductive, maternal and newborn healthcare is available, accessible and acceptable to all who need it (Jolivet et al 2018:10). The principles point to the need to assess and address not only the most proximal causes of maternal death, but also the broad range of more distal systemic and social determinants of maternal health and survival (Jolivet et al 2018:10). Therefore, a framework of three delays of maternal care was considered during the proposed strategy development. The proposed strategy principles are as follows:

- Accountability of quality of care in Migori Hospitals
- Available, accessible and acceptable high-quality maternal healthcare
- Strengthening Migori health referral systems
- Adequate resources and effective healthcare financing towards maternal health
- Community knowledge empowerment
- Strengthening measurement systems for maternal complications and deaths
- Multi-sectoral approach of government and NGOs in maternal health

5.4 PROPOSED STRATEGY FOR REDUCING THE MATERNAL MORTALITY RATIO IN MIGORI, KENYA

5.4.1 Strategic/long-term objectives

The proposed strategy is based on and informed by the study findings, the vision, mission, overall goal and the underlying principles of the study. The strategy aims to attain the following objectives by end of 2030.

5.4.1.1 Objectives to address first delays

- To enable Migori women, families and communities to identify danger signs for complications and make prompt care seeking decisions.
- To empower Migori women, families and communities to participate in initiatives to reduce maternal complications and deaths.
- To enable a culture shift to reduce traditional home deliveries and negative patriarchy power influence among Migori women.

5.4.1.2 Objectives to address second delays

- To integrate community-based referral system (*motorbikes*) and health facilities to enable mothers to reach the hospital promptly.
- To ensure efficient and affordable emergency transport referral schemes.

5.4.1.3 Objectives to address third delays

- To ensure that every hospital in Migori County has appropriate infrastructure, equipment and supplies for peripartum care.
- To increase the number of hospitals offering basic EmONC in rural areas of Migori County.
- To ensure constant blood availability through strengthening blood donation campaign initiatives in Migori region.
- To improve the competency of midwives (doctor, nurse or clinician) in Migori County.
- To improve human resource capacity in Migori Hospitals to enable adequate staff-patient ratios.

The researcher believes that the proposed interventions are not mutually exclusive. Addressing one could lead to a beneficial direct or indirect impact on multiple other

interventions. In addition, a delay or a challenge to maternal care in Migori County can be mitigated by either one or multiple interventions. Figure 5.2 illustrates the framework of interventions to implement for the proposed strategy.

5.4.2 Implementing the strategy through addressing the delays to reduce maternal mortality

5.4.2.1 Operational objectives/strategies targeting first delays

Table 5. 2: A description of objectives, findings and strategies targeting first delays

Objectives	**Major findings of first delay**	**strategies targeting first delays**
To enable Migori women, families and communities to identify danger signs for complications and make prompt care seeking decisions. To empower Migori women, families and communities to participate in initiatives to reduce maternal complications and deaths. To enable a culture shift to reduce traditional home deliveries and negative patriarchy power influence among Migori women.	5.4.2.1.1 Negative culture influence and mothers' health ignorance	• Utilise and incorporate CHVs, CHW, herbalists and TBAs to provide culturally appropriate verbal or visual safe motherhood educational messages • CHVs, house-hold heads and religious leaders to champion culture shift from old practices and beliefs, through home visits, discussion forums and radio • Provide sustainable incentives for referral and routine follow-up by CHVs
		• Community open days and outreaches to raise knowledge and awareness of danger signs and where to seek care • Promote adequate birth preparedness information (danger signs) during ANC visits to encourage women and their families to act promptly

Families and communities need to be able to recognise complications and be motivated to take action when a mother is in danger (Table 5.2). Bringing healthcare to communities through community participation and community-based interventions (*outreaches*) is crucial for access to healthcare and for mitigating first delays of maternal mortality (Elmusharaf et al 2015:5). Community healthcare workers, volunteers, herbalists and TBAs are an essential workforce in low- income countries, where human resources for rural healthcare infrastructure are often limited (Maru et al 2018:54; Nishimwe et al 2021:2514). This community workforce can be involved to support programmes that improve healthy maternal and household behaviours, including the seeking of care for uncomplicated pregnancy, referrals, culture shift and prompt treatment of complications (USAID 2015a:6). For instance, in a rural Ethiopian study, the introduction of the Health Development Army (HDA) (*a community voluntary group*) successfully identified pregnant women and encouraged them to attend ANC and access SBA rather than giving birth at home (Jackson, Tesfay, Gebrehiwot & Godefay 2017:150). In urban slums in a Bangladesh study, time taken for women referred by community health workers CHWs and CHVs was significantly shorter than that of those who were referred from home for both life-threatening and non-life-threatening conditions (Nahar, Banu & Nasreen 2021:4). This indicates that the ability to judge the graveness of the complications of pregnancy by community health workers and other CHVs helps reduce the time to decide to seek EmONC (Nahar et al 2021:3).

The researchers posit that, TBAs, whether trained or not, should be excluded from offering direct SBA-related care services. However, they can provide crucial linkages (indirect services) into an integrated strategy of the Migori community and the hospital (Table 5.2). Further, empowering and incentivising the TBAs is part of provision of an enabling environment needed in the community. Of note is that, TBAs have been delivering mothers in developing countries for years and they are part of a trusted socio-cultural system in the community (Choguya 2014:2). It is therefore essential to involve them into community reproductive services (Choguya 2014:2). This strategy could promote the rural community's uptake of SBA-related services such as TBAs (who are routinely first point of contact for clients in rural settings) would guide, inform and refer mothers appropriately (Kitui, Dutton, Bester, Ndirangu & Wangai 2017:2).

Lastly, at the facility level adequate and quality ANC education (birth preparedness) is provided to mothers to reduce their vulnerability to first delay (Table 5.2). Antenatal care education provides adequate information about the physiological, medical and behavioural aspects related to pregnancy and its complications, so that an individualised plan can be developed based on mothers' individual needs. ANC should enable the woman (and her companion) to recognise the need for promptness in care and for taking action (Danna & Bedwell 2020:6).

5.4.2.2 Operational objectives/strategies targeting second delays

Table 5. 3: A description of objectives, findings and strategies targeting second delays

Objectives	**Major findings of second delays**	**Strategies targeting second delays**
□ To integrate community-based referral system (motorbikes) and health facilities to enable mothers to reach the hospital promptly. □ To ensure efficient and affordable emergency transport referral schemes.	5.4.2.2.1 Referral delays, costs Poor transport and infrastructure system	• Establish accessibility through community-based integration and referral to health facilities using motorbikes • Facilitate cost-waiver for ambulance service initiatives • Revise and develop appropriate referral guidelines, forms and communication policy • Procure additional adequate ambulances to peripheries that are equipped.

Ensuring that those who develop obstetric emergencies during childbirth are quickly transported to facilities where they can receive quality EmONC can be the difference between life and death for the pregnant woman and her foetus (Alaofe et al 2020:4). Bhandari and Dangal (2014:10) advocate for strong and functional integration between community and health facilities to address the second delays in maternal care – reaching the hospital promptly. It is crucial to encourage local (*community*) transport initiatives (*such as motorbikes for referral*) and transportation infrastructure among minimally resourced communities to support access and engagement with health systems (Amosse et al 2021:123). UNICEF introduced a Boda Boda (motorcycle) referral transport system to reduce the barriers related to distance, lack of transport

means and cost of travel in West Nile Uganda (UNICEF 2022:2). The project observed that the motorcycle (Boda Boda) referral system saves mothers and babies in hard-to-reach areas (UNICEF 2022:2). The UNICEF system supports referrals from communities to health centres and from health centres to hospitals (UNICEF 2022:2). Both monetary and non-monetary incentives can be incorporated into the Boda Boda initiative to have increased deliveries at health centres. The incentives have the potential to increase the interest and commitment of Boda Boda riders in transporting mothers to the health facilities as a priority to other customers since they feel obliged (Muluya, Mugisha, Kithuka, Kibaara & Muwanguzi 2022:3). Thus, incentives help in improving maternal outcomes (Muluya et al 2022:3; Ssebunya & Matovu 2016:2).

In the present study, mothers delayed the decision to seek skilled birth attendance or did not seek help at all (*as some returned home when indicated for referral*), possibly due to financial reasons and referral charges (Table 5.3). To mitigate this, free ambulance services should be a high priority. In a Tanzanian study, researchers assessed the impact of introducing ambulance fees in a rural hospital (Vossius, Mduma, Moshiro, Mdoe & Kvaløy 2021:5). After the introduction of ambulance fees, an increase in labour complications and C/S was observed (Vossius et al 2021:5). In contrast, in Uganda an intervention that provided free-of-charge 24-hour ambulance and communication services between patients and healthcare providers reportedly increased access to and utilisation of maternal health services, particularly caesarean delivery services from 0.57 to 1.21 % in a year (Wekesah et al 2016:7).

