

**PATTERNS OF UNMET NEEDS AND FACTORS
AFFECTING PREVENTION OF HIV MOTHER-TO-
CHILDTRANSMISSION FOR FIRST IMMUNIZATION
SERVICE UPTAKE AMONG MOTHERS WITH
INFANTS AT MACHAKOS HOSPITAL MOTHER
CHILD HEALTH CLINIC**

LILLY MUTHONI NYAGAH

**MASTER OF SCIENCE
(Applied Epidemiology)**

**JOMO KENYATTA UNIVERSITY
OF
AGRICULTURE AND TECHNOLOGY**

2024

**Patterns of Unmet Needs and Factors Affecting Prevention of HIV
Mother-to-Child Transmission for First Immunization Service
Uptake among Mothers with Infants at Machakos Hospital
Mother Child Health Clinic**

Lilly Muthoni Nyagah

**A Thesis Submitted in Partial Fulfillment of the Requirements for
the Degree of Master of Science in Applied Epidemiology of the
Jomo Kenyatta University of Agriculture and Technology**

2024

DECLARATION

This thesis is my original work and has not been presented for a degree in any other university

Signature.....Date.....

Lilly Muthoni Nyagah

This thesis has been submitted for examination with our approval as the University Supervisors

Signature.....Date.....

Dr. Andrea Kim, PhD

KEMRI, Kenya

Signature.....Date.....

Prof. Joseph Gikunju, PhD

JKUAT, Kenya

DEDICATION

To my beautiful daughter Njeri Njugunah, on whose time this study was conducted.

ACKNOWLEDGEMENT

I am grateful to my supervisors Prof Gikunju and Dr Andrea Kim for walking the journey with me. The intellectual stimulation, review of drafts, advice and suggestions were incredibly helpful in bringing the thesis to life. I also appreciate the defense review committee for their brilliant suggestions and comments.

I wish to recognize the role of my social support specifically Elvis Kirui and Gabriel Agutu for their unwavering support throughout this journey. I'm indebted to my family specifically my parents, sister and daughter for their emotional support. To the FETP family, Gracias!

Finally, I would like to thank the respondents from Machakos Hospital who participated in the study without whom this study would have been impossible. Thomas Muthusi, the clinical officer/ HIV counsellor in Machakos Hospital, for collecting the study data and providing the services to the mothers who participated in this study.

TABLE OF CONTENTS

DECLARATION.....	ii
DEDICATION.....	iii
ACKNOWLEDGEMENT	iv
TABLE OF CONTENTS.....	v
LIST OF TABLES	ix
LIST OF FIGURES	x
LIST OF APPENDICES	xi
ACRONYMS AND ABBREVIATIONS	xii
ABSTRACT	xiii
CHAPTER ONE	1
INTRODUCTION.....	1
1.1 Introduction and Background Information.....	1
1.2 Problem Statement	4
1.3 Justification	4
1.4 Significance of the Study	5
1.5 Research Hypothesis	5
1.6 Research Questions	5
1.7 Objectives.....	6

1.7.1 General Objective.....	6
1.7.2 Specific Objectives.....	6
CHAPTER TWO	7
LITERATURE REVIEW.....	7
2.1 HIV/AIDS and Antenatal Care Services.....	7
2.2 Burden of HIV/AIDS among Postnatal Pregnant Women.....	8
2.3 Mother-to-child HIV Transmission during Pregnancy.	9
2.4 HIV/AIDS Infection and Treatment among Infants.....	10
2.5 Prevention of Mother-To-Child HIV Transmission.....	11
2.6 Awareness of Mother-To-Child HIV transmission and Prevention.....	11
2.7 Maternal, Postnatal Challenges to Care and Prevention of HIV transmission	12
CHAPTER THREE	14
MATERIALS AND METHODS	14
3.1 Study Site	14
3.2 Study Design	14
3.2.1 Inclusion Criteria.....	14
3.2.2 Exclusion Criteria.....	15
3.3 Sample Size.....	15
3.4 Sampling Procedure	15

3.4 Laboratory Procedures	16
3.5 Data Collection and Management	16
3.5.1 Data Collection.....	16
3.5.2 Data Management	17
3.5.3 Questionnaire	17
3.5.4 Plan of Analysis	17
3.6 Ethical Considerations	18
CHAPTER FOUR.....	19
RESULTS AND DISCUSSION	19
4.1 Study Population	19
4.2 Characteristics of the Study Population	19
4.3 Prevention of Mother-to-Child Transmission Cascade.....	22
4.4 Factors Associated with Missed Opportunities for HIV Testing	24
CHAPTER FIVE.....	27
CONCLUSION AND RECOMMENDATIONS.....	27
5.1 Discussion and Summary of Findings.	27
5.2 Limitations of the study	30
5.3 Conclusion	30
5.4 Recommendations	31

REFERENCES	32
APPENDICES	42

LIST OF TABLES

Table 4.1: Barriers to attending ANC	24
Table 4.2: Factors Associated with Missed HIV Testing	26

LIST OF FIGURES

Figure 1.1: PMTCT Cascade in a Kenyan Clinic	3
Figure 4.1: Age Distribution	19
Figure 4.2: Distribution of Marital Status	20
Figure 4.3: Education Level Distribution	20
Figure 4.4: Number of Children.....	21
Figure 4.5: Occupation.....	21
Figure 4.6: Distance to Facility from Place of Residence.....	22
Figure 4.7: ANC Cascade	23
Figure 4.8: Maternity Cascade	23
Figure 4.9: Post-Natal Cascade	24

LIST OF APPENDICES

Appendix I: Work Plan 42

Appendix II: Budget 43

Appendix III: Questionnaire..... 44

Appendix IV: Consent Explanation (Parents of the Infants) 52

Appendix V: Consent Form 54

Appendix VI: Study Approvals 55

ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
ARV	Antiretroviral
Cart	Combination Antiretroviral Therapy
HIV	Human Immunodeficiency Virus
MCH	Mother Child Health clinic
MOH	Ministry of Health
MTCT	Mother to Child Transmission of HIV
PMTCT	Prevention of Mother to Child Transmission of HIV
VCT	Voluntary Counseling and Testing
WHO	World Health Organization

ABSTRACT

Mother-to-child HIV transmission rates in Kenya have remained high at 10-15% at 18 months. Elimination of mother-to-child transmission of HIV is achievable through prevention of mother-to-child transmission (PMTCT) interventions. The PMTCT package comprises HIV testing and counseling, ARV prophylaxis, safe delivery, safe infant feeding practices, early infant diagnosis, and postnatal follow-up. All these aspects are important and a gap in any of them will negatively impact the effectiveness of PMTCT and eventually elimination of mother-to-child transmission of HIV. This was a cross-sectional study aiming to measure the proportion of mothers with unknown HIV status and to determine the associated factors, it involved 400 mothers accompanying their infants for routine immunization at the mother-child health clinic (MCH) at Machakos Hospital, Kenya. Information on HIV testing was obtained from their antenatal records and offered opt-out HIV testing to those with unknown HIV status. The collected data was entered into Epi info version 3.5.1 and analyzed using the same tool. Overall, 304 (76.0%) mothers had unknown status at MCH, of whom 25 (8.6%) tested HIV-positive. HIV positivity was three times higher among mothers who were never tested during pregnancy/delivery. Married women had 3.2-fold greater odds of having unknown status as compared to those who were single (AOR 3.2, 95% CI 1.4–7.0) while education was associated with ten-fold reduced odds of unknown status. Therefore, strict implementation of the PMTCT guidelines to ensure that mothers are tested at every opportune time Interventions are needed to improve women's ANC attendance, uptake of HIV testing, and disclosure of HIV status during pregnancy to achieve the elimination of MTCT

CHAPTER ONE

INTRODUCTION

1.1 Introduction and Background Information

Human immunodeficiency virus (HIV) infection can result in AIDS (acquired immunodeficiency syndrome) causes the immune system to gradually and persistently deteriorate and fail, increasing the risk of life-threatening diseases and malignancies (Bhatti et al., 2016) Human immunodeficiency virus is a leading cause of death in Kenya, with 21,000 deaths, a mortality ratio of 1.3 annually and a national prevalence of 4.5% (UNAIDS, 2019a). The disease is a formidable public health challenge with 1,500,000 individuals living with the condition majority of who are underprivileged (UNAIDS, 2019a). The wide availability of combination Antiretroviral therapy (cART) has reduced the burden of HIV by transforming it from a fatal disease to a chronic disease (Kharsany & Karim, 2016) albeit one that requires lifetime management and treatment. Pediatric HIV infections remain high. Globally, children under age 15 account for about 5 percent of all people living with HIV, 10 percent of new HIV infections, and 15 percent of all AIDS-related deaths (UNICEF, 2022). New HIV infections among children declined by more than half (54%) from 2010 to 2020, due mainly to the increased provision of antiretroviral therapy to pregnant and breastfeeding women living with HIV (UNAIDS, 2021). In Kenya, it is estimated that 5200 [3700-9500] children became newly infected with HIV in 2020 (UNAIDS, 2021).

The majority of new infections in children (88.1 %) occur in sub-Saharan Africa by vertical transmission which accounts for over 90 % of all HIV mother-to-child transmission (MTCT) worldwide (Remera et al., 2021; Ubesie, 2012). Through MTCT it is estimated that 37,000 – 42000 infants are infected annually in Kenya, corresponding to a MTCT rate of 8.5% (Early Infant Diagnosis data) at 6 weeks and 15% at 18 weeks of life according to Estimation and Projection Package (EPP) spectrum (Sirengo et al., 2014; Stover et al., 2012). Mother-to-child transmission of HIV occurs at different stages with varying transmission probabilities - during pregnancy (5-8%), labor and delivery (10-20%), and breastfeeding (10-15%) (Bhatta

et al., 2020). The rate of MTCT transmission of HIV ranges from 15 percent to 45 percent in the absence of intervention and can be reduced with integrated and harmonized intervention (Gebre et al., 2021). The transmission can be reduced to below 5% with appropriate interventions for prevention of mother-to-child transmission (PMTCT) of HIV.

A comprehensive PMTCT program has four components, namely: (1) primary prevention of HIV infection among women of childbearing age; (2) preventing unintended pregnancies among women living with HIV; (3) preventing HIV transmission from a woman living with HIV to her infant; and (4) providing appropriate treatment, care, and support to mothers living with HIV and their children and families (Mutabazi et al., 2017a). The systematic implementation of these protocols has made pediatric infection an increasingly rare problem in contexts where adequate health care is accessible. Over the last few years, significant impact has also been made in resource-limited settings. The diagram below shows the PMTCT cascade in a Kenyan clinic.

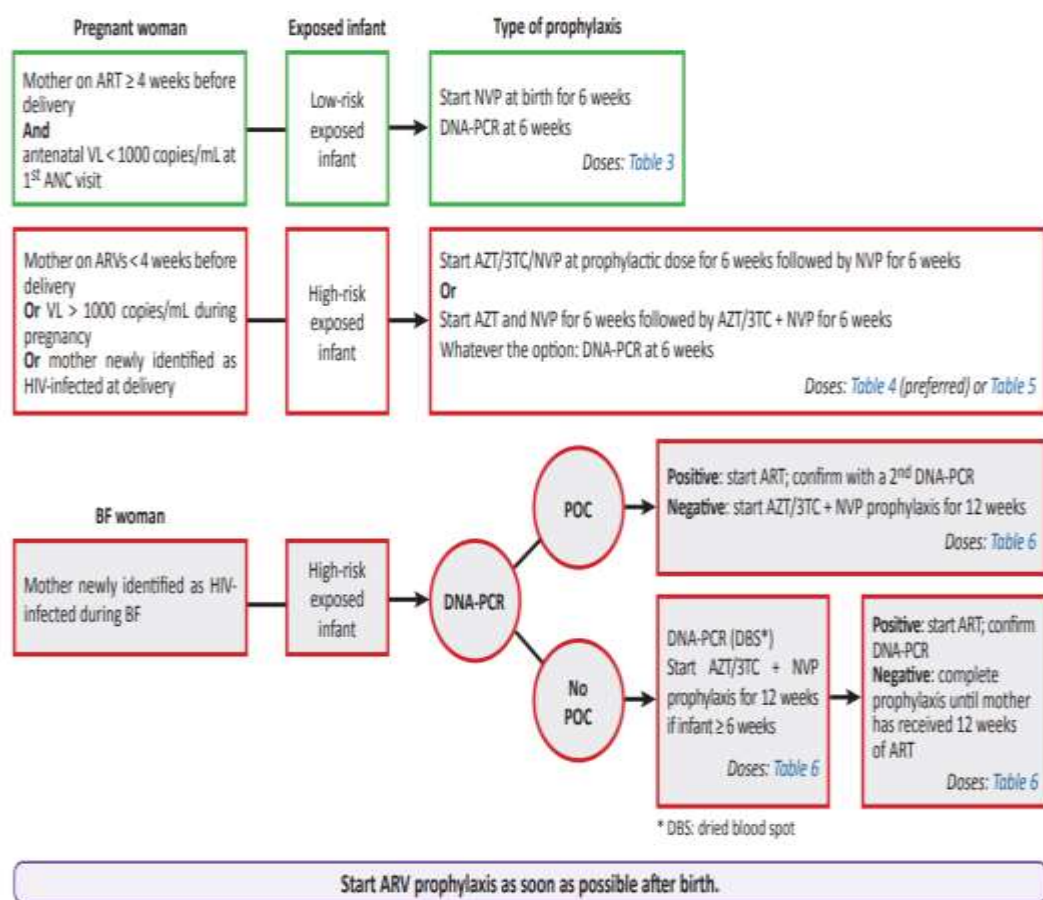


Figure 1.1: PMTCT Cascade in a Kenyan Clinic

In Kenya, significant progress has been made in scaling up national programs for PMTCT of HIV infection although uptake of HIV testing in Kenya is estimated at 92% because some HIV-infected infants present late and are not benefit from PMTCT best practices (Mwau et al., 2017). One of the major barriers to effective PMTCT programs is low ANC attendance. In Machakos, it is estimated that only 57% attend ANC and 48% deliver in hospital (NACC, 2014). Assessment of missed opportunities in early infant HIV testing within the PMTCT program indicates the need to increase maternal pre-pregnancy HIV diagnosis, timely antenatal care, early infant diagnosis services, early identification of mothers who seroconvert during pregnancy or breastfeeding, and improved HIV screening in outpatient and inpatient settings (Langat et al., 2021). Since immunization uptake is over 80% according to the Division of Vaccine Initiative, interviewing mothers at MCH will enable us to reach both those who missed ANC and hospital delivery. This study aimed to assess the demand for the

needs of PMTCT at antenatal, delivery, and subsequent follow-up to the first immunization of the infant. Assessing the factors influencing women's decisions to seek antenatal care, skilled delivery, and post-partum care and examining barriers to accessing PMTCT services is an important step toward identifying appropriate interventions for PMTCT.

1.2 Problem Statement

PMTCT is a cascade that starts with an HIV-free mother, then to the HIV-infected mother where unwanted pregnancies are prevented through the provision of family planning options. Once pregnant, prevention of transmission of human immunodeficiency virus to the infant is achieved by giving prophylaxis. Finally, there is the provision of care and treatment to the mother and her children. Each of these aspects is important and a gap in any of these aspects will negatively impact the effectiveness of PMTCT and eventually elimination of mother-to-child transmission of HIV. Although ANC attendance and hospital delivery have remained low, immunization coverage is above 80% in Kenya. Since at MCH there are mothers who attended the clinic and those who missed ANC and hospital delivery, MCH presents an opportunity to offer services to those who missed out during pregnancy and delivery. By targeting these mothers who have already delivered the patterns of uptake of PMTCT services at ANC, delivery and MCH were determined.

1.3 Justification

The burden of HIV is high in Kenya; with 21,000 deaths, a mortality ratio of 1.3 annually and a national prevalence of 4.5% (UNAIDS, 2019a). The disease is a formidable public health challenge with 1,500,000 individuals living with the condition (UNAIDS, 2019a). Human immunodeficiency virus poses a challenge to children in Kenya; it is estimated that 5200 [3700-9500] children became newly infected with HIV in 2020 (UNAIDS, 2019a). Kenya has made significant investments to expand the coverage and quality of prevention of mother-to-child transmission (PMTCT) services to reduce this public health challenge. This is evidenced by the decline in infant HIV transmission from 16% in 2012 to 8.3% in 2015 (Pricilla et al., 2018) and increasing the proportion of HIV+ pregnant women receiving antiretroviral

therapy (ART) from 60% in 2013 to 75% in 2015 (NACC, 2014). While this investment in PMTCT services has contributed to decreasing rates of mother-to-child transmission, Kenya has yet to achieve the global target of reducing perinatal transmission to 5%. One of the major barriers to effective PMTCT programs is low ANC attendance. According to the Machakos County HIV profile, only half of all pregnant women attended the recommended four ANC visits, and 31.9% of all HIV-positive pregnant women delivered in a hospital in the same county (NACC, 2014). Also given that at least 56% of deliveries take place at home (Caulfield et al., 2016), postnatal period provides an opportunity to capture the other close to 50% of women who may have missed out on PMTCT during labor and delivery. If these mothers are missed during the postpartum period, the elimination of MTCT will remain an unachievable dream.

1.4 Significance of the Study

The findings from this study will inform health workers and policymakers in designing appropriate policies for PMTCT during the post-natal period. This will result in a strengthened linkage in the PMTCT continuum and hence accelerate the achievement of PMTCT.

1.5 Research Hypothesis

There is a significant association between the characteristics of mother-infant pairs and the uptake of PMTCT services, with specific barriers to antenatal care (ANC) attendance contributing to the unmet need for PMTCT among mothers attending Maternal Child Health clinics at Machakos Level 5 Hospital.

1.6 Research Questions

1. What are the characteristics of mother-infant pairs presenting for a 1st immunization at MCH in Machakos level 5 hospital?
2. What is the uptake of PMTCT services among the mother-infant pairs attending MCH in the Machakos level 5 hospital?

3. What are the factors associated with the unmet need for PMTCT among mothers attending Machakos level 5 hospital??

1.7 Objectives

1.7.1 General Objective

To assess the unmet needs for PMTCT among mothers attending Maternal Child Health clinics at Machakos Level 5 Hospital.

1.7.2 Specific Objectives

1. To describe characteristics of mothers-infant pairs presenting for a 1st immunization at MCH in Machakos level 5 hospital.
2. To determine uptake of PMTCT services among the mother-infant pairs attending MCH in the hospital.
3. To establish factors associated with the unmet need for PMTCT among mothers attending Machakos level 5 hospital.
4. To describe barriers to ANC attendance among mothers accompanying their infants for immunization at MCH in Machakos level 5 Hospital.

CHAPTER TWO

LITERATURE REVIEW

2.1 HIV/AIDS and Antenatal Care Services

Only three studies were found about the adolescent proportion among HIV-positive pregnant or nursing women (Musarandega et al., 2017a). One study Gourlay et al., (2015) found that in a total of 756 pregnancies, 420 women tested HIV positive pregnancies and 4.8% occurred among adolescents aged <20 years. In a Kenyan study Ronen et al., (2017) found out that 21 (4.2%) of the 498 HIV-positive breastfeeding mothers in Kenya were under the age of 19. A study conducted in Zimbabwe Musarandega et al., (2017) found that 9.5 percent of HIV-positive women getting PMTCT services in ANC were adolescents aged 19 years. Emerging data by Ronen et al., (2017) suggests adolescent mothers had poorer ANC attendance and uptake of ARVs for PMTCT. Adolescents have been found to have attended ANC either earlier or at a comparable gestational age than adults (Musarandega et al., 2017; Ramraj et al., 2018; Ronen et al., 2017), while two studies described mixed results. Pregnancy among adolescents is associated with a range of adverse outcomes including late spontaneous or induced abortions, preterm delivery, low birth weight and neonatal mortality (Yussif et al., 2017). This is due to the challenges that adolescent women face in controlling sexual decisions, accessing reproductive health services and protecting themselves against infection with HIV (Musarandega et al., 2017). Young women face multiple legal, economic, and social vulnerabilities that intersect to affect their sexual behaviors, making them more susceptible to acquiring HIV and transmitting it (Janet Fleischman Katherine Peck et al, 2015), hence targeted interventions are needed to improve retention of this vulnerable population in the PMTCT cascade. A study by Mustapha et al., (2018) found utilization of PMTCT services by these adolescent and young mothers to be suboptimal.

The challenges associated with effective PMTCT and measuring its impact are numerous and multi-factorial, despite the notable HIV care advancements in sub-Saharan Africa (Yah & Tambo, 2019). (UNAIDS, 2014). To achieve this Early

initiation and commencement of ARV for all eligible parents/infants, scale-up of ARV treatment programs, innovative PMTCT uptake programs, and retention in care are all important aspects of HIV education, decentralization, and availability of HIV testing services (HTS) and support is necessary (Yah & Tambo, 2019). Many women of reproductive age are still not aware of their HIV status, a significant number of women living with HIV and needing ARV are not on treatment during pregnancy and this low uptake and losses to follow-up account for poor PMTCT effectiveness (Adedimeji et al., 2012). Pregnant women who had never attended ANC were about 6 times more likely to newly test HIV-positive compared to those who had attended ANC (Ndege et al., 2016). This suggests PMTCT cascade should begin at the home and at the village level to achieve the elimination of perinatal HIV transmission.

2.2 Burden of HIV/AIDS among Postnatal Pregnant Women

A meta-analysis of studies in sub-Saharan Africa published between 2002 and 2012 (Wettsein C, 2012) showed that HIV-testing uptake at antenatal care services was 94% for opt-out testing. Seventy percent of pregnant women received antiretroviral prophylaxis while 62% of women eligible for ART received treatment. Sixty-four percent of HIV-exposed infants had early diagnosis performed. According to pooled results, 60.7% of women received HIV testing as part of ANC, Ugandan women had the highest rate of HIV testing (81.5%) compared with women in Mozambique (69.4%), Nigeria (54.4%) and Congo (45.4%)(Ndege et al., 2016). Difficulty reaching a health facility was a barrier in Congo and Mozambique but not Nigeria or Uganda. Human immunodeficiency virus testing rates were lower in rural areas, among the poorest women, the least educated and those with limited knowledge of HIV. In every country, crude regression analyses showed higher odds of being tested for HIV if women received their ANC services from a skilled attendant compared with an unskilled attendant. After adjusting for confounders, women in the total sample had 1.78 times the odds of having an HIV test as part of their ANC if they went to a skilled attendant compared with an unskilled attendant (Finocchario-Kessler et al., 2018;). Only 57% of the women with unknown HIV status were tested. In South Africa, a 2010 study showed that 30.14% of infants were exposed at 6 weeks postpartum, with

92% of caregivers accepting to have their infants tested. Of infants whose mothers reported being HIV negative 4.1% were actually HIV exposed.

2.3 Mother-to-child HIV Transmission during Pregnancy.

Even in the current era of combined HIV prevention and treatment, significant HIV prevalence among pregnant and breast-feeding women in sub-Saharan Africa highlights the need for prevention tailored to high-risk pregnant and breast-feeding women (Graybill et al., 2020). A recent study of serodiscordant couples provides strong evidence for an elevated risk of HIV acquisition per-condomless-coital-act during pregnancy and the postpartum period (Thomson et al., 2018). However, in sub-Saharan Africa changes in sexual behavior and differences in HIV-sero-discordancy during pregnancy/postpartum reduce the impact of increased risk of HIV acquisition per-condomless-coital-act (Gray & Wawer, 2012). Although there are immunological reasons for increased risk of HIV acquisition during pregnancy, at a population level, this study by Marston et al., (2013) indicated a lower risk of HIV acquisition for pregnant women. This is similar to another study by Chetty et al., (2017) that found Pregnancy had a protective effect on HIV acquisition.

Human immunodeficiency virus-1 risk increased two-fold during pregnancy and this elevated risk of HIV-1 acquisition in pregnant women appeared in part to be explained by behavioral factors (Mugo et al., 2011). Increased susceptibility during pregnancy and breastfeeding could result from hormonal changes that alter genital mucosal surfaces; however, behavioral factors also play a role if male partners seeking other partners during pregnancy or postpartum bring HIV back into the relationship (Drake et al., 2014). Pregnancy and the postpartum period are times of ongoing HIV risk, with rates similar to those seen in "high-risk" populations. Maternal seroconversion (acquiring HIV infection) during late pregnancy and breastfeeding contributes significantly to pediatric HIV infections. (Davey et al., 2018). Mother-to-child transmission risk was elevated among women with incident infections (Drake et al., 2014) hence detection and prevention of incident HIV in pregnancy/postpartum is critical to decrease MTCT.

2.4 HIV/AIDS Infection and Treatment among Infants

Birth and point-of-care (POC) HIV testing are emerging approaches to simplify infant HIV diagnosis and accelerate antiretroviral therapy (ART) initiation for HIV-positive infants. Despite favorable attitudes, significant structural barriers in terms of insufficient resources (insufficient staffing, expertise, and infrastructure) and limited evidence available to clinicians were identified (Mugo et al., 2011). Studies show that nurses had moderate knowledge and positive attitudes towards evidence-based practices in prevention of mother-to-child transmission (PMTCT), insufficient resources and challenges in accessing new information hindered efforts and resulted in low implementation of evidence-based practices. Mulenga & Naidoo, (2017). Early infant diagnosis of HIV is critical to identify HIV-positive infants and initiate antiretroviral therapy. However, inefficiencies along the EID cascade of care (i.e., late presentation to care; long turnaround times for sample processing, mother notification, and ART initiation), result in Kenyan infants not being initiated on ART until a median age of 17.1–25.1 weeks (Finocchiaro-Kessler et al., 2018; Wexler et al., 2017). This is way above the targeted ART initiation age of 12 weeks to reduce the risk of mortality and slow disease progression (Sheahan et al., 2017). According to one study by Kassanje et al., (2021), mortality rates among children living with HIV have decreased substantially over time. However, when accounting for worse outcomes among those lost to follow-up, mortality estimates increased and temporal improvements were slightly reduced. Between 2015 and 2019, ART coverage among pregnant women in Kenya increased from 59% to 94%, while infant infections subsequently declined by 26% from 9,200 in 2015 to 6,800 in 2019 (UNAIDS, 2019b). Early infant diagnosis (EID) coverage at 2 months also increased from 53% in 2015 to 69% in 2019; falling short of Kenya’s ambitious targets (UNAIDS, 2019b). A study by Burmen et al., (2017) found a severe shortage of clinicians providing consultation services at the HIV clinic and indicated that if at-birth POC is to be successfully integrated into routine decision-making, these challenges need to be overcome. Applying a task-shifting approach to implementation and ensuring providers receive training on at-birth POC testing may mitigate provider-related challenges and counseling throughout the antenatal and postpartum periods may mitigate patient-related challenges.