Time is crucial in saving mothers with emergency complications. In Sierra Leone, a countrywide study demonstrated that maternal risk of death increased concurrently with National Emergency Medical Service (NEMS) operational times (Caviglia, Putoto, Conti, Tognon & Jambai 2021:9). Therefore, any reduction of the time to reach the hospital may translate into improved patient outcomes (Caviglia et al 2021:9). Emergency transport schemes (ETS) interventions, designed to improve pregnant women's access to EmONC at health facilities, have been undertaken globally in many underserved communities (Oguntunde et al 2018:774). The emergency system should be effective, affordable and adequate. Further, systematic review evidence suggests that integrating emergency obstetric transportation with complementary maternal health interventions (e.g., improved communication) reduces adverse pregnancy and childbirth outcomes (Alaofe et al 2020:6). In Burundi, to tackle the problem of lack of access to emergency

obstetric services, Medecins sans Frontieres (MSF) set up a central emergency obstetric and neonatal care (EmONC) facility, coupled with a 24-h communication network to facilitate ambulance referrals for the transfer of women with obstetric complications from peripheral maternity units to the EmONC facility (Zachariah, Manzi, Boogaard, Nyandwi, Reid et al 2013:994). Burundi study findings demonstrate that:

> Implementing an effective communication and ambulance system, to ensure access to a referral facility, results in acceptable care of complicated deliveries (Zachariah et al 2013:994).

5.4.2.3 Operational objectives/strategies targeting third delays

Table 5. 4: A description of objectives, findings and strategies targeting third delays

Objectives	Major findings of third delay	Strategies targeting third delays
To ensure that every hospital in Migori County has appropriate infrastructure, equipment and supplies for peripartum care.	5.4.2.3.1 Inadequate resuscitation supplies, drugs and general consumables	• Facilitate constant supply and availability of essential drugs and backup supply of commodities • Assess, revise and monitor procurement of consumable guidelines • Monitor routinely hospital capacity to emergency response and preparedness
To increase the number of hospitals offering basic EmONC in rural areas of Migori County.	5.4.2.3.2 Inadequate infrastructure (long waiting theatre lists and congested wards)	• Expand and increase capacity of laboratory and radiological services • Improve service capacity of lower-level hospitals

Most maternal deaths are preventable with timely management by a skilled health professional working in a supportive environment (WHO 2022a:1). An enabling environment that ensures adequate supplies, equipment, logistics systems and infrastructure as well as an efficient and effective system of communication, referral and transport are essential to averting the risks of maternal mortality (WHO 2022a:1). However, in the present study, participants' interviews indicated suboptimal care contributed by water challenges, erratic supplies, stockout of drugs and inadequate

emergency equipment. Improving the quality of care in health facilities is thus recognised as an important focus in the quest to end preventable mortality and morbidity among mothers and newborns (Barker et al 2016:20). This involves upgrading facility infrastructure, equipping the facilities with essential medical equipment and supplies and ensuring the presence of trained personnel in health facilities that are needed to make the facilities BEmOC or CEmOC providers (Hou et al 2022:2). An Ethiopian study described how the implementation of interventions such as equipping institutions in the area over a six-year period from 2008 to 2013 could reduce maternal mortality ratios (Lindtj et al 2017:e0169304). The findings showed that it was possible to achieve substantial reductions in maternal mortality ratios over a short period of time if the effective coverage of well-known interventions is implemented (Lindtj et al 2017:e0169304).

In Tanzania, Jhpiego implemented the *Mothers and Infants, Safe, Healthy and Alive* (MAISHA) programme to improve the quality of basic emergency obstetric and newborn care (BEmONC) (Otolorin et al 2015:S46):

> Some programmatic approaches included: distribution of equipment and supplies to fill identified gaps, and promotion of a supportive policy and advocacy environment.

These interventions have led to notable improvements in care. For example, in 2012, only four cases of PPH (0.8% of 500 births) were observed compared with 10 cases in 2010, which is a testament to the impact of preventing PPH (Otolorin et al 2015:S47).

The present findings (Table 5.4) further revealed long waiting theatre lists and congested wards. Decentralisation of services – providing CEmOC services near the home of patients is an important strategy to mitigate this challenge (Lindtj et al 2017:e0169304). This could reduce the burden of potentially life-threatening complications that overwhelms the tertiary healthcare system (Tukur, Lavin, Adanikin, Abdussalam & Bankole 2022:2). Similarly, in Kigoma, Tanzania, a comprehensive approach to improving emergency obstetric and newborn care had the following initiatives (Prasad et al 2022:3):

- Decentralising high-quality comprehensive emergency obstetric and newborn care (EmONC) to lower-level facilities.
- Specifically, six health centres were upgraded by constructing operating theatres, laboratories and providing equipment and supplies.

The programme in Kigoma demonstrated that decentralising high-quality maternal and reproductive health services to lower-level facilities in remote, low-resource settings is both feasible and effective (Prasad et al 2022:5).

Table 5. 5: A description of objectives, findings and strategies targeting third delays

Objective	Major findings of third delay	Strategies targeting third delays
To ensure constant blood availability through strengthening blood donation campaign initiatives in Migori region.	5.4.2.3.3 Lack of blood products and a regional blood bank	• Strengthen and maintain the blood supply system in hospitals through blood donation campaigns • Advocate for set-up of Migori regional blood bank

The need for blood is universal; however, present findings (Table 5.5) indicate that access for all those who need it is not (Mohammed, Yassin & Aliyi 2022:3). Literature shows an inverse relationship between the availability of blood and maternal deaths: in countries with the lowest availability of blood, maternal mortality is higher (Pan American Health Organization 2022:2). Women who suffer severe bleeding during pregnancy, delivery or after childbirth can die within two hours if untreated (WHO 2021a:3). Blood banks and blood transfusion centres are obliged to organise more frequent blood drives to maintain a regular blood supply and to adopt an approach for enhancing new blood donor recruitment and retention of donors. Targeted strategies such as school/college seminars, trainings and workshops should be regularly conducted to increase awareness and encourage voluntary blood donation among students (Melku, Melku, Asrie, Shiferaw, Woldu et al 2018:572). For instance, Club 25, launched in Zimbabwe in 1989, where students pledged to donate blood 25 times by the time they reached the age of 25, has been an effective and inexpensive way of targeting

young donors (Zanin, Hersey, Cone & Agrawal 2016:70). Today, Club 25 International is a youth-oriented global community of blood donors, reaching members in over 65 countries (Zanin et al 2016:70). On 11th November 2017, in Kenya, the MANI project and the Rotary Club launched a blood campaign organised by E4A-MamaYe in collaboration with Bungoma County Department of Health to reduce the high rates of maternal mortality (Bungoma-County-Govt 2022:2). The initiative set a target of collecting at least 800 units of blood per month and is committed to raising this through organised community groups with the support of all interested parties (Bungoma-County-Govt 2022:2). Elsewhere, media campaigns to motivate blood donations in higher-income countries have become more direct and imaginative, mentioning maternal mortality both in the context of saving women's lives but also the importance to the newborn of the mother surviving (Ray, Madzimbamuto & Fonn 2012:40). This includes video clips on Facebook and YouTube of recipients thanking donors for having saved their lives, thus giving the process a human face (Ray et al 2012:40).

Table 5. 6: A description of Objectives, findings and strategies targeting third delays

Objective	**Major findings of third delay**	**Strategies targeting third delays**
To improve the competency of midwives in Migori County.	5.4.2.3.4 Inadequate skills by healthcare workers, and Inappropriate care	• Refresher training and simulations of healthcare providers at facilities in maternal complications • Continuous mentorship and monitoring of performance • Review and assess data on quality of care and implement evidence on optimal care • Revise patient monitoring and documentation policy – *partograph*

Effective emergency care is dependent upon a healthcare provider's ability to recognise that an abnormal condition exists, that the condition has a level of severity warranting intervention and that an intervention is available to treat the condition (Mgawadere et al 2017:2). However, present findings indicated that some of the cases were inappropriately managed or mismanaged (Table 5.6). Training (*refresher*) programmes improve HCP knowledge, skills and attitudes as well as care delivery and outcomes for

women and their newborns (Banke-Thomas et al 2020:12). In a northern Bangladesh a study was conducted to explore the current knowledge and skills of healthcare providers already trained by SIMESON (simulation for essential skills for obstetrical and neonatal care) (Das et al 2022:802). There were improvements in the quality of care for maternal and neonatal health services at the intervention – government healthcare facilities (Das et al 2022:802). In Uganda, strategies for improving provider performance at six primary care clinics revealed that multi-faceted approaches such as training plus strengthening infrastructure and policy management support were more likely to have a stronger evidence base (Baumgartner, Headley, Kirya, Guenther & Kaggwa 2021:1104). The Uganda intervention indicates that their clinical training programme improved the practice of quality maternal and neonatal healthcare over a relatively short period (Baumgartner et al 2021:1104).