2.5 Prevention of Mother-To-Child HIV Transmission

Prevention of mother to child transmission of HIV (PMTCT) services are critical to achieve national and global targets of 90% antiretroviral therapy (ART) coverage in PMTCT, and mother to child transmission rates less than 5% (Vrazo et al., 2018). Adoption of PMTCT program in Kenya started in the year 2000 and since then there have been substantial scale up with more health facilities providing the services according to WHO PMTCT guidelines (Abere et al., 2018). Significant progress has been made from 2010 to 2016 since PMTCT enrolment increased from 5.8 to 31.7% , and the pediatric transmission rate decreased from 5.9 to 2.5% (Pricilla et al., 2018)(Pricilla et al., 2018)(Pricilla et al., 2018)(Pricilla et al., 2018)(Pricilla et al., 2018). However, MTCT rates in Kenya remain at 10 – 15% at 18 months according to early infant diagnosis data (Achwoka et al., 2018). Another study by Abere et al., (2018) confirms that there are still new HIV infections at 13.5 % despite being followed up in the PMTCT program and the new HIV infections were associated with mixed feeding. Gaps in early infant HIV testing suggest the need to increase maternal pre-pregnancy HIV diagnosis, timely antenatal care, early infant diagnosis services, early identification of mothers who seroconvert during pregnancy or breastfeeding and improved HIV screening in outpatient and inpatient settings (Langat et al., 2021).

2.6 Awareness of Mother-To-Child HIV Transmission and Prevention

Awareness and knowledge of mother-to-child transmission of HIV and its prevention among pregnant women is not yet at the required level (Achwoka et al., 2018; Vrazo et al., 2018). Though the level of awareness of HIV/AIDS among women attending Nigerian antenatal clinic was high, the level of knowledge about mother-to-child HIV-1 transmission is highly inadequate (Yaya et al., 2019), as indicated in Sub-Saharan African Countries' Demographic and Health Survey (Teshale et al., 2021). While routine infant immunization visits are focused on infants, immunizations provide an important opportunity to offer HIV testing to mothers who may have otherwise been missed during their antenatal care or did not receive antenatal care. Identification of HIV-infected mothers who are unaware of their status during this post-natal period could lead to a substantial reduction in MTCT. A study done in a tertiary hospital in

South Africa showed that of 34, 776 deliveries that occurred 7,500 (21.5%) had no documented HIV status. Hence, it's critical to promote adequate counseling and education about HIV/AIDS mother-to-child transmission in antenatal clinics as well as to the public (Vrazo et al., 2018).

2.7 Maternal, Postnatal Challenges to Care and Prevention of HIV transmission

To maximize the health impact of future maternal health financing efforts in Kenya, it is important to consider the underlying mechanisms by which the observed effects were achieved. A study by (Nyongesa et al., 2018) of national representative health facility exit interview data with ANC clients in Kenya found that women who believed that they had enough money to pay for delivery care were four times as likely to intend to deliver under the supervision of a skilled birth attendant. Another study by (Mohan et al., 2017) on the continuum for maternal healthcare in Tanzania found that women who had to pay for ANC were less likely to deliver in a health facility. While a lot has been done at improving PMTCT during antenatal period, very little is done in the postnatal period. Loss of follow-up across the PMTCT cascade results in missed opportunities to achieve the virtual elimination of mother-to-child transmission of HIV (Rawizza et al., 2015). Some of the challenges in providing PMTCT services include low utilization of ANC services with only 44% of pregnant women giving birth at a health facility, inefficacious regimes for PMTCT, lack of integration of PMTCT services with Reproductive Health and Family Planning (RH/FP) services, loss to follow up on women who do not return to the ANC to get their HIV test results, and lack of integration of early infant diagnosis in the MCH continuum resulting in missed opportunities for pediatric treatment. (Council, 2010). Unmet need for family planning for HIV positive women has also been identified as needing improvement (Ministry of Health 2012 - 2015). Moreover, the maternal and childcare continuum has been identified as being one of the weakest links in PMTCT. Nevertheless, several studies have shown high coverage of PMTCT services at ANC and delivery but poor follow-up of mothers and their infants (Mutabazi et al., 2017b; Samreth et al., 2019). While a lot has been done at improving PMTCT during antenatal period, very little is done in the postnatal period. MTCT rates have been declining from 27% in 2007 to 10 -15% in 2012 (National AIDS and STI Control Programme, 2012b). National AIDS and STI

Control Programme recommends that postnatal HIV counseling and testing should be offered to all women with unknown HIV status. Different factors have been shown to influence utilization of PMTCT services directly or indirectly: physical accessibility, lack of trust on result confidentiality, fear of stigma and discrimination, lack of awareness on the significance of voluntary counseling and testing (VCT) and PMTCT, shortage of qualified health professionals, lack of up-to-date training for health care providers, high health care provider turnover, and insufficient allocation of budget (Akal & Afework, 2018). Another study in Malawi suggested that an opt-out strategy, free maternity services, and integration of PMTCT into ANC would increase the uptake of PMTCT services (Kasenga et al., 2009). Facility-based delivery is necessary to reduce MTCT, Specifically, effective PMTCT requires the uptake and retention of pregnant women in a cascade of services including HIV testing, early uptake and adherence to antiretroviral (ARV) prophylaxis, safe obstetric practices, and infant feeding counseling (Puchalski Ritchie et al., 2019). Facility-based delivery remains critical given the high loss to follow-up after initiating ART (Buzdugan et al., 2015).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Site

The study was conducted at Machakos Level 5 Hospital, which is located at coordinates [1.5167° S, 37.2667° E] in Machakos County, Kenya. This referral hospital has a catchment population of 621,518 and a projected population (due to referrals) of 1.2 million. According to the HIV and AIDS profile for Machakos County, close to 50% of the people in Machakos County had never been tested for HIV by 2009. Only 49% of pregnant women in the county attended the recommended 4 ANC visits, and 68% of HIV-positive pregnant women did not deliver in the hospital. Further, a records review for 2013 in the hospital showed that skilled deliveries were at 42%, while the hospital's immunization coverage was 74%. [Geographical map showing the location of Machakos Level 5 Hospital in Machakos County, Kenya]

3.2 Study Design

This was a cross-sectional study carried out at Machakos Level 5 Hospital. 3.3 Sample Population. We conducted interviews with mothers who were accompanying their infants for the first set of immunizations, which included the BCG vaccine, the OPV birth dose, and the first dose of the pentavalent vaccine 3.4 Participants inclusion and exclusion criteria

3.2.1 Inclusion Criteria

Eligible participants were:

- All post-natal mothers bringing their infants for the first immunization inclusive of BCG, OPV birth doses, and pentavalent vaccinations
- Consent to participate.

3.2.2 Exclusion Criteria

Eligible persons who did not consent were excluded from the study.

Infants accompanied by any other person other than their biological mother were also excluded.

Mothers who were below 18 years were also excluded from participating in the study.

3.3 Sample Size

Using Cochran's formula (WG, 1977) the sample size was determined as follows:

According to HIV and AIDS profile, Machakos county, 46% of people in Machakos had never been tested.

$$Z^2pq/d^2$$

Where $Z=1.96$

$$p = 0.46$$

$$q = 0.54$$

$$d = 0.05$$

- Prevalence of non-testing for HIV 46%
- Critical value 1.96
- Confidence level 95%
- $\frac{1.96^2 * 0.46 * 0.54}{0.05^2} = 381$ women

However, we recruited 400 participants to ensure a robust dataset and accommodate any potential dropouts or incomplete data.

3.4 Sampling Procedure

The participants, which consisted of mother-infant pairs, were selected through systematic random sampling. The expected number of mothers coming for

immunization in a month was used to determine the population of the mother-infant pairs (N). This number was then divided by the desired sample size (n) to get the sampling interval (k). A random number less than or equal to (k) was selected as the starting point, and then a mother-infant pair was selected after every (k) interval until the required sample size was reached. The selected participants were assessed for eligibility, and their consent was obtained. A standardized questionnaire was then administered to the mothers. Mothers with an unknown HIV status were offered an HIV test, and those willing to receive family planning services were provided with the relevant services.

3.4 Laboratory Procedures

HIV testing was offered using an opt-out strategy to participants with an unknown HIV status, and those who consented to the test were tested. This process was carried out by a certified HIV Testing and Counseling (HTC) counselor. The participants received pre-test counseling, and their HIV status was determined using rapid HIV antibody testing with the Abbot Determine test kit (Abbot Diagnostics). For any samples that tested reactive on the Determine kit, a confirmatory test was conducted using the Unigold test kit (Trinity Biotech PLC, Ireland). Post-test counseling was provided to all clients as per the requirement in Kenya's HIV rapid test algorithm.

3.5 Data Collection and Management

3.5.1 Data Collection

A structured questionnaire was administered to the eligible female participants after they had received immunization services at the clinic. The questionnaire focused on gathering information about their antenatal care (ANC) period practices, delivery, and post-delivery experiences. After completing the questionnaire, HIV counseling and testing were offered to all the eligible participants who had an unknown HIV status. This was done by a certified HIV Testing and Counseling (HTC) counselor. Participants were considered to have an unknown HIV status if they had either never been tested for HIV or their last test was conducted more than 3 months before the study and confirmed to be HIV negative. The participant's HIV status was verified

using the information in their mother-baby booklet. The HIV testing was conducted under the national HIV testing and counseling algorithm (National AIDS and STI Control Programmed, 2012a).

3.5.2 Data Management

The data collected during the study was double-entered into Epi Info software to ensure accuracy. The security of the data was ensured by storing it on a user-restricted, password-protected computer. To further maintain data validity, the data was cleaned and edited before conducting the analysis. Additionally, the data was backed up on an external hard disk to safeguard against any potential loss or corruption of the information.

3.5.3 Questionnaire

A structured questionnaire was administered by trained research assistants to all eligible mothers to assess their experiences with antenatal care (ANC) and postnatal care (PNC). The questionnaire was pretested before the study, and the results were used to validate the questionnaire. The questionnaire was translated into Kiswahili and then back-translated to English to ensure accuracy (Appendix 4). This process was undertaken to enhance the reliability and validity of the data collection instrument.

3.5.4 Plan of Analysis

Univariate analysis was conducted to determine the frequencies and proportions of women attending Machakos Level 5 Hospital with unknown HIV status, stratified by select demographic and behavioral characteristics. The HIV prevalence rate among postnatal mothers with unknown HIV status was calculated by dividing the number of participants testing HIV-positive by the total number of participants. The proportions and 95% confidence intervals were also calculated. Bivariate analysis was performed to assess potential associations between select variables and unknown HIV status, as well as the various unmet needs. The Chi-square test and its associated p-value were used to test for statistical significance in the bivariate analysis. A p-value of less than 0.05 was considered statistically significant. Multivariate analysis was then conducted

to identify independent and significant factors associated with unknown HIV status. Variables included in the multivariate model were those that were significant at a p-value of less than 0.2 in the bivariate analysis. Factors that remained in the model with a significance level of p-value less than 0.05 were considered to have statistically significant associations. The measures of association were depicted as odds ratios, adjusted odds ratios, and 95% confidence intervals.

3.6 Ethical Considerations

The study was reviewed and approved by the Institutional Review Boards of Kenyatta National Hospital (KNH) (Appendix 5). Administrative approval was also obtained from the Machakos hospital administration (Appendix 6). Respondents were requested to provide informed consent before participating in the study after the study's purpose and procedures were explained to them. Participants were informed that their participation was entirely voluntary, and they were free to withdraw from the study at any point without it negatively impacting the quality of services they receive from the hospital. The potential risks, such as psychological trauma in case of a positive HIV result or pain from the testing procedure, as well as the benefits, such as knowledge of one's HIV status, education, and early treatment for the mother and infant, were explained to the participants (Appendix 7). All data collected was kept confidential and not shared with anyone outside the study team, except for presentation in scientific meetings or to inform policy. Access to the information was restricted to the principal investigator and the supervisors. No identifying variables were collected. Participants who tested HIV-positive were linked to the facility's Comprehensive Care Clinic for further care and treatment.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Study Population

Four hundred participants were enrolled with a mean age of 25.3 years (Standard Deviation 5.7 years), with the majority being between 20-29 years 231 (60.2%). Over three quarters 307 (77.3%) were married and living with their spouses with about a fifth 83 (20.9%) being single. The highest proportion had a primary level of education 141 (36.3%) with only 92 (23.7%) having tertiary education and a few, 18 (4.6%) not having any formal education. About half of the participants 194 (50.4%) had one child while 92 (23.9%) had two children and 53 (13.8%) had three children with only 46 (11.9%) having more than three children. Over half were housewives 207 (53.1%) with only 62 (15.9%) being informal employment and 85 (21.8%) being self-employed. A quarter of the participants 106 (26.8%) were living within two kilometers of the facility while 172 (43.4%) lived over four kilometers away as shown in (Table 4.1).

4.2 Characteristics of the Study Population

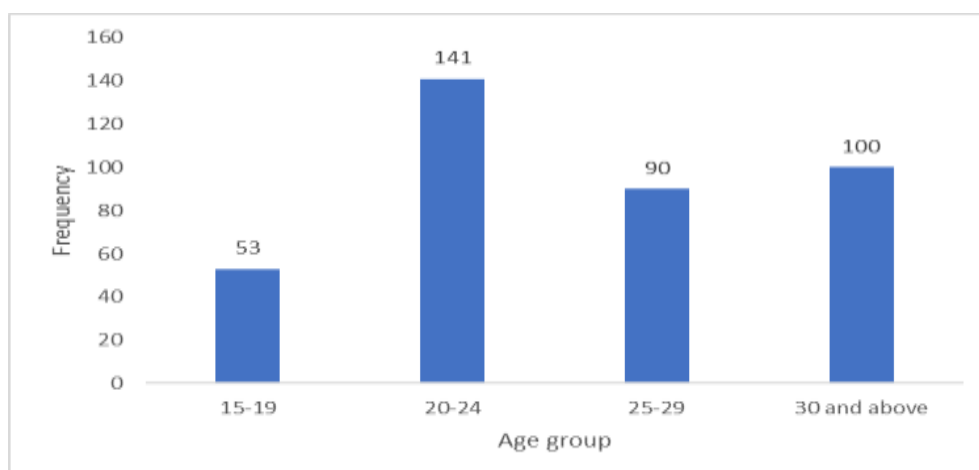


Figure 4.1: Age Distribution

Majority of the mothers enrolled to PMTCT study were married and lived together with their spouses 307 (77%) while only (1%) of each separated and divorced mothers

consisted the least enrolled although, the number of single mothers was substantially high 83 (21%) as indicated by (Figure 4.2).

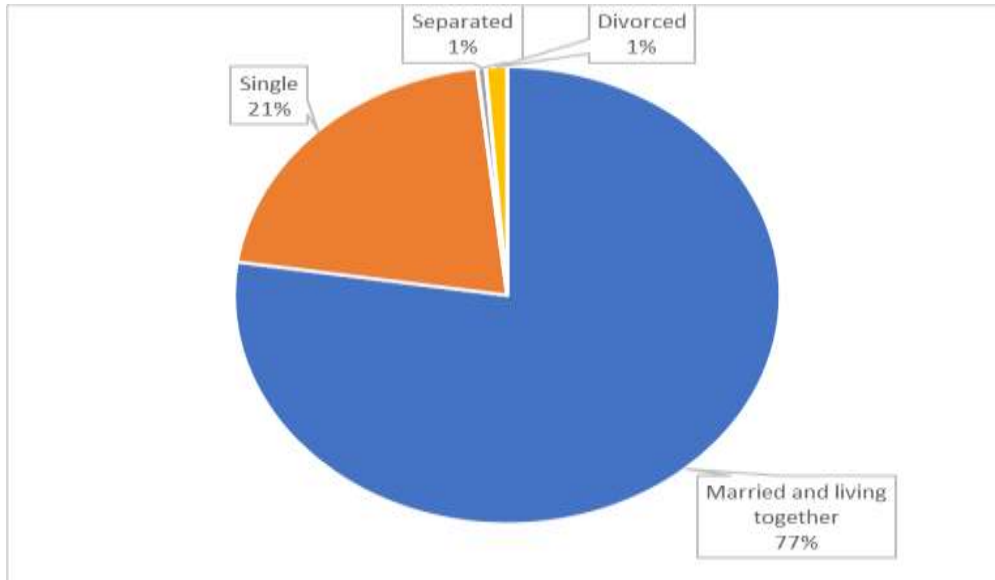


Figure 4.2: Distribution of Marital Status

The majority of the respondent 77% (307), were married and living with their spouses, while 21% (83) were single, 1% (4) were separated, and another 1% (4) were divorced.

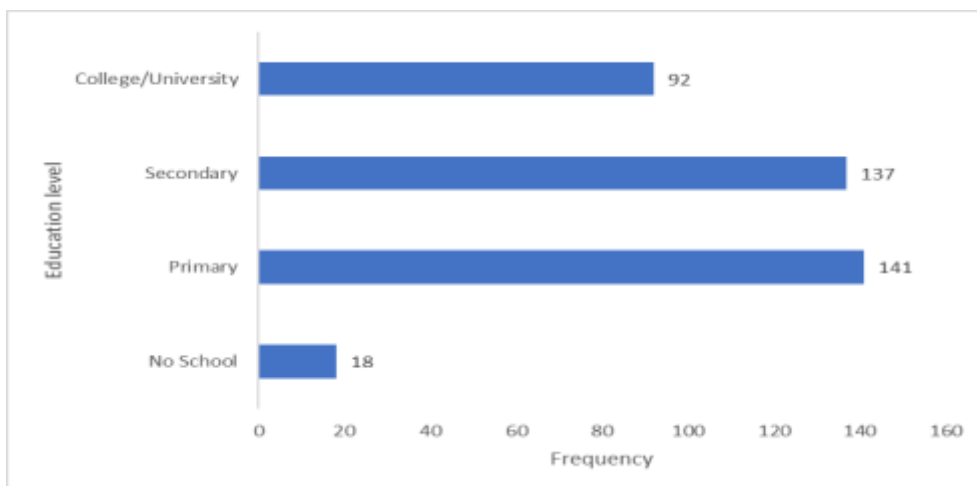


Figure 4.3: Education Level Distribution

According to (Figure 4.3), Most of the study participants had a formal education; primary 141 (36.34%), secondary 137 (35.31) with a considerable number attaining tertiary education 92 (23.7%). However, 18 (4.6%) of the participants had no formal or informal education for that matter.

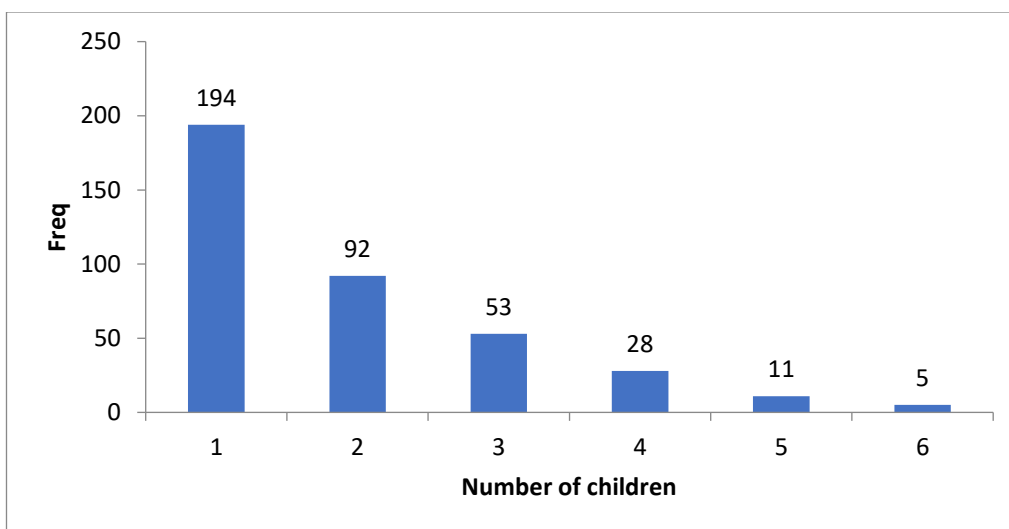


Figure 4.4: Number of Children

As illustrated in (Figure 4.4), the frequency of childbearing declined by the number of children owned by each mother enrolled in the study, majority had only a single child 194 (50.39%) during the study period and only (1.8%) had 5 children.

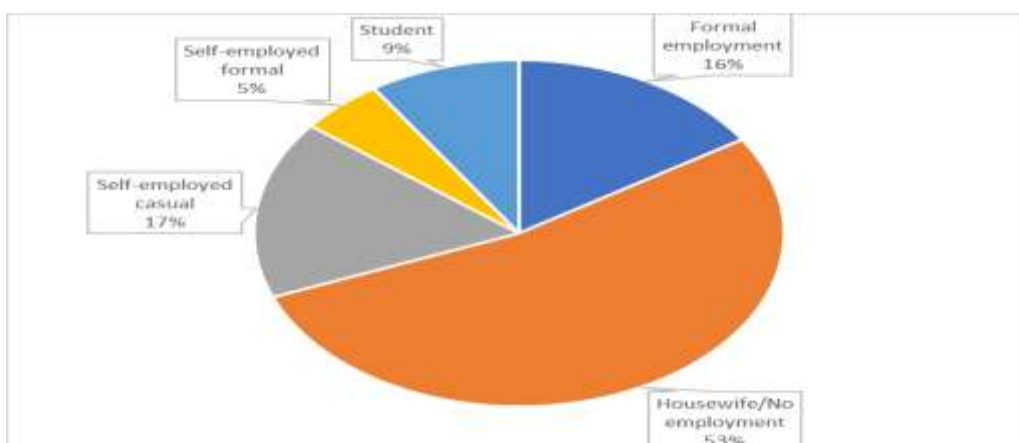


Figure 4.5: Occupation

Over half of all women participants in the study 207 (53%) earned their livelihood as housewives or were not employed, 65 (17%) of those who were employed worked casually, while only 62 (16%) were formally employed. The self-employed and studentship consisted of 20 (5%) and 36 (9%) of the total population respectively as shown in (Figure 4.5).

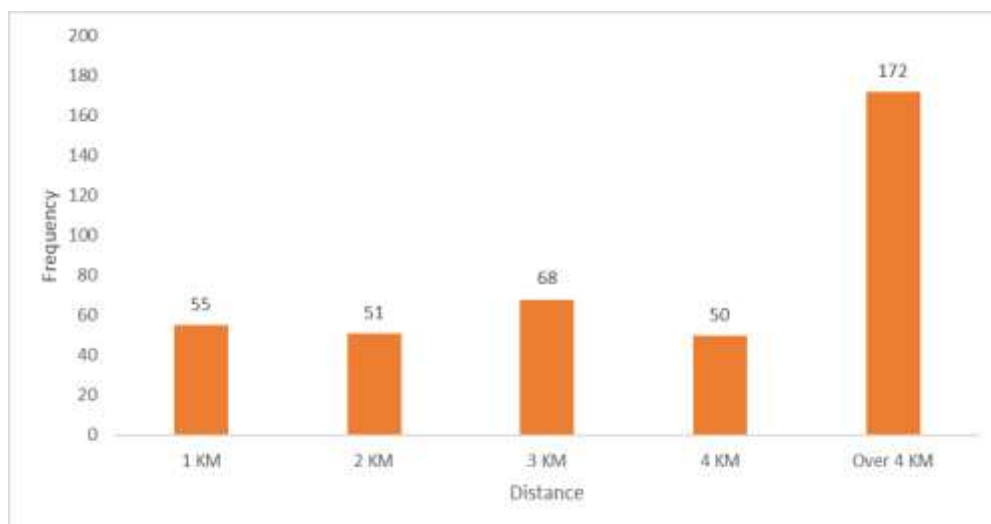


Figure 4.6: Distance to Facility from Place of Residence

Despite being with child/pregnant majority of the study participants had to travel long distance of more than 4km to the hospital to seek medical care 172 (43.43%), 50 (12.63%) had to travel at least 4km while only 55 (13.89%) traveled ≤ 1 km as shown in (Figure 4.6).

4.3 Prevention of Mother-to-Child Transmission Cascade

According to (Figure 4.7), On the ANC cascade, 20 (5%) mothers were missed because they did not attend ANC, 57 (14.3%) were not tested although they attended ANC meaning that almost a fifth of them, 77 (19.3%) did not access HIV testing services. On this cascade, out of 23 mothers who were found to be HIV positive, only 7 (30.4%) were put on treatment.