Improving health workers' performance through supervision and mentoring would be advantageous to minimise the variation of quality of care and improve maternal outcomes (Raru, Ayana, Bahiru, Deressa & Alemu 2022:3). In case of unexpected incidences or complications, the event is evaluated using a no-blame culture (Lindtj et al 2017:e0169304). This could reduce the poor partograph charting, inadequate patient monitoring and providers' incompetence that was observed in the present study.

Table 5. 7: A description of Objectives, findings and strategies targeting third delays

Objective	Major findings of third delay	Strategies targeting third delays
To improve human resource capacity in Migori Hospitals to enable adequate staff-patient ratios.	5.4.2.3.5 Staff shortage and motivation	• Promote staff retention and motivational incentives • Recruit sufficient number of SBAs and midwives • Enhance an appropriate staffing to patient ratio

Inequitable access to quality maternal childbirth in SSA is exacerbated by acute shortage and unequal distribution of skilled and specialised health personnel such as physicians, midwives and nurses (Wekesah et al 2016:8). Improving human resource strategies – including recruiting adequate health professionals and improving terms and

conditions is essential for reducing maternal mortality (Table 5.7). This would mitigate the increased demand for services and understaffed maternity wards in the present study (Kim et al 2020). It has been hypothesised that adequate provider staffing influences the quality of patient surveillance because it allows health providers to spend more time in direct care (Haegdorens, Bogaert, Meester & Monsieurs 2019:3). Insufficient staffing lead to the rationing of time to care, which has an important impact on the occurrence of missed care (Haegdorens et al 2019:2). Further, delays in receiving timely and appropriate care on reaching a health facility (third maternal care delays) can be directly caused by having too few skilled staff available to carry out adequate care (Bradley, Kamwendo, Chipeta, Chimwaza & Pinho 2015:3). Staff shortages may also cause delays in initiating emergency interventions (Bradley et al 2015:4). Recently in Nigeria, researchers investigated the association between client-provider ratios for antenatal and delivery care and the risk of maternal mortality in eightreferral hospitals (Okonofua, Ntoimo, Ogu, Galadanci, Abdus-salam et al 2018:2). Okonofua et al (2018:2) concluded that the maternal mortality ratios in Nigeria's referral hospitals were worsened by high client provider ratios, with few providers attending a large number of pregnant women experiencing complications (Okonofua et al 2018:2).

Motivation is described as something that energises individuals to take action and which is concerned with the choices the individual makes as part of his or her goal-oriented behaviour (Thi, Thu, Wilson & Mcdonald 2015:2). In the context of health systems strengthening, motivation is one of the driving forces among health workers that can potentially contribute towards the progress of attaining improved health levels and improved efficiency (Nabi, Karimi, Senkubuge & Hongoro 2020:4). On the other hand, low quality of care and medical errors occur more often when providers are demotivated, which can be fuelled by inadequate working conditions such as shortages of basic drugs and equipment or staff (Lagarde, Huicho & Papanicolas 2019:2). In the present study, regular payment of salaries and recognition of staff that perform well would increase their morale and commitment to work. However, in some settings (present study), preliminary problems might have to be addressed before tackling low motivation. For example, if staffs do not have the clinical skills to make a correct diagnosis, no amount of money or feedback will increase technical quality of care. If essential basic drugs and equipment are not available, incentives will not improve the treatments provided to patients (Lagarde et al 2019:3).

5.5 VALIDATION OF THE STRATEGY

5.5.1 Validation of review forms

The reproductive health experts were purposefully sampled (see Table 5.8). The researcher requested a detailed list of reproductive health experts from Migori County Ministry of Health. The reproductive health experts were selected based on the following considerations: they (1) are consultants in reproductive health; (2) have experience in policy formulation on maternal health; and (3) are managers in their respective organisations. The reproductive health experts were oriented on the present study's purpose and protocols before participating in the review process. The researcher requested to be provided feedback of the filled review and validation forms by email.

5.5.2 Reproductive health experts' demographics

Table 5. 8: Health experts' demographics

Pseudonym	Qualification	Work Experience
A	MA, PhD	Reproductive Health Lecturer at Maseno University
B	MSN, PhD	Project officer KEMRI
C	BSN, MPH	Project officer JPIEGO
D	BSN, MPH	County Reproductive Health Officer
E	BSN, MPH	County Reproductive Health Officer

Each strategy was validated based on the review forms developed by the researcher. The experts in maternal health reviewed the developed strategy by focusing on the following elements: acceptability, applicability, clarity, effectiveness, feasibility, relevance, sustainability and validity (see Table 5.9). A strategy was accepted in reference to the review comments and score ratings. An average score of >6 of a strategy by all experts participating in the review was considered. Additionally, review comments were used to revise and improve the formulated strategy.

5.5.3 Scoring criteria and description of validating each strategy

Table 5. 9: Scoring criteria and description of validating each strategy

Criteria	Agree 1	Disagree 0	Input
Acceptability: The strategy is acceptable in terms of reducing maternal mortality ratio (MMR) in Migori, Kenya.			
Applicability: The usefulness of the strategy as part of intervention in reducing maternal mortality ratio (MMR) in Migori, Kenya.			
Clarity: The strategy is simple for understanding for the purposes of application as an intervention in reducing maternal mortality ratio (MMR) in Migori, Kenya.			
Effectiveness: The strategy is able to achieve its objective as an intervention in reducing maternal mortality ratio (MMR) within the context of the study.			
Feasibility: The implementation of the strategy is possible in terms of the available hospital resources, namely, human and material.			
Relevance: The strategy is ideal for application in relation to the maternal mortality experiences.			
Sustainability: The ability of the strategy to address the present and future maternal mortality can be predicted.			
Validity: The strategy is justifiable in that it is evidence-based.			

Table 5.11 indicates the results/outcome of the validation process by the selected reviewers. The least (32/40) scored strategy was 5.4.2.3.4, while the highest strategy 5.4.2.3.5 scored 38 points. Further analysis reveals that all the strategic areas met the inclusion criteria that had been predetermined. Of note is that, all the reviewers agreed to the proposed strategies with only few amendments suggested. The reviewers' comments were incorporated in the presented proposed strategy. Table 5.10 demonstrates some of the reviewers' comments and researcher's responses.

Table 5. 10: **Description of reviewers' comments and researcher's responses**

Reviewers' comments	Researcher's response
Engaging TBA is controversial from other study findings. The researcher should provide an argument why TBA is essential for this study	Corrected as follows; The researcher posits that, TBAs, whether trained or not, should be excluded from offering the direct SBA related care services. However, they can provide crucial linkages (indirect services) into an integrated strategy of the Migori community and the hospital. Further, empowering and incentivizing the TBAs is part of provision of an enabling environment needed in the community.
The researcher should provide a motivation based on literature for use of motorcycle as a means of transport for a pregnant mother	Corrected as follows; UNICEF introduced a Boda Boda (motorcycle) referral transport system to reduce the barriers related to distance, lack of transport means and cost of travel in West Nile Uganda (UNICEF 2022:2). The project observed that the motorcycle (Boda Boda) referral system saves mothers and babies in hard-to-reach areas (UNICEF 2022:2). The UNICEF system supports referrals from communities to health centres and from health centres to hospitals (UNICEF 2022:2). Both monetary and non-monetary incentives can be incorporated into the Boda Boda initiative to have increased deliveries at health centres.

5.5.4 Outcome of validation by reviewers

Table 5. 11: Outcome of validation by reviewers

Sub-section	Strategy	Reviewers' scores (out of 8)					Reviewers total (out of 40)
		a	b	C	d	e	
5.4.2.1	1	8	8	7	5	6	34
5.4.2.2	1	6	8	6	8	6	34
5.4.2.3	1	8	7	5	8	7	35
	2	8	5	7	7	8	35
	3	5	6	8	7	7	33
	4	5	8	7	6	6	32
	5	8	8	7	7	8	38

5.6 CONCLUSION

This chapter described the strategy developed to reduce maternal mortality in Migori County. The researcher considered the literature review and integrated findings from the quantitative and qualitative phases to develop the strategy. The formulation process was stepwise, commencing with mission and vision development, SWOT analysis, strategic choice, principles that govern the strategy, long-term and short-term objectives. The strategy was guided by the three delays of maternal care theoretical framework. Accordingly, the strategy for implementation considered three strategic areas, namely, interventions targeting first delays, interventions targeting second delays, interventions targeting third delays. Strategy validation was done by a team of five reproductive health experts and their review comments enriched the proposed strategy.

The researcher believes that priority interventions needed are those that enable:

- Pregnant mothers to receive quality peripartum care in Migori hospitals

- Strengthened and efficient referral systems of obstetric emergencies
- Community knowledge empowerment on safe pregnancy and culture shift

These interventions would significantly transform the healthcare system and help reduce the number of maternal deaths in Migori, Kenya. However, the success of the proposed strategy depends on the stakeholders' commitment and availability of resources to enable its full-scale implementation.