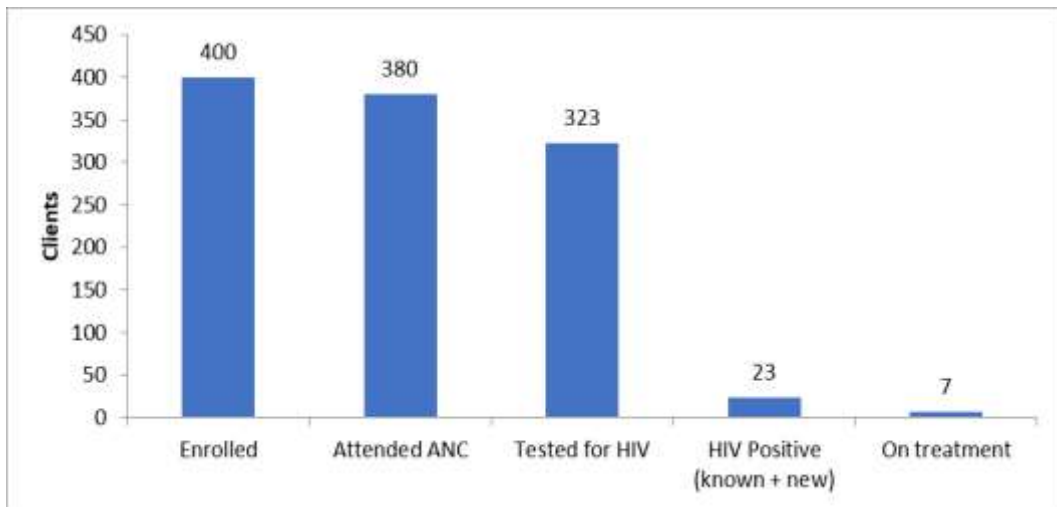


Figure 4.7: ANC Cascade

Out of 350 women who delivered in hospital, only 61 (17.4%) reported knowing their status, out of whom, 6 (9.8%) were HIV positive and were all on treatment as shown in (Figure 4.8).

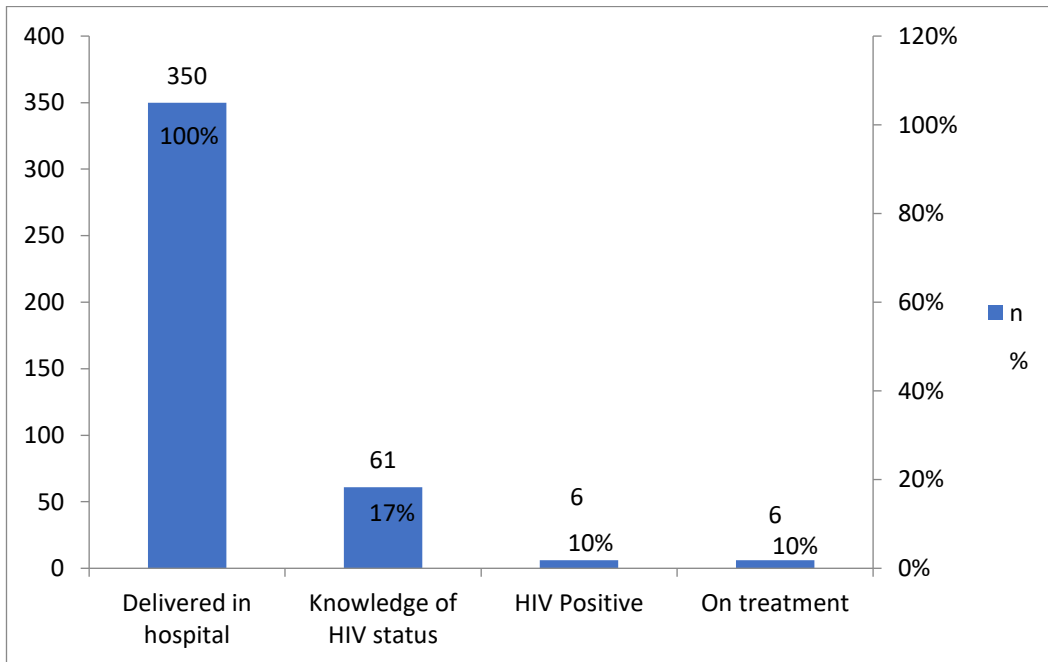


Figure 4.8: Maternity Cascade

On the post-natal cascade, out of the 400 mothers enrolled, 96 (24%) did not know their HIV status. Of those tested, 25 (8.2%) were HIV positive with all except two

being on treatment and only thirty-two (10.5%) had their infants tested for HIV as indicated by (Figure 4.9).

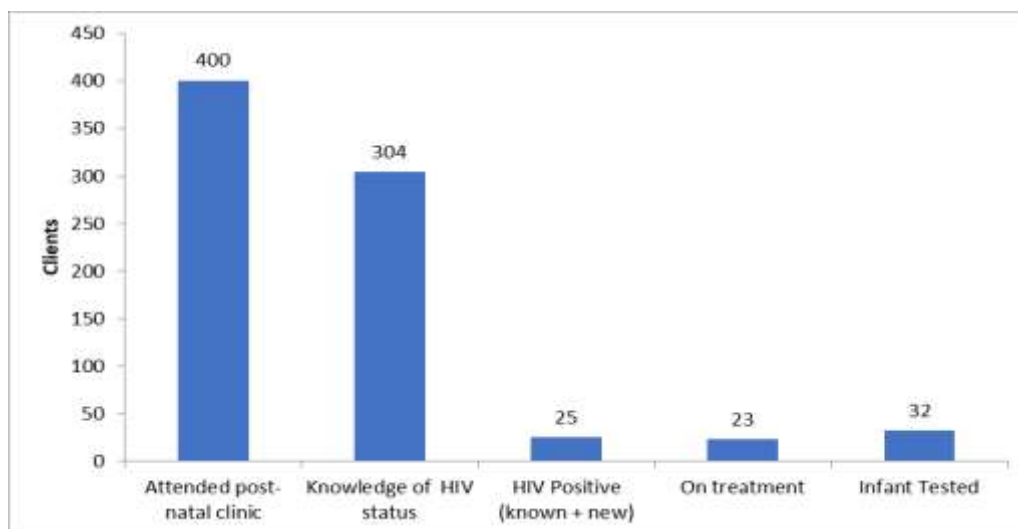


Figure 4.9: Post-Natal Cascade

4.4 Factors Associated with Missed Opportunities for HIV Testing

Table 4.1: Barriers to Attending ANC

Select variables	ANC Yes = 380 n (%)	ANC NO = 20 n (%)	X ²	P-Values
Age				
≥25 years	172(90.5)	18(9.5)	15.2486	<0.0001
<25 years	208(99)	2(1)		
Marital Status				
Living Alone	79(87.8)	11(12.2)	12.7523	<0.0001
Living with a Partner	301(97.1)	9(2.9)		
Level of Education				
No education	15(83.3)	3(16.7)	5.4009	0.020
Educated	365(95.5)	17(4.5)		
Occupation				
Employed	131(89.1)	16(10.9)	16.9418	<0.0001
Unemployed	249(98.4)	4(1.6)		
Distance from health facility				
< 2km	99(93.4)	7(6.6)	8.8946	0.012
3km-4km	118(100)	0(0)		
>5kms	163(92.6)	13(7.4)		
No of children				
More than 2 children	98(99)	1(1)	4.4092	0.036
less than 2 children	282(93.7)	19(6.3)		

Women aged 25 years or older were more likely to attend ANC, with 90.5% in this age group attending compared to only 9.5% who did not ($p < 0.0001$). This highly significant p-value suggests a strong association between older age and ANC attendance. Marital status also plays a significant role, with 97.1% of women living with a partner attending ANC, compared to 87.8% of those living alone ($p < 0.0001$), indicating that being in a partnership is strongly associated with higher ANC attendance.

Education level significantly influences ANC attendance, with 95.5% of educated women attending compared to 83.3% of those with no education ($p = 0.020$). Employment status shows a similar pattern, where 98.4% of unemployed women attended ANC compared to 89.1% of employed women ($p < 0.0001$), suggesting that unemployment may be associated with higher ANC attendance.

Distance from the health facility is also a crucial factor; 93.4% of women living within 2 km attended ANC, while only 6.6% did not ($p = 0.012$). Additionally, all women living 3-4 km away attended ANC, and 92.6% of those living more than 5 km attended ($p = 0.012$). The number of children further impacts ANC attendance, with 99% of women with more than two children attending compared to 93.7% of those with fewer children ($p = 0.036$).

Overall, these findings highlight the factors such as age, marital status, education, employment, proximity to healthcare, and number of children significantly influence ANC attendance, as indicated by the p-values showing strong statistical associations.

Table 4.2: Factors Associated with Missed HIV Testing

Select variables	All (N = 380)*	Unknown HIV status (N=304)	Known HIV status (N=76)	P-Value	Unadjusted	Adjusted
	n (%)	n (%)	n (%)		OR (95% CI)	OR (95% CI)
Age						
≥25 years	213(47)	175(58)	38(50)	0.23	1	
<25 years	167(53)	129(42)	38(50)		1.3 (0.8- 2.2)	
Marital Status						
Living Alone	89(23)	79(26)	10(13)	0.02	1	
Living with Partner ^a	291(77)	225(74)	66(87)		2.31 (1.3-4.7)	3.2 (1.4-7.0)
Level of Education						
No education	17(5)	5(2)	12(16)	<0.001	1	
Educated	363(96)	299(98)	64(84)		0.1 (0.0-0.3)	0.1 (0.0-0.2)
Occupation						
Employed	141(37)	113(37)	28(37)	0.96	1	
Unemployed	239(63)	191(63)	48(63)		1.0 (0.6-1.7)	
Distance from health facility						
Less than 3 KM	167 (44)	145(48)	22(29)	0.003	1	
Above 3 KM	213(56)	159(52)	54(71)		2.2 (1.3-3.8)	2.7 (1.3-5.6)
No of children						
More than 2	94(25)	73(24)	21(28)	0.51	1	
Fewer than 2	286(75)	231(76)	55(72)		0.8 (0.5-1.5)	
ANC Visits						
None	19(5)	12(4.)	7(9.)	0.06	1	
At least one visit	361(95)	292(96)	69(91)		0.4 (0.2-1.1)	

* 20 women who refused to disclose their HIV status are excluded. Age, occupation, number of children and the number of ANC visits did not appear to influence uptake for HIV testing

Women living more than three kilometers away from the health facility were 2.7 times more likely to have an unknown HIV status compared to those who lived within three kilometers (adjusted odds ratio [AOR] 2.7, 95% CI 1.3–5.6). Married women were 3.2 times more likely to have an unknown status compared to those who were single (AOR 3.2, 95% CI 1.4–7.0). Education had a protective effect, with educated women having significantly lower odds of having an unknown status compared to those with no education (AOR 0.1, 95% CI 0.0–0.2).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Discussion and Summary of Findings.

The findings highlight several important gaps in preventing mother-to-child transmission (PMTCT) cascade. Despite the availability of effective PMTCT interventions, the study found that a significant proportion of pregnant women were missed at various cascade stages. The PMTCT cascade starts during pregnancy, when all pregnant women with unknown HIV status should be offered opt-out testing at their first ANC visit, and all women should be offered a repeat HIV test (after 3 months) in the third trimester. Women who refuse HIV testing at their initial antenatal visit should be offered it again at a later appointment (NASCO, 2012). Opt-out testing should be done immediately for women who appear in labor without documented HIV testing. At each postnatal visit, all women with unknown HIV status should get HIV counseling and testing. Screening at the first child immunization is also advised for HIV-negative moms who have not been screened previously during the post-natal period.

On the antenatal care (ANC) cascade, nearly one-fifth of the women did not access HIV testing services, either because they did not attend ANC or were not tested despite attending. This represents a major missed opportunity, as early identification of HIV-positive status is crucial for timely initiation of antiretroviral therapy and prophylaxis to prevent vertical transmission.

Even though PMTCT treatments have been shown to prevent HIV transmission to newborns, the advantages are only realized once the mother has been identified with HIV and is receiving treatment. It was interesting to note that despite the mothers in the population in the study delivering in the hospital setup, only a small number of mothers were aware of their HIV status, signaling a potential disconnect between the delivery services offered and the HIV testing services. Some gaps remain in achieving 90% coverage targets at each step of the PMTCT cascade towards reducing vertical transmission of HIV. This was seen in this study where one in every five of the MCH

mothers with unknown HIV status had missed an opportunity for HIV testing at every step of the PMTCT process, either because they did not attend ANC and maternity or because they were not tested for HIV at either ANC or maternity. A probable reason for this could be due to inconsistent implementation of testing guidelines in PMTCT as noted in another study (Rogers et al., 2016).

The low uptake of HIV testing was associated with several factors. Women living alone, those with no formal education, and those living further than 3 km from the health facility were significantly more likely to have unknown HIV status. This suggests that socioeconomic and geographic barriers continue to hinder access to PMTCT services.

The HIV-positive women who were enrolled in our study, 44% were diagnosed at the time of routine infant vaccination. Disclosure rates have been shown to be low among HIV-infected mothers and has been associated with poor use of PMTCT services (Kinuthia et al., 2018). The large majority of the subjects enrolled were young and married e.g. 60-70% which was consistent within studies taken in other parts of the country e.g. Turkana and Nyanza, as well as other countries within the Sub-Saharan Africa (SSA) region (Ongaki *et al.*, 2019). This therefore showed that the two variables mentioned above did not significantly contribute to the uptake of PMTCT testing services at these clinics. There was however inadequate information on whether the presence of a partner contributed to the promotion of visits to MCH clinics and subsequent HIV testing, since some studies did show that male awareness and eventual visits did contribute positively to the overall improvement in testing (Nkuoh and Meyer, 2016).

The challenges continued in the maternity and postnatal cascades. Only 17% of women delivering in the hospital knew their HIV status, and less than 11% of HIV-exposed infants were tested for HIV in the postpartum period. These findings indicate major gaps in the implementation of universal HIV testing during pregnancy, delivery, and the postnatal period.

A significant factor highlighted by the study was the distance between the place of residence and the health facility. Approximately half of the mothers of the mothers

enrolled in the study lived over 4km away, with over three quarters living 3km. The potential cost of transport incurred would therefore pose a challenge to the availability of the study individuals present, influencing clinic turnout. This was supported by similar studies done in Southern African countries e.g. South Africa, Zimbabwe exploring barriers to proper access to PMTCT services by mothers (McCoy *et al.*, 2015, Skinner *et al.*, 2005).

The level of education also played a significant role in both awareness and willingness to being tested for HIV, with a wide gap being noted between those educated at various levels up to the secondary and tertiary level. This would suggest that an increase in overall exposure to knowledge, including that of HIV, helped with increased awareness of the need for strategies to protect the infant from potential postnatal infection. Findings of a cross-sectional study (Gunn *et al.*, 2016) across 4 nations of each part of Africa also supported this.

The number of children also played a role in the availability to and frequency of visits possible by the mothers enrolled. The increase in the number of children by the mother available seemed to impact negatively on attendance due to the fact that caring for multiple infants/children took a toll on the time and financial power of the women. With many of them being mostly informally employed, the majority of incomes were received on a day-to-day basis. This may have affected the attendance therefore as the women had their hands full dealing with daily commitments. Without attendance therefore it would potentially be difficult to get proper awareness on HIV and the importance of testing. The number of visits was also seen as an important factor in the uptake of the services and eventual testing for HIV testing, as also demonstrated by (Ongaki *et al.*, 2019). It was shown that a visit or more allowed the mother to receive adequate information of what the services were and what was offered, as well as some basic health education on HIV. This new education would then encourage them to return a consequent visit which would therefore enable improved chances of prevention of transmission of infection to the newborn infant. The study also identified barriers to ANC attendance, which is a critical entry point for PMTCT services. Older women, those living alone, the uneducated, and those employed were less likely to

attend ANC. Addressing these barriers through targeted interventions could improve the uptake of ANC and subsequent PMTCT services

5.2 Limitations of the study

This study only accounted for women who showed up for ANC programs at MCH clinics. Therefore, mothers who may have unknown HIV status and did not bring their children to MCH were missed by this study. The nature of the interaction between the health care provider and the patient was also not accounted for, which may have influenced consequent ANC visits by the mother as illustrated by (Ogueji and Omotoso, 2021). Some of the data gathered from moms was self-reported and hence susceptible to recall and social desirability bias. The sample size was small, which may preclude the generalizability of the findings.

5.3 Conclusion

This study has revealed significant missed opportunities for HIV testing and PMTCT service delivery across the maternal-child healthcare continuum. Socioeconomic factors such as education level, marital status, and distance to the health facility emerged as key determinants of unmet needs for PMTCT. Strengthening the implementation of universal HIV testing, improving access to services, and addressing contextual barriers are crucial to ensuring that all HIV-positive pregnant women and their infants receive the full benefits of PMTCT interventions. It is therefore clear that despite reasonable progress made in terms of PMTCT of HIV there is still need for interventions to be put in place that promote greater interactions between the mothers visiting MCH clinics and the health care system. Despite some variables posing no significant challenge to the uptake of the services; the lack of intervention in others may continue to hold back the uptake of these services hindering their full implementation and the consequent impact on the community at large. Interventions that focus on encouraging hospital deliveries that may include community engagement through public health education should be considered. This would help greatly in capturing the population of mothers that have unknown HIV status, and the importance of PMTCT services.

5.4 Recommendations

Based on the study findings, the following recommendations are proposed: Enhance the implementation of universal HIV testing at all ANC, maternity, and postnatal care visits through continuous training and supervision of healthcare providers. There is need to implement community-based strategies to improve access to PMTCT services, such as mobile outreach clinics and community-based distribution of HIV self-testing kits, particularly in hard-to-reach areas. Strengthen the integration of PMTCT services into routine maternal and child health programs to ensure seamless delivery of services and reduce missed opportunities. Develop targeted interventions to address socioeconomic barriers to ANC attendance and PMTCT uptake, such as providing transportation subsidies or childcare support for women. Improve the monitoring and evaluation of the PMTCT cascade to identify and address gaps in service delivery at the facility and community levels. Implementing these recommendations can contribute to the achievement of national and global targets for the elimination of mother-to-child transmission of HIV.

REFERENCES

- Abere, M. N., Omoni, G. M., Odero, T. M., Atai, P. O., Abere, M. N., Omoni, G. M., Odero, T. M., & Atai, P. O. (2018). Status of New HIV Infections among Infants Born of HIV Positive Mothers on Prevention of Mother to Child Transmission at Kisii Teaching and Referral Hospital, Kenya. *Open Journal of Pediatrics*, 8(4), 347–365. <https://doi.org/10.4236/OJPED.2018.84035>
- Achwoka, D., Mandala, J., Muriithi, M., Zeng, Y., Chen, M., Dirks, R., Sirengo, M., Wafula, R., & Torpey, K. (2018). Progress toward elimination of perinatal HIV transmission in Kenya: Analysis of early infant diagnosis data. *International Journal of STD and AIDS*, 29(7), 632–640. <https://doi.org/10.1177/0956462417724015>
- Adedimeji, A., Abboud, N., Merdekios, B., & Shiferaw, M. (2012). A Qualitative Study of Barriers to Effectiveness of Interventions to Prevent Mother-to-Child Transmission of HIV in Arba Minch, Ethiopia. *International Journal of Population Research*, 2012. <https://doi.org/10.1155/2012/532154>
- Akal, C. G., & Afework, D. T. (2018). Status of Prevention of Mother-to-Child Transmission (PMTCT) Services Utilization and Factors Affecting PMTCT Service Uptake by Pregnant Women Attending Antenatal Care Clinic in Selected Health Facilities of Afar Regional State, Ethiopia. *Journal of Environmental and Public Health*, 2018. <https://doi.org/10.1155/2018/5127090>
- Bhatta, M., Dutta, N., Nandi, S., Dutta, S., & Saha, M. K. (2020). Mother-to-child HIV transmission and its correlates in India: Systematic review and meta-analysis. *BMC Pregnancy and Childbirth*, 20(1), 1–15. <https://doi.org/10.1186/S12884-020-03193-3>/FIGURES/10
- Bhatti, A. B., Usman, M., & Kandi, V. (2016). Current Scenario of HIV/AIDS, Treatment Options, and Major Challenges with Compliance to Antiretroviral Therapy. *Cureus*, 8(3). <https://doi.org/10.7759/cureus.515>

- Burmen, B., Owuor, N., & Mitei, P. (2017). An assessment of staffing needs at a HIV clinic in a Western Kenya using the WHO workload indicators of staffing need WISN, 2011. *Human Resources for Health, 15*(1). <https://doi.org/10.1186/S12960-017-0186-3>
- Buzdugan, R., McCoy, S. I., Webb, K., Mushavi, A., Mahomva, A., Padian, N. S., & Cowan, F. M. (2015). Facility-based delivery in the context of Zimbabwe's HIV epidemic - missed opportunities for improving engagement with care: A community-based serosurvey. *BMC Pregnancy and Childbirth, 15*(1), 1–8. <https://doi.org/10.1186/S12884-015-0782-Y/FIGURES/1>
- Caulfield, T., Onyo, P., Byrne, A., Nduba, J., Nyagero, J., Morgan, A., & Kermodé, M. (2016). Factors influencing place of delivery for pastoralist women in Kenya: A qualitative study. *BMC Women's Health, 16*(1), 1–11. <https://doi.org/10.1186/S12905-016-0333-3/TABLES/1>
- Chetty, T., Vandormael, A., Thorne, C., & Coutsoúdis, A. (2017). Incident HIV during pregnancy and early postpartum period: a population-based cohort study in a rural area in KwaZulu-Natal, South Africa. *BMC Pregnancy and Childbirth, 17*(1). <https://doi.org/10.1186/S12884-017-1421-6>
- Davey, D. J., Farley, E., Towriss, C., Gomba, Y., Bekker, L. G., Gorbach, P., Shoptaw, S., Coates, T., & Myer, L. (2018). Risk perception and sex behaviour in pregnancy and breastfeeding in high HIV prevalence settings: Programmatic implications for PrEP delivery. *PLOS ONE, 13*(5), e0197143. <https://doi.org/10.1371/JOURNAL.PONE.0197143>
- Drake, A. L., Wagner, A., Richardson, B., & John-Stewart, G. (2014). Incident HIV during pregnancy and postpartum and risk of mother-to-child HIV transmission: a systematic review and meta-analysis. *PLoS Medicine, 11*(2). <https://doi.org/10.1371/JOURNAL.PMED.1001608>
- Finocchiaro-Kessler, S., Gautney, B., Cheng, A. L., Wexler, C., Maloba, M., Nazir, N., Khamadi, S., Lwembe, R., Brown, M., Odeny, T. A., Dariotis, J. K., Sandbulte, M., Mabachi, N., & Goggin, K. (2018). Evaluation of the HIV Infant Tracking System

(HITSsystem) to optimise quality and efficiency of early infant diagnosis: a cluster-randomised trial in Kenya. *The Lancet. HIV*, 5(12), e696–e705. [https://doi.org/10.1016/S2352-3018\(18\)30245-5](https://doi.org/10.1016/S2352-3018(18)30245-5)

Gebre, M. N., Feyasa, M. B., & Dadi, T. K. (2021). Levels of mother-to-child HIV transmission knowledge and associated factors among reproductive-age women in Ethiopia: Analysis of 2016 Ethiopian Demographic and Health Survey Data. *PLOS ONE*, 16(8), e0256419. <https://doi.org/10.1371/JOURNAL.PONE.0256419>

Gourlay, A., Wringe, A., Todd, J., Cawley, C., Michael, D., Machemba, R., Reniers, G., Urassa, M., & Zaba, B. (2015). Factors associated with uptake of services to prevent mother-to-child transmission of HIV in a community cohort in rural Tanzania. *Sexually Transmitted Infections*, 91(7), 520–527. <https://doi.org/10.1136/SEXTRANS-2014-051907>

Graybill, L. A., Kasaro, M., Freeborn, K., Walker, J. S., Poole, C., Powers, K. A., Mollan, K. R., Rosenberg, N. E., Vermund, S. H., Mutale, W., & Chi, B. H. (2020). Incident HIV among pregnant and breast-feeding women in sub-Saharan Africa: a systematic review and meta-analysis. *AIDS (London, England)*, 34(5), 761–776. <https://doi.org/10.1097/QAD.0000000000002487>

Janet Fleischman Katherine Peck, A. (2015). *Addressing HIV Risk in Adolescent Girls and Young Women*. www.csis.org

Kassanjee, R., Johnson, L. F., Zaniewski, E., Ballif, M., Christ, B., Yiannoutsos, C. T., Nyakato, P., Desmonde, S., Edmonds, A., Sudjaritruk, T., Pinto, J., Vreeman, R., Dahourou, D. L., Twizere, C., Kariminia, A., Carlucci, J. G., Kasozi, C., & Davies, M. A. (2021). Global HIV mortality trends among children on antiretroviral treatment corrected for under-reported deaths: an updated analysis of the International epidemiology Databases to Evaluate AIDS collaboration. *Journal of the International AIDS Society*, 24(S5), e25780. <https://doi.org/10.1002/JIA2.25780>

- Kharsany, A. B. M., & Karim, Q. A. (2016). HIV Infection and AIDS in Sub-Saharan Africa: Current Status, Challenges and Opportunities. *The Open AIDS Journal*, *10*(1), 34–48. <https://doi.org/10.2174/1874613601610010034>
- Kinuthia, J., Singa, B., McGrath, C. J., Odeny, B., Langat, A., Katana, A., Ng'Ang'A, L., Pintye, J., & John-Stewart, G. (2018). Prevalence and correlates of non-disclosure of maternal HIV status to male partners: A national survey in Kenya. *BMC Public Health*, *18*(1), 1–10. <https://doi.org/10.1186/S12889-018-5567-6/TABLES/3>
- Langat, A., Callahan, T. L., Yonga, I., Ochanda, B., Waruru, A., Ng'anga, L. W., Katana, A., Onyango, B., Singa, B., Oyule, S., Githuka, G., Omoto, L., Muli, J., Tylleskar, T., & Modi, S. (2021). Associations of Sociodemographic and Clinical Factors with Late Presentation for Early Infant HIV Diagnosis (EID) Services in Kenya. *International Journal of Maternal and Child Health and AIDS*, *10*(2), 210. <https://doi.org/10.21106/IJMA.537>
- Marston, M., Newell, M. L., Crampin, A., Lutalo, T., Musoke, R., Gregson, S., Nyamukapa, C., Nakiyingi-Miuro, J., Urassa, M., Isingo, R., & Zaba, B. (2023). Is the risk of HIV acquisition increased during and immediately after pregnancy? A secondary analysis of pooled HIV community-based studies from the ALPHA network. *PloS One*, *8*(12). <https://doi.org/10.1371/JOURNAL.PONE.0082219>
- Mohan, D., LeFevre, A. E., George, A., Mpembeni, R., Bazant, E., Rusibamayila, N., Killewo, J., Winch, P. J., & Baqui, A. H. (2017). Analysis of dropout across the continuum of maternal health care in Tanzania: findings from a cross-sectional household survey. *Health Policy and Planning*, *32*(6), 791–799. <https://doi.org/10.1093/HEAPOL/CZX005>
- Mugo, N. R., Heffron, R., Donnell, D., Wald, A., Were, E. O., Rees, H., Celum, C., Kiarie, J. N., Cohen, C. R., Kayintekore, K., & Baeten, J. M. (2011). Increased risk of HIV-1 transmission in pregnancy: a prospective study among African HIV-1-serodiscordant couples. *AIDS (London, England)*, *25*(15), 1887–1895. <https://doi.org/10.1097/QAD.0B013E32834A9338>