The next chapter will summarise the findings, highlight the contribution and limitations of the study, and present overall conclusions and recommendations.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS OF THE STUDY

6.1 INTRODUCTION

In the preceding chapter, the researcher described the development of the strategy that would reduce maternal mortalities in Migori, Kenya. Subsequently, interventions that translate the strategy into implementation were developed. The developed strategy was based on and informed by the current study findings.

This chapter presents the overall conclusions of the study drawn from the findings. The chapter further proposes recommendations to reduce maternal deaths in Migori, Kenya. The strengths and contributions of the study are outlined. Possible areas of future research in relation to high maternal mortality and the limitations of the study are also discussed.

6.2 RESEARCH DESIGN AND METHODS

An explanatory sequential mixed methods design was utilised for this study. The explanatory sequential mixed methods design was characterised by an initial quantitative phase of data collection and analysis followed by collecting qualitative data to help explain or elaborate on the quantitative results (Polit & Beck 2017:312; Subedi 2016:574). This was categorised into three phases as follows: phase 1 as qualitative, phase 2 as quantitative, and phase 3 as an integration of the qualitative and quantitative findings. The study was conducted in four sampled hospitals within Migori County in Kenya. The validity, reliability and trustworthiness of the study were ensured.

6.2.1 Phase 1

The population was medical records of all deceased women (cases) and those who survived (controls) during pregnancy, childbirth and puerperium from 1 January 2016 to 31 December 2019 at the four hospitals in Migori County. A checklist was used to collect data from the respective medical records. The quantitative data was entered into

the IBM SPSS Statistics 23. Using descriptive statistics by percentage distribution tables the socio-demographic variables were analysed. Next, binary logistic regression was used to make inferences of the maternal mortality determinants by their odds ratio.

6.2.2 Phase 2

The study population comprised the following: (1) midwives working within the peripartum units in the sampled hospitals, and (2) mothers in the peripartum units in that period hospitalised due to pregnancy and childbirth complications within the sampled hospitals. Data collection utilised in-depth interviews and interview guides as the main study tool. The qualitative data was analysed through the use of NVivo 11 software as the latter has the potential to draw rich insights from qualitative data. Content analysis using a qualitative approach was adopted and data was analysed into themes.

6.2.3 Phase 3

The integrated qualitative-quantitative data collection and analysis processes were juxtaposed side-by-side through a joint display in order to support the researcher's process of drawing meta-inferences (McCrudden & McTigue 2019:381). Based on integration of the results of phase 1 and phase 2 of the present study, the researcher developed a strategy for reducing MMR in Migori, Kenya. The developed strategy was validated by the recommendations and reviews of five experts in maternal health.

6.3 SUMMARY OF THE FINDINGS

6.3.1 Phase 1

Quantitative findings revealed that the top pregnancy complications that caused deaths were haemorrhage, hypertensive disorders and sepsis. Major determinants associated with mortalities were the non-use of the partograph for women in labour (67%), postpartum (64%), referral case (66%) and residence (68%). The researcher concluded that most vulnerable cases were those that

- had their labour unmonitored using a partograph compared to their counterparts

- were in the postpartum period of care compared to those in intrapartum and antepartum point of care
- were referred from periphery hospitals compared to non-referrals, and lastly
- were rural dwellers who were more vulnerable compared to urban residents

6.3.2 Phase 2

The findings revealed some existing initiatives that aimed to reduce maternal mortalities. These include: the Linda Mama policy, NASG programmes, capacity building, and family planning. However, the initiatives were limited in coverage, and they were faced with implementation challenges. The researcher believes that the disparities in access to existing strategies make mothers vulnerable to maternal mortalities.

Respondents further demonstrated that Migori women were poorly educated and in a society that holds on to old culture and traditions that encourage non-utilisation of hospital interventions. The most vulnerable were those that were ignorant of obvious danger signs, sought traditional herbalists, and were negatively influenced by patriarchy's power in their communities.

Also, data showed that healthcare systems challenges and failures exposed hospitalised mothers to sub-optimal care. The study showed that the sampled Migori hospitals were often out of stock of emergency supplies and consumables. Blood was rarely available in the entire study area when needed. Mothers were vulnerable to referral delays. Lastly, the data demonstrated inadequacy of skills of the healthcare team that was in some cases inappropriately managed. The respondents revealed that acute staff shortages and demotivated staff were possible reasons for substandard care.

6.3.3 Phase 3

In the final phase, the researcher, in consultation with the supervisor, presented the strategy to be endorsed. The developed strategy aims to reduce maternal mortalities in Migori, Kenya. The long-term strategic objectives are as follows:

- To enable Migori women, families and communities to identify danger signs of complications and make prompt care seeking decisions.
- To empower Migori women, families and communities to participate in initiatives to reduce maternal complications and deaths.
- To enable a culture shift to reduce traditional home deliveries and the negative influence of patriarchy's power among Migori women.
- To integrate a community-based referral system (motorbikes) and health facilities to enable mothers to reach the hospital promptly.
- To ensure efficient and affordable emergency transport referral schemes
- To ensure that every hospital in Migori County has appropriate infrastructure, equipment and supplies for peripartum care.
- To increase the number of hospitals offering basic emergency obstetric care in rural areas of Migori County.
- To ensure constant blood availability through strengthening blood donation campaign initiatives in Migori region.
- To improve the competency of midwives in Migori County.
- To improve human resource capacity in Migori Hospitals to enable adequate staff-patient ratios.

6.4 RECOMMENDATIONS TO REDUCE MATERNAL MORTALITIES IN MIGORI, KENYA

6.4.1 Recommendations for hospital management

- Provision of quality obstetric care is proportional to better maternal outcomes. However, findings indicated that some cases were inappropriately and suboptimally managed. This calls for strengthening of continuous quality improvement measures in the peripartum units.
- Hospitalised mothers expect that drugs and consumables are constantly available. Erratic supply as indicated by the findings contributes to inequality of access to hospital interventions by poor mothers. An efficient procurement procedure that minimises delays and ensures adequate stocks of supplies is needed.

- Adequate staffing is needed in peripartum units. The findings indicate high midwife to patient ratios which contribute to poor patient monitoring and demotivation among staff. The hospitals should recruit adequate staffs that match patient admissions.
- Hospital managements should organise for continuous refresher trainings for their midwives. Some midwives noted that they had never undergone trainings in the last three years. Further data revealed some cases were vulnerable to negligence of care. Drills and continuous on-job training would improve the level of skills and competencies among the healthcare providers.

6.4.2 Recommendations for governments and policy makers

- The findings indicated persistent lack of blood. Also, the top pregnancy complication that caused death was haemorrhage. This means that most cases needed blood that was rarely available. The stakeholders should establish blood campaigns teams and set up a Migori regional blood bank centre.
- The study noted limited implementation of the existing strategies. For instance, the NASG programme is only rolled out in a limited number of hospitals. The researcher thus recommends more funding to current strategies to enable wider coverage and increased utilisation.
- Continuous monitoring and evaluation of current strategies is needed. The researcher noted that some initiatives were not being utilised as envisioned by the founders due to unforeseen challenges. For instance, Linda Mama demands that all registered mothers should be adults of 18 years old and have singleton births. This limits the initiative utilisation among teenage mothers and those with multiple births. Monitoring would help inform the government and policy makers of any implementation bottlenecks on the existing reality in practice that might need intervention.
- The government should set up more comprehensive emergency obstetric care hospitals, especially at the sub-county level. The findings indicated that the existing county hospitals were overwhelmed with demand. In addition, most cases in phase 1 were referrals from periphery-based hospitals. Decentralisation of obstetric care would likely reduce second and third delays.
- Procure adequate ambulance vehicles and revise the existing referral system protocol. The findings indicate that mothers were exposed to referral delays due to

limited availability of ambulances. At least two ambulances should be stationed in each sub-county.

6.4.3 Recommendations for communities

- The researcher recommends strengthening the integration of community systems and hospital care systems. In the study, data revealed that there was a lack of community referral systems and delays of stipends payments to CHVs. To enable pregnant mothers with obstetric conditions to reach hospital promptly, community motorbikes could be utilised to transport the mother to the nearest health centre. Motivated CHVs are likely to improve referral of mothers to hospital.
- Organising community health promotion and education on safe pregnancy. Findings illustrate that some Migori families were ignorant of obvious obstetric danger signs. This could be improved through community outreaches that involve all women of reproductive age, household heads, village elders and community traditional healers.
- Transformation of culture in the community is needed. The researcher observed that Migori women were negatively influenced by traditional practices that encourage home deliveries. Also, they were vulnerable to the negative influences of patriarchy. Initiatives that promote positive cultural practices that involve in-laws, male partners and TBAs as culture champions are recommended.

6.4.4 Recommendations for further research

- A future research project to implement the proposed strategy in Migori County Kenya.
- Assess the obstetric emergency preparedness and response of the hospitals in Migori County, Kenya.
- Evaluate the knowledge of midwives working in peripartum departments in Migori County.
- Determine barriers that hinder supply of consumables and drugs in Migori County.
- Assess TBA related maternal deaths that might be unreported in the hospital care system.

6.4.5 Recommendations for dissemination of study findings

The researcher will share the final approved version of the thesis with the Department of Health Migori County, the four hospitals that participated, the reproductive health NGOs based in Migori, and the Kenyan Ministry of Health. The researcher intends to extract articles from the final approved thesis and publish them in accredited peer reviewed journals. The study findings will further be presented in stakeholder meetings and conferences. The insights arrived at in this study will hopefully alert the government of Kenya to the barriers to achieving the goal it has set to reduce the MMR and facilitate implementation of the proposed strategy.

6.5 STRENGTHS AND CONTRIBUTION OF THE STUDY

The study's strength is anchored on the current proposed strategy to reduce maternal mortalities in Migori, Kenya. The strategy is based on the present determinants of maternal deaths. The thematic analysis of views from the midwives and hospitalised peripartum mothers enriched the presented data. They provided clearer demonstrations of challenges facing the existing strategies and hospital shortcomings of maternal care experienced in daily practice. Below, the strengths of the study are discussed in relation to its contributions at the level of quality of care, methodology and policy.

6.5.1 The strengths of the study in relation to its contribution at the level of quality of care

The findings revealed suboptimal care indicators of the hospital systems ranging from inadequacy of skills by the midwives, lack of blood, acute staff shortages, referral delays to erratic drug supply. The researcher posits that these issues need to be addressed urgently to reduce maternal mortalities. Furthermore, the stakeholders can utilise the findings provided as a springboard for future quality improvement programmes in the study area.

6.5.2 The strengths of the study in relation to its contribution at the level of methodology

At methodological level, the study adopted an explanatory sequential mixed methods approach that was conducted in three phases (quantitative, qualitative and integration) guided by a three-delay framework from the literature as a conceptual framework. The quantitative phase1 analysed medical files of the cases to present determinants of maternal deaths. The qualitative phase-2 was conducted through in-depth interviews of midwives and peripartum mothers. The respondents exposed the real-world experiences of maternal care and their associated interventions. The two phases were later integrated (Phase 3) to develop a strategy. The proposed strategy was validated by a team of reproductive experts.

The researcher believes that the elaborate methodology enabled access to different subgroups of the population that enriched the data collected. The qualitative data helped explain the quantitative data as envisaged by the study design. Lastly the validation of the strategy by a team of experts implies that the strategy is highly feasible in the study area.

6.5.3 The strengths of the study in relation to its contribution at the level of policy

The present strategy provided interventions to all possible major determinants of maternal mortality based on the three delays of maternal care framework. The healthcare community system failures can be used as a guide by policy makers to design interventions that are more focused, and needs based. The researcher further advocates for strengthening the existing interventions and policies as he identified their gaps and made recommendations. The study argues that the implementation of the proposed strategy would significantly reduce maternal deaths in the study area.

6.6 LIMITATIONS

The study was conducted in four hospitals in only one county (Migori) out of the 47 counties in Kenya. It could be difficult to generalise the present findings to the other counties. The study was hospital based, which implies that mortality cases under TBAs

at the community level were unaccounted for. In the retrospective phase, some medical files had unrecorded information, meaning that the data could not be retrieved. Accordingly, a medical record that had missing data on a variable of interest was omitted in the general descriptive presentations (see section 3.3.1.5.2 piloting phase). The topic "*maternal mortality*" is regarded as a sensitive issue within the Kenyan healthcare system particularly by the midwives. Some respondents were not freely open due to fear related to the sensitive discussion. Hence, they were requested to share their perpartum unit experiences rather than their personal experiences.

6.7 OVERALL CONCLUSION

The purpose of this study was to investigate the determinants of maternal mortality and develop a strategy for reducing the maternal mortality ratio (MMR) in Migori, Kenya. The study identified top pregnancy maternal complications causing deaths such as haemorrhage, hypertension and sepsis. Various major social and hospital system determinants were as follows: referral delays, lack of drugs and blood, staff-related factors, rural residence, and maternal ignorance of danger signs. Existing maternal interventions were acknowledged, and their gaps were used to strengthen the proposed strategy. The researcher developed a strategy based on the integrated findings of the quantitative and qualitative phases. The strategy addresses both hospital system and community level failures through a three-delay framework.

This final chapter, Chapter 6, presented and outlined the study findings, limitations, recommendations for hospital management, policy making and future research. The researcher believes that the study objectives have been met.

In conclusion, in order to unravel the persisting problem of maternal deaths; the researcher calls for increased focus to stem the identified determinants of maternal deaths by the policy makers. The study alerts them (policy makers) that hospital systems are in dire need of quality improvement initiatives while community empowerment is also required. Finally, a call is made to the stakeholders (Kenyan governments, NGOs and healthcare providers) to implement the proposed strategy in the study area.

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ANNEXURES

ANNEXURE AA: ETHICS APPROVAL

UNISA university of south africa

COLLEGE OF HUMAN SCIENCES RESEARCHETHICS REVIEW COMMITTEE

11 November 2020

NHREC Registration # : Rec-240816-052
CREC Reference #: 63714094_CREC_CHS_2020

DearB.B MASABA

Decision:
Ethics Approvalfrom11November 2020to31October2024

Principal Researcher(s):B.B MASABA(email:63714094@mylife.unisa.ac.za)

Supervisor:Prof R.M Mmusi-Phetoe(email:emphetrm@unisa.ac.za)

Title: A STRATEGY FOR REDUCING MATERNAL MORTALITY IN MIGORI, KENYA

Degree Purpose: PhD Nursing

Thank you for the application for research ethics clearance by the Unisa College of Human ScienceEthics Committee.Ethics approval is granted for three years.

The***High-Riskapplication was reviewed***byCollege of Human Sciences Research Ethics Committee,on**November2020**in compliance with the Unisa Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.
2. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the studyshould be communicated in writing to the College Ethics ReviewCommittee.
3. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.
4. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 12 429 4150

confidentiality of the data, should be reported to the Committee in writing, accompanied by a progress report.

5. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.
6. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data require additional ethics clearance.
7. No fieldwork activities may continue after the expiry date **(31 October 2024)**.Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **-63714094_CREC_CHS_ 2020***should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.*

Yours Sincerely,

Signature :

Dr. K.J. Malesa
CHS EthicsChairperson
Email: maleskj@unisa.ac.za
Tel: (012) 4294780

Signature :

Prof K. Masemola
Executive Dean : CHS
E-mail: masemk@unisa.ac.za
Tel: (012) 429 2298

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www.unisa.ac.za

ANNEXURE A1: COUNTY LEVEL PERMISSION REQUESTED

ANNEXURE A1

PERMISSION TO CONDUCT RESEARCH STUDY

Name of the Researcher: Brian Barasa Masaba: 63714094
Supervisor: Professor Rose Mmusi-Phetoe

MASABA BRIAN BARASA
P.O BOX 2524-50200
BUNGOMA
TEL: 0719 422 418
21ST NOVEMBER 2020

COUNTY DIRECTOR OF MEDICAL SERVICES
MINISTRY OF HEALTH SERVICES
P.O. BOX 195-40400
KENYA

Dear Sir/Madam,

RE: APPLICATION FOR PERMISSION TO COLLECT DATA

I am writing to request permission to collect academic research data in Migori County. The study will utilise the following hospitals; 1) [redacted]county referral hospital, 2) [redacted]ospital, 3) [redacted]county hospital and 4) [redacted] county hospital. I am currently enrolled in a PhD Nursing program at, University of South Africa (UNISA) and I am in the process of developing a PhD thesis. My research study is entitled; **A strategy for reducing maternal mortality in Migori, Kenya**. I plan to carry out the study in 2020-2022.The study has been approved by the Health Studies Research Ethics Committee of the University of South Africa. I have majored into mortality clinical audits; some of my previous published study include; Determinants of High Neonatal Mortality Rates in Migori County Referral Hospital in Kenya.

The present study will highly depend on; 1) the information recorded in patients' medical records, 2) midwives experiences and 3) peripartum mothers' care. The results of this study are aimed at informing the management of the Migori County and other decision-making bodies about strategies in reducing maternal mortality

in the Migori County. Furthermore, this study may provide some form of baseline data for further and broader research in the county.

I look forward to your positive response.

Yours Faithfully,

Brian Barasa Masaba

ANNEXURE A2: STUDY SITE PERMISSION GRANTED

Telegrams [redacted]
Telephon
Email: [redacted].com

REPUBLIC OF KENYA

[redacted]
SUNA-MIGORI

[redacted] COUNTY REFERRAL HOSPITAL

[redacted] UP/R[redacted]OL [redacted]

Date:20th January2021

Masaba Brian Barasa
PhD Nursing student,
University of South Africa.