- Mulenga, C., & Naidoo, J. R. (2017). Nurses' knowledge, attitudes and practices regarding evidence-based practice in the prevention of mother-to-child transmission of HIV programme in Malawi. *Curationis*, 40(1). <https://doi.org/10.4102/CURATIONIS.V40I1.1656>
- Musarandega, R., Machekano, R., Chideme, M., Muchuchuti, C., Mushavi, A., Mahomva, A., & Guay, L. (2017a). *PMTCT Service Uptake Among Adolescents and Adult Women Attending Antenatal Care in Selected Health Facilities in Zimbabwe*. www.jaids.com
- Musarandega, R., Machekano, R., Chideme, M., Muchuchuti, C., Mushavi, A., Mahomva, A., & Guay, L. (2017b). PMTCT Service Uptake Among Adolescents and Adult Women Attending Antenatal Care in Selected Health Facilities in Zimbabwe. *Journal of Acquired Immune Deficiency Syndromes (1999)*, 75(2), 148. <https://doi.org/10.1097/QAI.0000000000001327>
- Mustapha, M., Musiime, V., Bakeera-Kitaka, S., Rujumba, J., & Nabukeera-Barungi, N. (2018). Utilization of “prevention of mother-to-child transmission” of HIV services by adolescent and young mothers in Mulago Hospital, Uganda. *BMC Infectious Diseases*, 18(1). <https://doi.org/10.1186/S12879-018-3480-3>
- Mutabazi, J. C., Zarowsky, C., & Trottier, H. (2017a). The impact of programs for prevention of mother-to-child transmission of HIV on health care services and systems in sub-Saharan Africa - A review. *Public Health Reviews*, 38(1), 1–27. <https://doi.org/10.1186/S40985-017-0072-5/TABLES/2>
- Mutabazi, J. C., Zarowsky, C., & Trottier, H. (2017b). The impact of programs for prevention of mother-to-child transmission of HIV on health care services and systems in sub-Saharan Africa - A review. *Public Health Reviews*, 38(1), 1–27. <https://doi.org/10.1186/S40985-017-0072-5/TABLES/2>
- Mwau, M., Bwana, P., Kithinji, L., Ogollah, F., Ochieng, S., Akinyi, C., Adhiambo, M., Ogumbo, F., Sirengo, M., & Boeke, C. (2017). Mother-to-child transmission of HIV in Kenya: A cross-sectional analysis of the national database over nine years. *PLOS ONE*, 12(8), e0183860. <https://doi.org/10.1371/JOURNAL.PONE.0183860>

- NACC. (2014). *HIV AIDS county profile*. <https://nacc.or.ke/wp-content/uploads/2015/10/KenyaCountyProfiles.pdf>
- NASCOP. (2012). *Guidelines for Prevention of Mother to Child Transmission (PMTCT) of HIV/AIDS in Kenya*. www.nascop.or.ke
- Ndege, S., Washington, S., Kaaria, A., Prudhomme-O'Meara, W., Were, E., Nyambura, M., Keter, A. K., Wachira, J., & Braitstein, P. (2016). HIV Prevalence and Antenatal Care Attendance among Pregnant Women in a Large Home-Based HIV Counseling and Testing Program in Western Kenya. *PLOS ONE*, *11*(1), e0144618. <https://doi.org/10.1371/JOURNAL.PONE.0144618>
- Nyongesa, C., Xu, X., Hall, J. J., Macharia, W. M., Yego, F., & Hall, B. (2018). Factors influencing choice of skilled birth attendance at ANC: Evidence from the Kenya demographic health survey. *BMC Pregnancy and Childbirth*, *18*(1), 1–6. <https://doi.org/10.1186/S12884-018-1727-Z/TABLES/2>
- Pricilla, R. A., Brown, M., Wexler, C., Maloba, M., Gautney, B. J., & Finocchiaro-Kessler, S. (2018). Progress Toward Eliminating Mother to Child Transmission of HIV in Kenya: Review of Treatment Guidelines Uptake and Pediatric Transmission Between 2013 and 2016—A Follow Up. *Maternal and Child Health Journal*, *22*(12), 1685. <https://doi.org/10.1007/S10995-018-2612-0>
- Puchalski Ritchie, L. M., van Lettow, M., Pham, B., Straus, S. E., Hosseinipour, M. C., Rosenberg, N. E., Phiri, S., Landes, M., & Cataldo, F. (2019). What interventions are effective in improving uptake and retention of HIV-positive pregnant and breastfeeding women and their infants in prevention of mother to child transmission care programmes in low-income and middle-income countries? A systematic review and meta-analysis. *BMJ Open*, *9*(7), 24907. <https://doi.org/10.1136/BMJOPEN-2018-024907>
- Ramraj, T., Jackson, D., Dinh, T. H., Olorunju, S., Lombard, C., Sherman, G., Puren, A., Ramokolo, V., Noveve, N., Singh, Y., Magasana, V., Bhardwaj, S., Cheyip, M., Mogashoa, M., Pillay, Y., & Goga, A. E. (2018). Adolescent Access to Care and Risk

of Early Mother-to-Child HIV Transmission. *The Journal of Adolescent Health : Official Publication of the Society for Adolescent Medicine*, 62(4), 434–443. <https://doi.org/10.1016/J.JADOHEALTH.2017.10.007>

Rawizza, H. E., Chang, C. A., Chaplin, B., Ahmed, I. A., Meloni, S. T., Oyebode, T., Banigbe, B., Sagay, A. S., Adewole, I. F., Okonkwo, P., Kanki, P. J., & Team, the A. P. (2015). Loss to Follow-up within the Prevention of Mother-to-Child Transmission Care Cascade in a Large ART Program in Nigeria. *Current HIV Research*, 13(3), 201. <https://doi.org/10.2174/1570162X1303150506183256>

Remera, E., Mugwaneza, P., Chammartin, F., Mulindabigwi, A., Musengimana, G., Forrest, J. I., Mwanyumba, F., Kondwani, N., Condo, J. U., Riedel, D. J., Mills, E. J., Nsanzimana, S., & Bucher, H. C. (2021). Towards elimination of mother-to-child transmission of HIV in Rwanda: a nested case-control study of risk factors for transmission. *BMC Pregnancy and Childbirth*, 21(1), 1–8. <https://doi.org/10.1186/S12884-021-03806-5/TABLES/2>

Rogers, A. J., Weke, E., Kwena, Z., Bukusi, E. A., Oyaro, P., Cohen, C. R., & Turan, J. M. (2016). Implementation of repeat HIV testing during pregnancy in Kenya: A qualitative study. *BMC Pregnancy and Childbirth*, 16(1), 1–11. <https://doi.org/10.1186/S12884-016-0936-6/FIGURES/1>

Ronen, K., McGrath, C. J., Langat, A. C., Kinuthia, J., Omolo, D., Singa, B., Katana, A. K., Ng'Ang'A, L. W., & John-Stewart, G. (2017). Gaps in Adolescent Engagement in Antenatal Care and Prevention of Mother-to-Child HIV Transmission Services in Kenya. *Journal of Acquired Immune Deficiency Syndromes (1999)*, 74(1), 30. <https://doi.org/10.1097/QAI.0000000000001176>

Samreth, S., Keo, V., Tep, R., Ke, A., Ouk, V., Ngauv, B., Mam, S., Ferradini, L., Ly, P. S., Mean, C. v., & Delvaux, T. (2019). Access to prevention of mother-to-child transmission of HIV along HIV services cascade through integrated active case management in 15 operational districts in Cambodia. *Journal of the International AIDS Society*, 22(10). <https://doi.org/10.1002/JIA2.25388>

- Sheahan, A., Feinstein, L., Dube, Q., Edmonds, A., Chirambo, C. M., Smith, E., Behets, F., Heyderman, R., & van Rie, A. (2017). Early Antiretroviral Therapy Initiation and Mortality Among Infants Diagnosed with HIV in the First 12 Weeks of Life: Experiences from Kinshasa, DR Congo and Blantyre, Malawi. *The Pediatric Infectious Disease Journal*, 36(7), 654. <https://doi.org/10.1097/INF.0000000000001539>
- Sirengo, M., Muthoni, L., Kellogg, T. A., Kim, A., Katana, A., Mwanyumba, S., Kimanga, D. O., Maina, W. K., Muraguri, N., Elly, B., & Rutherford, G. W. (2014). Mother-to-Child Transmission of HIV in Kenya: Results from a Nationally Representative Study. *Journal of Acquired Immune Deficiency Syndromes (1999)*, 66(Suppl 1), S66. <https://doi.org/10.1097/QAI.0000000000000115>
- Stover, J., Brown, T., & Marston, M. (2012). Updates to the Spectrum/Estimation and Projection Package (EPP) model to estimate HIV trends for adults and children. *Sexually Transmitted Infections*, 88 Suppl 2(Suppl_2). <https://doi.org/10.1136/SEXTRANS-2012-050640>
- Teshale, A. B., Tessema, Z. T., Alem, A. Z., Yeshaw, Y., Liyew, A. M., Alamneh, T. S., Tesema, G. A., & Worku, M. G. (2021). Knowledge about mother to child transmission of HIV/AIDS, its prevention and associated factors among reproductive-age women in sub-Saharan Africa: Evidence from 33 countries recent Demographic and Health Surveys. *PLOS ONE*, 16(6), e0253164. <https://doi.org/10.1371/JOURNAL.PONE.0253164>
- Thomson, K. A., Hughes, J., Baeten, J. M., John-Stewart, G., Celum, C., Cohen, C. R., Ngunjiri, K., Kiarie, J., Mugo, N., & Heffron, R. (2018). Increased Risk of HIV Acquisition Among Women Throughout Pregnancy and During the Postpartum Period: A Prospective Per-Coital-Act Analysis Among Women With HIV-Infected Partners. *The Journal of Infectious Diseases*, 218(1), 16–25. <https://doi.org/10.1093/INFDIS/JIY113>

- Ubesie, A. C. (2012). Pediatric HIV/AIDS in sub-Saharan Africa: emerging issues and way forward. *African Health Sciences*, 12(3), 297–304. <https://doi.org/10.4314/AHS.V12I3.8>
- UNAIDS. (2014). *Fast-Track - Ending the AIDS epidemic by 2030 | UNAIDS*. https://www.unaids.org/en/resources/documents/2014/JC2686_WAD2014report
- UNAIDS. (2016). *Children and HIV*. Retrieved from https://www.unaids.org/sites/default/files/media_asset/FactSheet_Children_en.pdf
- UNAIDS. (2019a). *Kenya | UNAIDS*. Retrieved from <https://www.unaids.org/en/regionscountries/countries/kenya>
- UNAIDS. (2019b). *Un aids Data 2019*. Retrieved from https://www.unaids.org/sites/default/files/media_asset/2019-UNAIDS-data_en.pdf
- UNAIDS. (2021). *Global and Regional Data*. Retrieved from https://www.unaids.org/sites/default/files/media_asset/JC3032_AIDS_Data_book_2021_En.pdf
- UNICEF. (2022). *Paediatric care and treatment*. Retrieved from <https://data.unicef.org/topic/hivaids/paediatric-treatment-and-care/>
- Vrazo, A. C., Sullivan, D., & Phelps, B. R. (2018). Eliminating Mother-to-Child Transmission of HIV by 2030: 5 Strategies to Ensure Continued Progress. *Global Health: Science and Practice*, 6(2), 249–256. <https://doi.org/10.9745/GHSP-D-17-00097>
- Warren, C. E., Abuya, T., & Askew, I. (2013). Family planning practices and pregnancy intentions among HIV-positive and HIV-negative postpartum women in Swaziland: A cross sectional survey. *BMC Pregnancy and Childbirth*, 13(1), 1–10. <https://doi.org/10.1186/1471-2393-13-150/TABLES/4>
- Wexler, C., Cheng, A. L., Gautney, B., Finocchario-Kessler, S., Goggin, K., Khamadi, S., Bawcom, C., Ochieng, M., Koech, S., Odera, I., Odeke, J., Ndung’E, N., & Mwinamo,