Dear Masaba,

RE: AUTHORITY TO CONDUCT RESERCH I[redacted]UNTY REFERRAL HOSPITAL

Following your request to collect data ion[redacted]County Referral Hospital titled, '**A strategy for reducing maternal mortality in Migori, Kenya**', I am pleased to inform you that you have been granted permission to undertake the said data collection.

This will be restricted to the following arrears as indicated in your request:

- Information recorded in patients' medical records
- Midwives experiences
- Peripartum mothers' care

By a copy of this letter you, you will be required to liaise with various heads of the departments for further information and support.

We shall be glad if you can finally share the findings at the end of your research.

Yours sincerely,

[redacted]

Deputy Medical Superi[redacted]dent,
[redacted]UNTY R[redacted]L HOSPITAL

ANNEXURE A3: STUDY SITE PERMISSION GRANTED

[redacted] HOSPITAL, MIGORI
Website: w[redacted]pital.or.ke
E-mail: [redacted]ospital.or.ke

P.O Box [redacted]
40400
SUNA-MIGORI
Cell Phone: 0722[redacted]
0722[redacted]
0786[redacted]

08th January, 2021

Mr. Brian Barasa Masaba,
[redacted]
P.O. Box [redacted]
SUNA - 40400,

Dear Mr. Barasa,

RE: AUTHORITY TO COLLECT DATA IN OUR FACILITY

We convey to you greetings from the [redacted]ospital, Migori.

On behalf of the Hospital Management Team, I take the opportunity to acknowledge your request to collect data within our Institution. I am glad to share with you that the request is granted.

We wish you well in your studies.

Yours sincerely,
[redacted]

[redacted]SION HOSPITAL - MIGORI
08 JAN 2021
P.O. Box [redacted] – 40400,
SUNA

[redacted]
CHIEF EXECUTIVE OFFICER

ANNEXURE A4: STUDY SITE PERMISSION GRANTED

REPUBLIC OF KENYA

COUNTY GOVERNMENT OF MIGORI HEALTH DEPARTMENT

Medical Officer of Health
[redacted]unty
P.O. Bo[redacted]
[redacted]

Email: [redacted]t@yahoo.com

23rd March, 2021

REF: : [redacted]**/VOL.I/72**

Masaba Brian Barasa
PhD Nursing student
University of South Africa

Dear Masaba,

RE: AUTHORITY TO CONDUCT RESEARCH IN K[redacted]OUNTY HOSPITAL

Following your request to collect data in [redacted] County Hospital titled **'A strategy for reducing maternal mortality in Migori, Kenya'**, I am pleased to inform you that you have been granted permission to undertake the said data collection.

This will be restricted to the following arrears as indicated in your request.

- Information recorded in patients' medical records
- Midwives experiences
- Peripartum mothers' care.

By a copy of this letter you, you will be required to liaise with various heads of the departments for further information and support.

We shall be glad if you can finally share the findings at the end of your research.

Yours sincerely,

THE MEDICAL OFFICER OF HEALTH
DISTRICT.

[redacted]

[redacted] County Medical Officer of H[redacted]

ANNEXURE B1: STUDY TOOL: MEDICAL RECORDS

Data collection tool: Medical records
Name of the researcher: Brian Barasa Masaba: 63714094
Supervisor: Professor Rose Mmusi-Phetoe
Title of research project: A strategy for reducing maternal mortality in Migori, Kenya

SECTION A: DEMOGRAPHIC DATA

***Instruction*:**

- Kindly indicate answer with an X
- The information will be obtained from mother's file

1. Unique code number:

	ANSWER

2. Type of health facility

	ANSWER
a. County Referral Hospital	
b. private Hospital	
c. County Hospital	
a. County Hospital.	

3. Maternal religion

	ANSWER
a. Christian	
b. Muslim	
c. Hindu	
d. Others	

4. Maternal age

	ANSWER
a.<20	
b.21-29	
c. 30-39	
d. 40-49	

5. Employment status of the mother

	ANSWER
a. Formal employment	
b. Informal employment	
c. Not working	

6. Residence of the mother

	ANSWER
a. Urban	
b. Rural	
c. Informal settlements	

7. Maternal education

	ANSWER
a. No education	
b. Primary	
c. Secondary	
d. Tertiary	

8. Marital status

	ANSWER
a. Married	
b. Single	
c. Divorced	
d. Widow	

9. Alcohol or smoking use during pregnancy

	ANSWER
a. Smoking	
b. Alcohol	
c. None	

SECTION B: MOTHER'S DETAILS AND REPRODUCTIVE HEALTH STATUS

10. Gestational age

	ANSWER
a. below 37 weeks	
b. 37-42 weeks	
c. above 42 weeks	

11. Attended Antenatal care visits

	ANSWER
a. Yes	
b. No	

12. Had history of previous C/S

	ANSWER
a. Yes	

b. No	

13. Birth interval between the preceding child and the current (case) pregnancy

	ANSWER
a. <2 years	
b. >2 years	

14. Number of times the mother has been pregnant

	ANSWER
a. 1-2	
b. 3-4	
c. 5-6	
d. >7	

15. HIV test recorded results of the mother

	ANSWER
a. Reactive	
b. No- reactive	
c. Not tested	

16. The patient was a Referral from another facility

	ANSWER
a. Yes	
b. No	

17. Was presenting with life threatening condition at admission

ANSWER

a. Yes	
b. No	

SECTION C: INTERVENTION DATA

18. Place of delivery

	ANSWER
a. Home	
b. Hospital	

19. Mode of delivery

	ANSWER
a. SVD	
b. C/S	
c. Vacuum	

20. Childbirth care provided by skilled personnel, as defined by the WHO

	ANSWER
a. Nurse	
b. Doctor	
c. Clinical officer	

21. What was the cause of maternal death

	ANSWER
a. Malaria	
b. Diabetes	
c. Hypertension	

d. Puerperal sepsis	
e. Obstetrical haemorrhage	
f. Pre-eclampsia	
g. Bleeding	
h. Heart disease	
g. Any other illness	

20. Moment of death (in relation to pregnancy period)

	ANSWER
a. While pregnant	
b. During delivery	
c. Postpartum	

21. Time of arrival at facility and time of death

	ANSWER
a. Less than 24 hours	
b. More than 24 hours	

22. Status of the baby at birth

	ANSWER
a. Alive	
b. Dead	

23. Type of delay experienced

	ANSWER
a. First	
b. Second	

c. Third	

24. Use of parto-graph in patient monitoring

	ANSWER
a. Yes	
b. No	

ANNEXURE B2: STUDY TOOL: MIDWIVES

Data collection tool:	Midwives
Name of the researcher:	Brian Barasa Masaba: 63714094
Supervisor:	Professor Rose Mmusi-Phetoe
Title of research project:	A strategy for reducing maternal mortality in Migori, Kenya

Dear Sir/Madam

You are being invited to participate in a study entitled **A strategy for reducing maternal mortality in Migori, Kenya**. The study will utilise 4 hospitals. I am currently enrolled in a PhD Nursing programme at University of South Africa (UNISA) and I am in the process of developing a PhD thesis. I plan to carry out the study in 2020−2022. The study has been approved by the Health Studies Research Ethics Committee of the University of South Africa.

Attached to this questionnaire is a detailed Informed consent form about the present study. Thank you for taking time to read the information sheet and for participating in this study.

If you would like to be informed of the final research findings, please contact Brian Barasa Masaba on 0719422418, email: masababrian6@gmail.com. If you have questions at any time about the study or the procedures, you may contact my mentor, Professor Rose Mmusi-Phetoe via phone at 0824540553 or via email at: emphetrm@unisa.ac.za.

Do you wish to participate?

Please initial here _____ if you consent to the interview and agree to the audio-taping of the interview. You will be given a copy of this form. I shall also ask you to confirm your consent on tape when we start with the interview.

SECTION A: DEMOGRAPHIC DATA

***Instruction*:**

- Kindly indicate answer with an X
- The information will be obtained from in-depth interview with midwives

1. Unique code number:

	ANSWER

2. Professional qualification

	ANSWER
a. Nurse	
b. Midwive	
c. Doctor	
d. Clinical officer*	

3. Years of experience in maternal health

	ANSWER
a. 0-3	
b. 4-7	
c. 7-10	
d. >10	

SECTION B: MATERNAL − HEALTH DATA

1. What hospital-based maternal mortality reduction innovations/current strategies are being implemented in your hospital?
2. What hinders scale-up of innovations/strategies, both within and beyond project areas?