- P. (2017). Evaluating turnaround times for early infant diagnosis samples in Kenya from 2011-2014: A retrospective analysis of HITSystem program data. *PLOS ONE*, *12*(8), e0181005. <https://doi.org/10.1371/JOURNAL.PONE.0181005>
- Yah, C. S., & Tambo, E. (2019). Why is mother to child transmission (MTCT) of HIV a continual threat to new-borns in sub-Saharan Africa (SSA). *Journal of Infection and Public Health*, *12*(2), 213–223. <https://doi.org/10.1016/J.JIPH.2018.10.008>
- Yaya, S., Ghose, B., Udenigwe, O., Shah, V., Hudani, A., &Ekholuenetale, M. (2019). Knowledge and attitude of HIV/AIDS among women in Nigeria: a cross-sectional study. *European Journal of Public Health*, *29*(1), 111–117. <https://doi.org/10.1093/EURPUB/CKY131>
- Yussif, A. S., Lassey, A., Ganyaglo, G. Y. K., Kantelhardt, E. J., &Kielstein, H. (2017). The long-term effects of adolescent pregnancies in a community in Northern Ghana on subsequent pregnancies and births of the young mothers. *Reproductive Health*, *14*(1), 1–7. <https://doi.org/10.1186/S12978-017-0443-X/FIGURES/2>

APPENDICES

Appendix I: Work Plan

Task	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Proposal Writing	Active	Active	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed
Review & Approval	Completed	Active	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed
Data & Sample Collection	Completed	Completed	Active	Active	Active	Completed	Completed	Completed	Completed	Completed	Completed	Completed
Laboratory Tests	Completed	Completed	Completed	Completed	Active	Active	Active	Active	Completed	Completed	Completed	Completed
Data Analysis	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Active	Active	Active	Active	Completed
Report Writing	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Active	Active	Active	Completed
Dissemination	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Completed	Active	Active	Active

Appendix II: Budget

Item	Unit Cost	No. of Units	Total (Ksh)
Printing and Binding	200	50	50000
Test Kits and reagents	400*2		100000
Travel	2000	30	60000
Lunch allowance for research assistant	1000	30	30000
Allowances for HTC counselor	1000	30	30000
Airtime/ Internet bundles	1000	30	20000
Dissemination	40000	1	40000
Publication	30000	1	30000
TOTAL			360,000

Appendix III: Questionnaire

ASSESSING MISSED OPPORTUNITIES FOR PMTCT AMONG POST-NATAL MOTHERS IN MACHAKOS

Name of Facility:	
Date of Assessment (DD-MM-YYYY):	
Assessor's Name:	

Number	Question	Response/Code
SECTION A. PARENT DEMOGRAPHICS		
QA1	Age	
QA2	Marital Status	Single 01 Widowed 02 Separated 03 Divorced 04 Married and living together 05 Married but living alone
QA3	Highest level of education completed?	No School 01 Primary 02 secondary 03 College/University 04
QA4	Location of residence	
	How many children do you have	
QA5	Occupation	Formal employment 01 Self-employed formal 02 Self-employed casual 03 Housewife/No employment 04 Student 05
QA6	Estimated distance to the facility	
QA7	Estimated average income in a day (KSHS)	
SECTION B. CHILDREN AND ANC VISIT INFORMATION		
QB1	Date of birth of the child you are	Date Month Year <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>

	bringing for vaccination today		
QB2	Did you attend ANC during your pregnancy?	Yes No	01 02
IF ANSWER TO QB 8 IS YES, CONTINUE TO NEXT QUESTIONS. IF NO, CONTINUE TO SECTION C.			
QB3	At what gestation period did you start attending ANC?	First Trimester Second Trimester Third Trimester Maternity	01 02 03 04
QB4	How many times did you attend ANC?	One time 2-3 times 4-6 times More than 6 times	01 02 03 04
QB5	Was an HIV test offered to you during ANC?	Yes No	01 02
QB6	If a test was offered, did you accept or decline?	Accept Decline	01 02
IF TEST WAS DECLINED:			
	a If declined, what was the reason?	Already knew my status I did not want to know my status Test costs too much Other reason (specify):[]	01 02 03 04
	b If you already knew your	HIV Positive HIV Negative	01 02
	c If HIV positive, were you on medication?	Yes No	01 02
	d If you were on medication for HIV, did you disclose this to any of the ANC staff?	Yes No	01 02
IF TEST WAS ACCEPTED:			
	e If accepted, were you given results?	Yes No	01 02

QC1	Why did you not attend ANC?	Did not know about it The clinic is too far away Did not have time/too busy I know all I need to give birth My culture/religion doesn't allow I received care at home I did not want an HIV test I didn't trust the clinic staff Other (describe): []	01 02 03 04 05 06 07 08 09
QC2	Where did you deliver the child you are bringing for vaccination today?	Home Hospital Other location (specify): []	01 02 03
QC3	If in hospital were you tested for HIV?	Yes NO	
QC4	At discharge were you given an appointment to CWC/MCH	Yes No	01 02
QC5	a If you did not deliver your child in the hospital, what was the reason?	The clinic is too far away Can't afford hospital costs I don't trust hospital staff Visited a traditional midwife Other reason (specify):[]	01 02 03 04 05
	b If you did not deliver in a hospital, did you take your child to hospital after delivery	Yes No	01 02
	If yes, how long after delivery	Immediately Within a week ➤ week	01 02 03
QC6	Has this child ever been tested for HIV?	Yes No	01 02
QC7	a If yes, at what age? (age in weeks)		

	b	If yes, what is the status of the child?	HIV Positive HIV Negative Don't know Don't want to share	01 02 03 04
QC8		If you delivered in a hospital, were you tested for HIV at maternity?	Yes No	01 02
	a	If yes, what was the result of this HIV test?	HIV Positive HIV Negative Not comfortable sharing	01 02 03
SECTION D. QUESTIONS ON THIS CHILD				
QD1		Did you plan to have this child?	Yes NO	01 02
QD2		If No, were you on a family planning method?	Yes No	01 02
QD3		If yes which method?	Condoms Oral contraception/pills Injectables Implants IUCD Female sterilization Male sterilization LAM Traditional method Other[]	01 02 03 04 05 06 07 08 09 10
QD4	a	Do you desire to have more children in the next 3 years?	Yes No Not decided	01 02 03
QD5		If No, what are you and your husband doing to ensure that you don't get pregnant/?		
SECTION D. QUESTIONS ON THIS VISIT				
QE1		What was the reason for your hospital visit today?	Routine immunization Child is sick Mother is sick Others	01 02 03

QE2	What services were offered to you today? (tick more than one if needed)	HIV testing and counseling for the mother EID IFP Counseling Family Planning	01 02 03 04 05
QE3	If yes for HTC, did you accept the test?	Yes No	01 02
QE4	a If yes, what is your HIV status?	HIV Negative HIV Positive Not comfortable sharing	01 02 03
	b If yes to family planning, have	Yes No	01 02
	c What method are you using?	Condoms Oral contraception/pills Injectables Implants IUCD Female sterilization Male sterilization LAM Traditional method Other[]	01 02 03 04 05 06 07 08 09 10
	d If No, why?	Infrequent/no sex breastfeeding Want more children Opposed to contraception use Partner is opposed Religious prohibition Not aware of any method Not aware of any source Dissatisfied with available options Health concerns/fear of side effects Access (distance, stock outs) Financial costs Other []	01 02 03 04 05 06 07 08 09 10 11 12 13
QE5	Has you heard information on infant feeding practices ?	Yes No	01 02
QE6	If yes, from whom?	Health care worker Media Friends/Family	01 02 03

QE7	What are your feeding practices for this child?	Exclusive breast feeding Exclusive formula feeding Mixed feeding	01 02 03
QE8	If mixed feeding, why?	No time Not enough breast milk Working Others[]	01 02 03 04
SECTION E:PARTNER TESTING			
QF1	If married, was an HIV test offered to	Yes No	01 02
QF2	If a test was offered to your partner, did	Accept Decline	01 02
	a If your partner declined, what was the reason?	Already knew status Scared of being tested Not ready to be tested Other (describe): []	01 02 03 04
	b If the test was accepted, what were the results?	HIV Negative HIV Positive Doesn't know Not comfortable sharing	01 02 03 04
SECTION F. KNOWLEDGE ASSESSMENT			
QG1	If a man/woman has HIV, does his/her partner always have HIV?	Yes No Don't Know	01 02 03
QG2	Is it possible for a healthy-looking person to have HIV?	Yes No Don't Know	01 02 03
QG3	If a mother is HIV positive, can she transmit HIV to her baby:		
	a During pregnancy?	Yes No Don't Know	01 02 03
	b During delivery?	Yes No Don't Know	01 02 03
	c During breastfeeding?	Yes No Don't Know	01 02 03

QG4	Have you heard of antiretroviral drugs or ARVs that people with HIV can take	Yes No Don't Know	01 02 03
QG5	Age of the second last born? (state in years)		
QG6	Where did you deliver your second to last born child	Home Hospital Other location(specify): [.....]	01 02 03
SECTION G:HIV TESTING(for those not tested during this visit)			
QH1	Thanks for your time, may I now go ahead and test you?	Yes No	01 02
QH2	Test results	HIV positive HIV Negative	01 02

Appendix IV: Consent Explanation (Parents of the Infants)

Hello, my name is Dr. Lilly Nyagah. I am a student in Jomo Kenyatta University of Agriculture and Technology pursuing a Masters Course in Applied Epidemiology. I am carrying out a study to identify missed opportunities for PMTCT among the mothers attending post-natal clinics.

The purpose of the study

The aim of this study is to identify any missed opportunity for PMTCT in Machakos. You have been selected to participate because you are a mother bringing their infant for the first pentavalent vaccination in this hospital. I will ask you some question about this child, your pregnancy history, delivery and breastfeeding. I shall eventually offer an HIV test which is offered on voluntary basis.

Voluntary participation

Your decision to participate in this study is entirely voluntary and you are free to choose not to consent or opt out at any stage of the study. The entire interview is expected to take about 30 minutes of your time.

Risks/benefits

You stand no risks by participating in this study. You will gain by getting to know your HIV status which has potential to minimize risk of transmission to your infant and also you shall be linked to care. You shall not pay or be for participating in this study.

Confidentiality

The information collected will only be used for the purposes I have informed you about and will be confidential. Your questionnaire will be assigned a unique number instead of your name to ensure the information you provide cannot be traced back to you.

If you have any questions or clarifications about this study, please contact the Kenyatta National Hospital Ethics Review Committee secretary on P.O Box 20723, Nairobi or +254(0)20-726300-9 or +254(0)20-725272.

Appendix V: Consent Form

I..... have been requested to participate in a study “assessing missed opportunity for PMTCT among post-natal mothers in Machakos”. I have been given adequate information and time to ask any questions that I have on this study. I have fully understood the consent that I am giving and by my signature below I voluntarily agree to participate in this study.

Signed.....

Date.....

Witnessed by.....

Date.....

Appendix VI: Study Approvals



UNIVERSITY OF NAIROBI
COLLEGE OF HEALTH SCIENCES
P O BOX 19676 Code 00202
Telegrams: varsity
(254-020) 2726300 Ext 44355

Ref: KNH-ERC/A/116

Link: www.uonbi.ac.ke/activities/KNHUoN



KNH/UoN-ERC
Email: uonnh_erc@uonbi.ac.ke
Website: www.uonbi.ac.ke



KENYATTA NATIONAL HOSPITAL
P O BOX 20723 Code 00202
Tel: 726200-9
Fax: 725272
Telegrams: MEDSUP, Nairobi

2nd May 2014

Nyaga Lilly M
TM-312-0864-2012
JKUAT

Dear Lilly

RESEARCH PROPOSAL: PATTERN OF UNMET NEEDS FOR PREVENTION OF MOTHER TO CHILD TRANSMISSION OF HIV(PMTCT) AMONG MOTHERS ATTENDING MOTHER CHILD HEALTH(MCH) CLINIC IN A MACHAKOS HOSPITAL (P617/012/2013)

This is to inform you that the KNH/UoN-Ethics & Research Committee (KNH/UoN-ERC) has reviewed and approved your above proposal. The approval periods are 2nd May 2014 to 1st May 2015.

This approval is subject to compliance with the following requirements:

- a) Only approved documents (informed consents, study instruments, advertising materials etc) will be used.
- b) All changes (amendments, deviations, violations etc) are submitted for review and approval by KNH/UoN ERC before implementation.
- c) Death and life threatening problems and severe adverse events (SAEs) or unexpected adverse events whether related or unrelated to the study must be reported to the KNH/UoN ERC within 72 hours of notification.
- d) Any changes, anticipated or otherwise that may increase the risks or affect safety or welfare of study participants and others or affect the integrity of the research must be reported to KNH/UoN ERC within 72 hours.
- e) Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. (Attach a comprehensive progress report to support the renewal.)
- f) Clearance for export of biological specimens must be obtained from KNH/UoN-Ethics & Research Committee for each batch of shipment.
- g) Submission of an executive summary report within 90 days upon completion of the study. This information will form part of the data base that will be consulted in future when processing related research studies so as to minimize chances of study duplication and/or plagiarism.

For more details consult the KNH/UoN ERC website www.uonbi.ac.ke/activities/KNHUoN.

Yours sincerely


PROF. M. L. CHINDIA
SECRETARY, KNH/UN-ERC

c.c. The Principal, College of Health Sciences, UoN
The Deputy Director CS, KNH
The Chairperson, KNH/UN-ERC
The Assistant Director, Health Information, KNH
Supervisors: Dr. Joseph Gikunju, Dr. Andrea Kim