3. Is your maternity adequately staffed (any shortages of specialists)?
4. Experiences and challenges in drugs, blood, equipments availability and supply.
5. Is on-time safe blood available today within your facility.
6. What are challenges experienced during referral of mothers with obstetric emergencies?
7. Are all maternal deaths audited when they occur, any challenges?
8. What could be the challenges faced by mothers in accessing maternal health care interventions within the community served by this facility?
9. Suggest strategies/recommendations for improving access of maternal care interventions; emergency obstetric care handling.
10. What are the general challenges that hinder maternal care interventions within the hospital (related to maternal mortality)?
11. Please share your maternal mortality encounters, experiences.
12. Do staff within your department often experience burn out?
13. What is the experience on the time availability of consultants (weekends, at night)?
14. What are the constraints/bottlenecks to reducing maternal mortality ratio (meeting SDG 3.1)?
15. To what an extent do politicians support maternal survival interventions in your facility?
16. Do you have any additional comments on maternal care interventions that we have not discussed?

ANNEXURE B3: STUDY TOOL: PERIPARTUM MOTHERS

Data collection tool:	Peripartum mothers
Name of the researcher:	Brian Barasa Masaba: 63714094
Supervisor:	Professor Rose Mmusi-Phetoe
Title of research project:	A strategy for reducing maternal mortality in Migori, Kenya

Dear Sir/Madam

You are being invited to participate in a study entitled **A strategy for reducing maternal mortality in Migori, Kenya**. The study will utilise 4 hospitals. I am currently enrolled in a PhD Nursing programme at University of South Africa (UNISA) and I am in the process of developing a PhD thesis. I plan to carry out the study in 2020-2022. The study has been approved by the Health Studies Research Ethics Committee of the University of South Africa.

Attached to this questionnaire is a detailed Informed consent form about the present study. Thank you for taking time to read the information sheet and for participating in this study.

If you would like to be informed of the final research findings, please contact Brian Barasa Masaba on 0719422418, email: masababrian6@gmail.com. If you have questions at any time about the study or the procedures, you may contact my mentor, Professor Rose Mmusi-Phetoe via phone at 0824540553 or via email at: emphetrm@unisa.ac.za

Do you wish to participate?

Please initial here _____ if you consent to the interview and agree to the audio-taping of the interview. You will be given a copy of this form. I shall also ask you to confirm your consent on tape when we start with the interview.

SECTION A: DEMOGRAPHIC DATA

***Instruction*:**

- Kindly indicate answer with an X
- The information will be obtained from in-depth interview with hospitalized peripartum mothers

1. Unique code Number:

	ANSWER

2. Type of health facility

	ANSWER
a. County Referral Hospital	
b. Private Hospital	
c. County Hospital	
d. County Hospital.	

3. Maternal religion

	ANSWER
a. Christian	
b. Muslim	
c. Hindu	
d. Others	

4. Maternal age

	ANSWER
a.<20	

b.21-29	
c. 30-39	
d. 40-49	

5. Employment status of the mother

	ANSWER
a. Formal employment	
b. Informal employment	
c. Not working	

6. Residence of the mother

	ANSWER
a. Urban	
b. Rural	
c. Informal settlements	

7. Distance between home and facility

	ANSWER
a. More than 2hours travel time	
b. Less than 2hours travel time	

8. Maternal education

	ANSWER
a. No education	
b. Primary	
c. Secondary	
d. Tertiary	

9. Marital status of the mother

	ANSWER
a. Married	
b. Single	
c. Divorced	
d. Widow	

10. was the current pregnancy planned

	ANSWER
a. Yes	
b. No	

SECTION B: HOSPITALISATION EXPERIENCE

11. Describe the experience on admission day from home (Referral need, transportation costs challenges and decision maker)

ANSWER

12. Describe the experience on quality of care received and attitude by health providers

ANSWER

13. Describe the experience on availability of drugs, medical equipments, consultants and blood for transfusion.

ANSWER

14. Describe the experience on affordability of care during your stay

	ANSWER

15. Describe the challenges you experienced in maternal care in this hospital (before, during and after delivery).

	ANSWER
A-before-- B-during-- C-after delivery--	

16. Describe the experience any **recommendations** for improving maternal care in this hospital (before, during and after delivery).

	ANSWER
A-Before B-During C-After delivery	

17. Describe the **DELAYS** you experienced in maternal care in this hospital (before, during and after delivery).

	ANSWER
A-Before-- B-During-- C-After delivery--	

ANNEXURE C: REQUEST FOR CONSENT

REQUEST FOR CONSENT

Date _____

Dear research participant

I am a Doctoral student at the University of South Africa (UNISA). As part of the requirements for my Doctoral Degree I have to complete a research dissertation. The title of my study is **A strategy for reducing maternal mortality in Migori, Kenya.** If you agree to participate in this study, you will be given a questionnaire to answer. Please understand that **your participation is voluntary.** This means that you will not be forced to take part in this study. The choice of whether to participate, is yours alone. However, without your kind co-operation, I will not be able to find information about maternal mortality as required for this project work.

The study will be conducted using a questionnaire containing questions relating to maternal mortality. Please note that there are no right or wrong answers and you are not obliged to answer all the questions asked. The questionnaire will last approximately 20 minutes.

At all times, I shall keep your details safe and treat all information given to me as confidential. Your actual name or identity will not be known to anyone else related to the research. You are free to withdraw without any penalty.

There are no anticipated risks, compensation or other direct benefits to you as a participant in this study. If you have any questions about this research protocol, please contact me (0719 422 418). If you have any concerns, you may also contact my supervisor, Prof R. Mmusi-Phetoe at 012 429 6021.

Please sign and return this copy of the form. By signing this letter, you give me permission to report your responses anonymously in the final study to be submitted to my supervisors.

[Name]_____

I have read the procedure described above for the proposed research study. I voluntarily agree to participate in the research and I have received a copy of this description.

_____ _____

Signature of participant Date

I will like to receive a summary copy of the final report submitted for assessment.

YES	NO

ANNEXURE D: INFORMATION LEAFLET

INFORMATION LEAFLET

PARTICIPANTS: PERIPARTUM MOTHERS AND PROFESSIONAL MIDWIVES

Researcher's name : Brian Barasa Masaba
Institution: UNISA
Student number: 63714094
Supervisor: Prof RM Mmusi-Phetoe

Title: A strategy for reducing maternal mortality in Migori, Kenya

Hello (Good morning, Afternoon, Evening), my name is Brian Barasa Masaba, I am a Doctoral student at UNISA's Department of Health studies. You are kindly invited to volunteer your participation in this research project titled "**A strategy for reducing maternal mortality in Migori, Kenya**".

The following information is provided to enable you decide on whether to participate or not:

The objectives of the study are

- To explore and describe the causes of maternal mortality in Migori, Kenya
- To explore and describe the socio-economic determinants contributing to maternal mortality in Migori, Kenya
- To analyse the current strategies that aim at reducing maternal mortality ratio (MMR) in Migori, Kenya.
- To develop a strategy to reduce MMR in Migori, Kenya

Why are you being invited to participate?

The phenomenon of maternal mortality in health facilities has been observed globally and in Migori, Kenya as well. As midwives/peripartum mother your inclusion as a participant is just due to the fact that you have been listed as midwife/peripartum mother

in this facility. You and your other colleagues have been deemed as primary sources of information pertaining to study.

The purpose of this study

The purpose of this study is to explore the causes and determinants of maternal mortality and to develop a strategy for reducing maternal mortality ratio within one of the most affected rural counties (Migori) in Kenya. The strategy developed will be in line with the changing patterns of determinants of maternal mortality and the new initiative on the global front.

Can you withdraw from this study even after having agreed to participate?

Participating in this study is voluntary and you are under no obligation to consent to participation. And if you consent to participate, you are still free to withdraw at any time and without giving a reason.

What are the potential risks of the study?

There is the potential for minor discomfort because you will be interviewed about your experiences regarding the mortality of women in peripartum ward to. In-depth information regarding this phenomenon is likely to evoke emotions and you might also experience some anxiety related to the interview itself. Because of the nature of the interview, you will spend some time answering to the questions which might be an inconvenience for you.

What are the potential benefits of taking part in this study?

It is expected that the findings and/or recommendations will serve to correct the identified shortcomings so that quality services are provided to pregnant women.

Are there any negative consequences for your non-participation?

The study seeks to obtain your experiences on the issue of concern. There is therefore, no expected negative consequences as your response may not be used for any

disciplinary measure. Should you decide not to answer any question, this decision of yours will be respected and observed.

Will the information you convey and identity be kept confidential by the researcher?

All information obtained from you will be kept strictly confidential and your name will not be written in this form. The information you tell us will never be exposed to other parties that means it will be used only in connection with this study. Only your answers may be reviewed by people responsible for data capturing, analysis and members of the Research Ethics Review Committee.

Is there any compensation in any form, including gifts of any kind for your participation in this study?

There will be no compensation in any form, including gifts or of any kind for your participation in this study. All cost will be borne by the researcher, you will therefore, not be expected to carry any costs in whatsoever form in relation to this study.

How will you be informed of the findings/results of the research?

The findings of the study will be communicated with the Kenya Ministry of Health for policy decision and appropriate interventions. However, "If you have questions at any time about the study or the procedures, you may contact my mentor and supervisor, **Professor Rose Mmusi-Phetoe via phone at 0824540553 or via email at: emphetrm@unisa.ac.za.**

If you feel you have not been treated according to the descriptions in this form, or that your rights as a respondent in research have not been honored during the course of this project, or you have any questions, concerns, or complaints that you wish to address to someone other than the investigator, you may contact the Chairperson of the Research Ethics Committee, **Professor L Roets via phone at +27124292226 or via email at roetsl@unisa.ac.za".**

ANNEXURE E: CONFIDENTIALITY BINDING FORM

Date _____

Names:

Participant _____ Researcher: _____

Type of business

This is a study being undertaken by a Doctoral student who is studying with the University of South Africa (UNISA).

Reason for disclosure

Information collected from this interview will be kept in confidence. Besides the researcher the only other persons who may access the information if need arises are the research supervisors and examiners from UNISA.

Information to be protected

The information gathered will relate to the experiences on maternal mortality and maternal care of the study participants in Migori, Kenya.

Signatures:

Participant _____ Researcher: _____

ANNEXURE F: CONSIDERATION OF COVID-19 DURING DATA COLLECTION

PHASE 1: Quantitative data collection

On obtaining ethical clearance from UNISA Health Studies Research Ethics Committee, permission to collect data will be sought from Kenya Ministry of Health and the respective administrative heads of the four sampled hospitals within Migori County (see the respective Annexure A1 & A2). Thereafter the researcher will request an informed consent from the respective four sampled hospitals' archive manager before conducting the study. The archive manager will be further requested to sign a consent of participation form which will have been approved by UNISA's Health Sciences Research Ethics Committee. The consent form contains a detailed summary of the study's purpose and ethical principles to be applied.

In consideration to Covid-19; the researcher will first request the archive manager to retrieve the files needed for the present pilot study and put them in a private room 2 days before the planned day for the main study. The private room to be utilised will be approximately 10 square meters, with air-conditioning allowing proper ventilation. Room surfaces and furniture will be cleaned with 0.1% sodium hypochlorite disinfectant. At the entrance of the room there will be an alcohol based hand sanitizer to disinfect hands.archive manager will be requested wear surgical mask and wash hands before retrieving the files.

The archive manager will retrieve the files needed as follows; first two medical registers will be identified for each specific year of the study period; 1) maternal mortality register and 2) maternity discharge-register. The maternal mortality register will be used to identify cases (deceased women) while the maternity discharge-register for controls (women who survived). All the cases within the register that meets the study criteria will be selected. For every single case; surviving woman who was hospitalized immediately preceding and following case will be selected. Using the admission numbers from the two mentioned medical registers, files will be retrieved from shelves in the health record department.

On the day of pilot study; only the researcher will access the private room while wearing surgical masks once permitted. The researcher will also wash hands before and after

entering the room. With all permissions granted, the researcher will utilise a study checklist to collect data from the medical health records department of the sampled hospitals. The study's checklist to be used will be in soft copy format (excel spreadsheet). The collected data will be entered in an excel spreadsheet after a close scrutiny on completeness and possible errors by the researcher.

PHASE 2: Qualitative data collection

The qualitative phase **Data collection** will unfold as follows: The researcher having all the needed ethical approvals; he will request nurse in-charge of maternity department to help him identify the needed study participants.

In ensuring safety of the participants (peripartum mothers and professional midwives) in the context of Covid-19; the researcher will request for telephonic interviews with the volunteered-sampled participants. To enable this, the researcher will first request for informed consent signing from the peripartum mothers and professional midwives who agree to the study. The participants will be further requested for their telephone contacts and consent to be audio-taped.

The researcher will use audio taped responses, for an example (telephonic interviews) to virtually replicate the face-to-face interview in all the sampled study participants. In case of challenges such as study participants being unable to use technology or with no phones; a face-to-face interview will be organised in line with Covid-19 safety guidelines. A private room maternity department will be requested for the in depth-interviews at the sampled facilities for the participants who agreed to attend the interviews.

The researcher and the midwives will be free from Covid-19 symptoms as guaranteed by routine daily screening of all persons that enter the hospitals. The midwives are regarded as essential workers and they will be reporting on duty on daily basis according to their shifts. The peripartum mothers will be those presently hospitalized in the selected facilities after experiencing pregnancy and childbirth complications and only those free from Covid-19 symptoms as guaranteed by daily screening during care. Proper referrals will be tested if presenting with at least one symptom upon screening. The study participants will be health educated on Covid-19 prevention measures. These

measures will include; study participants covering of mouth and nose with a disposable tissue when coughing or sneezing and use the nearest waste receptacle to dispose of the tissue after use. For those with no disposable tissue they will be advised to cough or sneeze into their elbows. Each participant will be reminded on measures of social distancing, not to touch their faces and the new greeting etiquette of using elbows to greet.

To prevent Covid-19 spread, the researcher and participants will maintain space of about 2 meters apart. The researcher will provide all participants with surgical mask. Both the researcher and the participants will wear masks. The participants will be assessed psychological if they are ready to do the interview as most health professionals and patients are anxious about the Covid-19 pandemic.

The private room to be utilised will be approximately 10 square meters, with air-conditioning allowing proper ventilation. Room surfaces and furniture will be cleaned with 0.1% sodium hypochlorite disinfectant. Participant and researcher will wash hands before entering the room. Lastly at the entrance of the room there will be an alcohol-based hand sanitizer to disinfect hands.

The potential participants will be given information about the study and requested to sign consent forms upon voluntarily agreeing to be interviewed. The interview guides developed by the researcher through the use of relevant literature and validated by the supervisor will be used to collect data. The researcher will use the audio recorder and take notes to ensure that all the data collected is accurate. Participants will be assigned unique numbers for the purpose of anonymity; these numbers will be used on the consent form as well. For the purpose of anonymity and confidentiality the audio recorder and notes will be locked in a locker at the researcher's home, and the consent forms will also be locked but separately from the audio and the notes. These data will be kept safe for five years after the thesis has been published.

ANNEXURE G: CRITERIA FOR VALIDATION OF INDIVIDUAL STRATEGIES

PARTICIPANTS: REPRODUCTIVE HEALTH EXPERTS

Researcher's name : Brian Barasa Masaba
Institution: UNISA
Student number: 63714094
Supervisor: Prof RM Mmusi-Phetoe

Hello (Good morning, Afternoon, Evening), my name is Brian Barasa Masaba, I am a Doctoral student at UNISA's Department of Health studies. You are kindly invited to volunteer your participation in this research project titled "**A strategy for reducing maternal mortality in Migori, Kenya**".

Instruction

Kindly validate the stated strategy below according to the given criteria. Enter your response in the appropriate column by using a tick. If your response is 'disagree' in respect of a particular criterion, kindly comment in the adjacent space provided under the column of comments.

Strategy 1: _____

Criteria for validation of individual strategies

Criteria	Agree 1	Disagree 0	Comments
Acceptability: The strategy is acceptable in terms of reducing maternal mortality ratio (MMR) in Migori, Kenya.			
Applicability: The usefulness of the strategy as part of intervention in reducing maternal mortality ratio (MMR) in Migori, Kenya.			

Criteria	Agree 1	Disagree 0	Comments
Clarity: The strategy is simple for understanding for the purposes of application as an intervention in reducing maternal mortality ratio (MMR) in Migori, Kenya.			
Effectiveness: The strategy is able to achieve its objective as an intervention in reducing maternal mortality ratio (MMR) within the context of the study.			
Feasibility: The implementation of the strategy is possible in terms of the available hospital resources, namely, human and material.			
Relevance: The strategy is ideal for application in relation to the maternal mortality experiences.			
Sustainability: The ability of the strategy to address the present and future maternal mortality can be predicted.			
Validity: The strategy is justifiable in that it is evidence-e based.			

Signature _____Qualification _____

Occupation _____ Work experience _____

ANNEXURE H: EDITOR'S DECLARATION

To Whom It May Concern

This is to certify that I have edited the language of the Thesis of BRIAN BARASA MASABA, submitted in accordance with the requirements for the degree of DOCTOR OF PHILOSOPHY in the subject NURSING at the UNIVERSITY OF SOUTH AFRICA

Title: *A Strategy for Reducing Maternal Mortality in Migori, Kenya.*

Supervisor:*Professor Rose Mmusi-Phetoe*

Feedback about the work has been provided to the author and, to my knowledge, after corrections the text is free of language errors.

Leonie Viljoen, PhD (UCT)
Cell: 082 9244 733

ANNEXURE I: TURNITIN DIGITAL RECEIPT

turnitin

Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

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File name:	thesis_brian_barasa_masaba-PhD.docx
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A STRATEGY FOR REDUCING MATERNAL MORTALITY IN MIGORI, KENYA

by

BRIAN BARASA MASABA

submitted in accordance with the requirements

for the degree of

DOCTOR OF PHILOSOPHY

in the subject

ANNEXURE J: TURNITIN ORIGINALITY REPORT